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THE CO-OPERATION IN THE HEAVY ENGINEERING INDUSTRY IN RCD 1/

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Teheran, September 1971

1/ The views and opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the secretariat of UNIDO.

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This Preface contains [illegible] present report.

This report consists of three parts. Part I (Chapters [illegible]) is concerned with the problem of locational distribution of the twelve RCD projects among the member countries. Part II (Chapters [illegible]) is concerned with devising specific schemes of co-operation based on these twelve projects, while Part III (Chapters [illegible]) provides a tentative outline of the institutional arrangements under which effective co-operation may be possible.

The problem of locational distribution of the twelve RCD projects, which form the subject matter of Part I, is conceptually akin to the problem of efficient allocation of resources under constraints, with location in space as a further variable in the system. There is a standard body of mathematical programming techniques and computational algorithms which can often be used to handle such problems. Evidently, severe limitations of data did not allow the experts to use these techniques of analysis and they had to take resort to some alternative "rough-and-ready" method to tackle this problem. While their approach has some novelty, it is based on very limited information and is characterized by a somewhat ad-hoc procedure. Consequently, the resulting solution to the problem presented in Part I of this report, cannot be considered operational. Indeed it is not even clear that more useful results can be obtained by following this approach further. Rather than further elaborating the particular approach suggested by the experts, it may be more worthwhile to proceed along the more conventional line of analysis and develop the required data base for that.

The analysis presented in Parts II and III of this report is relatively independent of the particular approach suggested in Part I. The analysis in these parts is largely factual, though the lack of information often forces the experts to use impressionistic data and restrict their analysis to a somewhat general level without being too specific. Nevertheless, Part II of the report succeeds in presenting a comprehensive picture of the twelve engineering industries, drawing on all previous studies and field surveys. This could provide a valuable starting point for discussions as well as for taking practical steps towards RCD co-operation in the area of engineering industries. Part III which deals with the

[illegible] authorities.

[illegible] in tackling the [illegible] a group [illegible] problem, [illegible] to carry for [illegible] of control, this [illegible] down to a [illegible] Under these circumstances, [illegible] more favourable circumstances. [illegible] the reader will probably [illegible] feasible in such a situation.

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[illegible] engineering [illegible] [illegible] features [illegible] co-operation, [illegible] market [illegible] co-operation [illegible]. However, [illegible] countries, their [illegible] activities [illegible] each country and [illegible] special [illegible] government [illegible] in this [illegible] arrange- [illegible] which makes it rather [illegible] co-operation.

[illegible] Secondly, [illegible] relations [illegible] considerations [illegible]. At the same time, the [illegible] experts to emphasise gradual implementation of such co-operation.

[illegible] It is a finding of this report that [illegible] efforts of the RCD countries to establish close co-operation in engineering industries has a sound technical and economic basis, whereas [illegible] exploiting the advantages of modern technology, economies of [illegible], larger markets etc., brought about through co-operation. However, such co-operation will require further preparation concerning various technical, economic and organizational details.

[illegible] In proposing the criteria for distribution of the [illegible] engineering projects among the RCD countries, the experts had to take into account the unsatisfactory nature of the project studies and of the supporting statistical information base. They do not allow the projects to be distributed at present according to rational criteria. The applicability of a rational distribution system depends on various pre-conditions which have to be [illegible] by RCD. Nevertheless, to facilitate immediate action in the field of rational distribution of projects among RCD countries, the experts propose a simple distribution methodology although its results cannot be considered very precise or even completely reliable.

The main criterion according to which the projects are allocated among the member countries is as follows. The net social value added of the joint project, accruing to each country in proportion to the benefits it receives from the utilized investments for these projects. Further, the projects should be distributed equally on the grounds of equal profitability and their profitability in terms of competitiveness on the international market in the long run. The corresponding distribution of projects will create a pattern of mutual exchange among the RCD countries, of engineering goods, of raw materials for producing them, and will never result in shifts in their foreign trade with the rest of the world. Therefore, this report proposes that the distribution of projects which satisfies the main criterion mentioned above, should also satisfy two other auxiliary criteria: (a) the mutual flow of goods related to the projects among the member countries should be in reasonable balance, (b) net savings in foreign exchange should result in each country.

The projects can be distributed either in one phase or in two, or several phases. In the latter case the distribution carried out may balance any over-allocation or under-allocation of projects among the member countries occurring in the first phase. If, in spite of that, there is not an equal share of benefits among the member countries, some schemes for compensation have to be worked out. The possibility of putting into practice these criteria requires several prior conditions to be satisfied. Thus, a more comprehensive way of drafting the multi-national projects has to be followed, proper accounting prices have to be determined in order to carry out the social evaluation of projects, inter-industrial tables have to be compiled and so on. The experts recommend strongly a set of rational criteria for project distribution based on such data because they lead to an optimal result which will allow each RCD Government to ascertain more clearly the benefits and costs of co-operating in RCD undertakings.

However, in case the RCD is not in a position to implement the relevant recommendations, the report suggests proceeding along a rather special method for the sake of immediate action. This method can no doubt be further improved by using a better and firmer statistical base than is available at the moment.

4. [illegible] twelve projects in the [illegible] engineering industry [illegible] with [illegible] the [illegible] market [illegible] of [illegible] trade. The report emphasizes that the co-operational arrangement of the twelve projects is linked with already existing [illegible] with [illegible] and construction, for the overall level of capacity utilization of the whole engineering sector has to be raised. Due to the present stage of development of the engineering industry, the experts came to the conclusion that co-operation should encompass a whole spectrum of possibilities - starting with trade arrangements and purchase guarantees for some goods, then arrangements in delivery of intermediate goods and components, subcontracting, division of work and specialization, and finally up to joint investment and setting up of joint production arrangements, institutions, etc. The main recommendations are as follows:

(a) The report on the diesel electric locomotives for railways in Turkey is suitable for RCD joint production. The report recommends a large co-operational arrangement between Turkey and Pakistan starting with a joint design centre, manufacture of components for locomotives and the production of shunting locomotives. The co-operational arrangement can be extended to the production of railway wagons or equipment for railways and a joint study on the electrification of railways among all three RCD countries.

(b) This report proposes that the production of marine diesel engines be approved as an RCD joint project. It also proposes that action should be taken for the standardization of diesel engines and for the division of work among existing plants and projects to maintain high level of capacity utilization at competitive prices. It is further recommended that the possibilities for further co-operational arrangements in the production of various components of diesel engines and the sub-contracting with other specialized firms for some parts for diesel engines be explored in greater detail.

(c) The UNIDO experts came to the conclusion that the RCD countries are suitable for introducing the production of hydro, steam and gas turbines, generators, large transformers and other equipment necessary for building power stations. It is proposed in this study that a joint feasibility report for such production be prepared after the three Governments declare their interest in this sphere.

(d) This report finds that the production of industrial valves and the production of pumps and compressors together with pumps for the chemical industry are suitable for co-operational arrangements under the Joint Purpose Enterprises Scheme.

(e) Other projects such as centrifuges and filters for the chemical industry and the production of boilers, pressure vessels and steam heating appliances are largely directed towards the domestic market and the trade arrangements among the RCD countries to balance excess capacity against excess demand are recommended. The production of oil drilling equipment is not recommended for the RCD region, while production of oil refining equipment can be included in a future programme for producing equipment for the chemical industry.

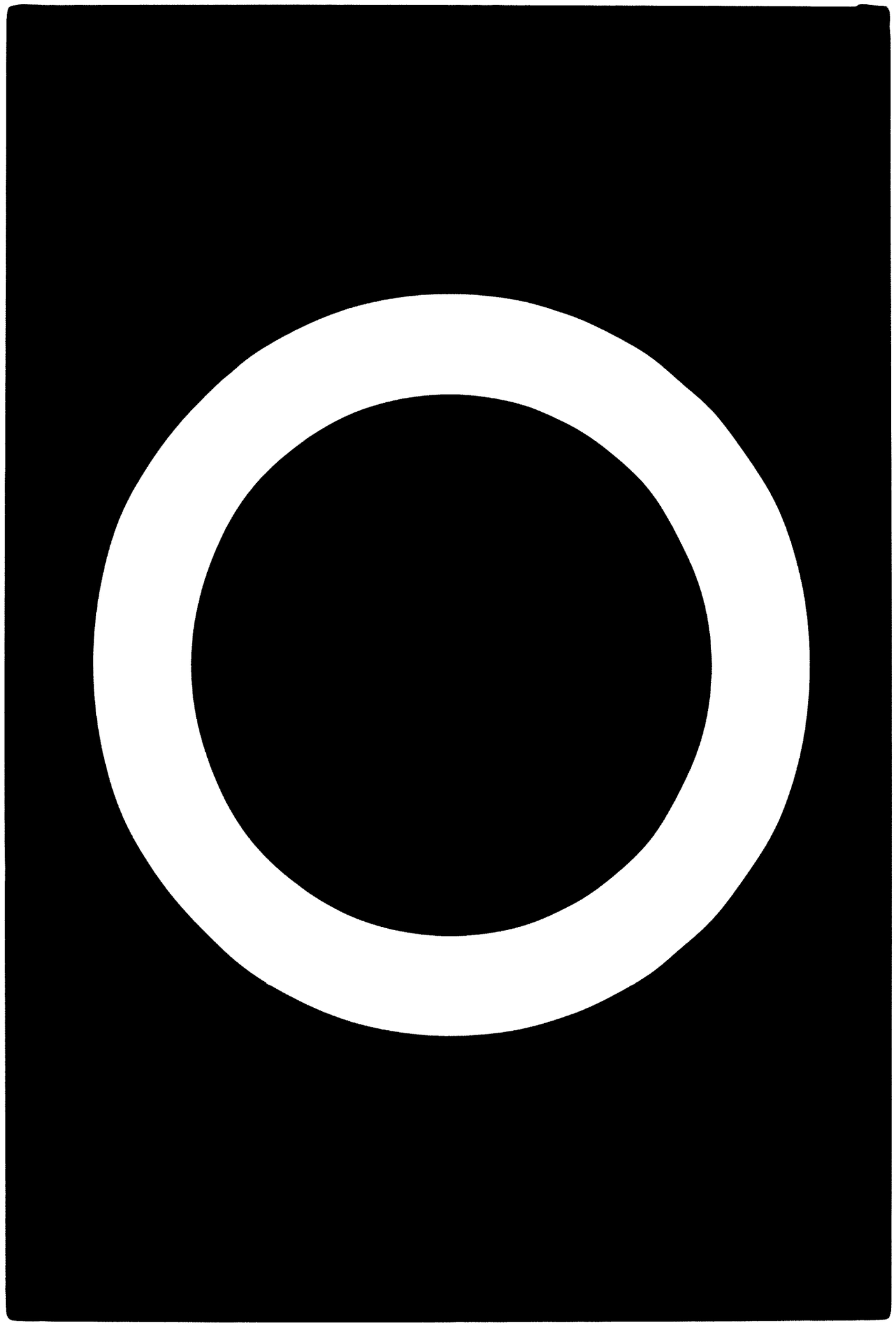
(f) In addition to the twelve projects in the report, further studies on the establishment of co-operational arrangements in the production of agricultural machinery, machine tools, automotive industry and various machinery for processing industry are proposed.

5. In proposing an organizational structure for the RCD region suitable for the proposed co-operational arrangements, this report takes into account that its non supra-national character should be combined with its effective functioning.

RCD has developed an organizational framework consisting mainly of inter-governmental bodies while the regional non-governmental and private business institutions are lagging behind. In the report it is suggested that the existing organization of RCD could be improved by strengthening the RCD Secretariat with technical staff to meet the new tasks regarding distribution of projects and co-operational arrangements.

The report recommends further that the various branches of engineering industry be organized within a rather flexible structure reflecting the technical and institutional peculiarities and the stages of growth characterizing each branch. It encompasses: (a) the RCD Joint Purpose Enterprises Scheme with suggestions for its improvement by enlarging its scope to all co-operational arrangements.

(b) A Regional Board for the heavy mechanical industry as a co-ordinating and advisory board among the large heavy engineering factories in the RCD countries. This Regional Board could be a preliminary phase in establishing the RCD Heavy Mechanical Corporation. (c) If an RCD country decides to prepare a feasibility report for heavy electrical equipment, it is proposed that a preparatory committee



INTRODUCTION

1.1 Purpose of the Study

On the basis of a decision made at the 10th Session of the Regional Planning Council of the RCD, the RCD Secretariat requested the UNIDO to prepare a study on Heavy Engineering and Electrical Industry. The Secretary General of the RCD, by letter of 24 July 1967, had forwarded to UNIDO Headquarters, the following Terms of Reference which had received the concurrence of all the three Governments concerned. (see Appendix I, Annex I)

In accordance with this request, UNIDO Headquarters, Vienna, sent a high official, Mr. Resk, in August 1967, to discuss this subject with the RCD Secretary General. As a result of steps taken and contacts made, a Job Description for the first phase of this study was prepared. In the Job Description, which was approved by the three Governments, the main tasks of the study are defined as follows (Annex II): -

"To prepare studies on the basis of which the three participating countries (Iran, Pakistan, Turkey) can decide on the locational distribution of given projects and on the mechanism for suitable co-operation arrangements. A team consisting of the team leader, an industrial economist and additional consultants as may be required, is requested to: -

1. establish criteria for macro-location of industries in the member countries,
2. evaluate the viability of 12 projects (mentioned in the background information) from the standpoint of establishing co-operational arrangements,
3. study the mechanism and the suitable organizational structure for co-operative arrangements."

2. Background to the Study

Two UNIDO Experts with assignments for one year, arrived in Teheran at the end of September 1970. During October and the beginning of November they firstly made some mainly fact-finding visits to the relevant Government authorities in Iran, Pakistan and Turkey to collect necessary statistical information and other data for their study.

At the end of the first visit to the Member Countries, on the request of the Secretary General of the RCD, the UNIDO Experts started immediately to prepare the Preliminary Report on Heavy Engineering Industry in the RCD countries. The report was submitted to the RCD Ministerial Council held in Dacca in January 1971. In a Joint Communiqué of the Ministerial Council of the RCD regarding the UNIDO Study the following statement was made:

> "13. The Council reviewed the progress of the study assigned to UNIDO on the feasibility of establishing RCD Heavy Engineering and Electrical Corporation(s) in order to evolve an integrated approach wherever practicable. The Council noted that UNIDO had appointed an Experts Group for this purpose which had already submitted a preliminary report. This report was now under the consideration of the Member Governments. The Council noted that UNIDO would complete this important study as soon as possible."

This Preliminary Report is attached to this Final Report. A lot of background statistical informations on the RCD countries are there recorded.

The study of the UNIDO Experts was partly affected by the main scope and the functions of the RCD Secretariat. The RCD is a special kind of organization: it is neither a multinational integrated economic area, nor a customs union or a Common Market. The RCD is based on joint actions and agreements in various fields of economic and non-economic activities, decided in common by the three Governments. The RCD Secretariat is not a decision-making body in any problem or issue and does not have at its command a technical staff for analysing economic problems. Therefore, the UNIDO Team could not have any substantive counterparts in the RCD Secretariat. Moreover, in contacting various institutions and the officials in each RCD country, the UNIDO Team came up against divergent opinions, especially with regard to the contents, methods, and perspectives for co-operation in Heavy Engineering Industry in the RCD region. Although these were mostly personal opinions, they nevertheless added to the difficulties already encountered in devising practical steps for co-operation in Heavy Engineering Industry.

The RCD is still in its initial phase of development. While much work at the governmental level has been and is being done, the industrial firms and business organizations particularly in the private sector are not yet sufficiently involved in the activities of the RCD. They are not enough in contact with each other, further there are no organizational, juridical and other arrangements to start practical co-operation at this level. It is our impression that many businessmen are waiting for appropriate measures from the three governments to support and stimulate trade through RCD co-operation. Some of the existing facilities and agreements among the RCD countries regarding the joint enterprises are reasonable and suitable as a starting point for co-operation, namely the postulate of the nearly equal flow of goods among the RCD countries, nearly equal distribution of benefits, exchange and sale of goods based on world market prices, maintenance of quality according to international standard, and so on.

3. On available documents and data

According to the Terms of Reference and the Job Description, the UNIDO Team should work on the basis of Feasibility Reports for the twelve above-mentioned projects. The Regional Planning Council of RCD entrusted the preparation of these Project Reports to the relevant countries a few years ago. In the beginning of 1971 only six Project Reports were available for the UNIDO Experts as well as one Feasibility Report. During the first visit to the RCD countries, the UNIDO Team collected some statistical publications on the Development Plans for each country, data and technical documents for projects, and other publications referring to foreign investment and development policies. The UNIDO Team had also access to other general studies and project reports on Engineering and other Industries, which were prepared especially for RCD. These studies were mainly prepared by Consultancy Firms in Pakistan, and by Iranian Institutions. The UNIDO Experts collected some information and data in the Chambers of Commerce and Industry of the RCD countries, in Industrial Banks and some private firms of each country. The Experts also used various economic and technical books, UN publications and industrial profiles.

In particular the following Project Reports were made available to the UNIDO Team: -

No.	Title	Prepared by
1.	Locomotives	Turkey
2.	Centrifugal and Special Filters for Chemical Industry	
3.	Diesel Engines and Diesel Engines for Marine	Pakistan and Turkey
4.	Boilers, Pressure Vessels and Steam Heating Applicances	Turkey
5.	Boilers large size for Grid Power Station	"
6.	Mechanical Equipment Turbines and Coupling System	"

7. In addition, the Report on "Power Equipment Plant", prepared by Ministry of Economy, Imperial Government of Iran was available to UNIDO Team. This Feasibility Report contains some data regarding Projects No. 4 and - Rotating Electrical Machinery and Turbo-generators.

It should be pointed out that only three of the above project-reports can be considered to be usual pre-feasibility reports, other lack various basic data such as major value-data, amount of investment, locational factors, etc.

However, for the following projects falling within the scope of UNIDO Study, no project reports were available: -

No.	Title	Country to which it was entrusted
1.	Oil Drilling Equipment	Iran
2.	Pumps and Compressors	Turkey
3.	Special Valves	Iran
4.	Pumps for Chemical Industry	Pakistan
5.	Rotating Electrical Machinery and Turbo-generator (steam/gas[1])	Iran

From the beginning of 1971 the UNIDO Experts started looking for these project-reports, at the RCD Secretariat and at the relevant Governments, while at the same time they also started to search for some other sources data regarding these projects for complementary information. The experts noticed that the RCD regional Planning Council had discussions on the 12 projects (as well as on some other projects) during the 5th, 6th and 7th Sessions of this Body, held from 1966-7 up to the present time.

1/ We merged these new projects in one project with respect to the above mentioned report on 'Power Equipment Plant".

The RCD held regularly two meetings yearly and the time schedule for the preparation of the project report was continuously being extended.

In such situation the Team Leader asked urgently the RCD Secretariat to supply the Team with those project-reports that were lacking and were entrusted to the Governments for preparation. The RCD Secretariat sent a letter to each one of the three countries - Iran, Turkey and Pakistan, - asking them to fulfill their obligations (Annex III, RCD letter). At the last meeting of the Committee on Industry held in Ankara from 2 June to 1 July 1971, Iran informed that their report will be finalized and circulated in July. The Industrial Committee accepted Iran's decision. Thus, the experts had virtually no data based on project-studies for those five projects.

Nevertheless, the UNIDO Experts have been successful in collecting a part of the relevant data from other sources and on the basis of this they propose some recommendations for most of the projects. But some of the conclusions are only explanatory and highly tentative in nature. It was the intention of the UNIDO Team to go deeper into the matter and propose some practical lines of action for co-operational arrangements. The assignment of consultancy firms/specialists had been foreseen for that purpose.

The UNIDO Team Leader prepared the Terms of Reference in March 1971 which were approved by the RCD Secretariat and the UNDP in Teheran for the recruitment of such expert-consultant Groups. At the same time, the UNIDO Team realized that more ample preparations were necessary and that conditions were not yet favourable for taking immediate steps towards co-operation. The agreement on trade and other economic policy measures were not yet sufficiently concrete. Further the overall situation and some specific events taking place at this time in the RCD region also affected the UNIDO in its agreement to recruit experts-consultants or consultancy firms. The UNIDO Experts were also of the opinion that the appointment of consultancy firms in establishing practical co-operation in Heavy Industry would be more useful and effective after consideration of this report by the three Governments concerned. This approach is probably more practical in the present stage of development of the RCD countries and would contribute much more to the success of their co-operational arrangements in the longer-run.

4. Scope and Structure of the Report

This was the situation in which the two UNIDO Experts had to do their best to carry out and finalize their study on time. The problem of RCD co-operation is so complex that it could not be tackled exhaustively from all possible angles. Some aspects of co-operation have just been mentioned but not sufficiently emphasised. However, a framework has been set up within which more detailed works can be carried out. Further study and decisions should contribute to further practical achievements and implementation of co-operational arrangements. Therefore, the content of this report stresses the most essential pre-requisites which form the basis for carrying forward the development programme and the locational distribution of the projects in Heavy Industry. These will include preparation of feasibility reports for the regional project (Part I), setting up and starting the co-operational arrangement among the 12 related projects (Part II), and the establishment of a suitable organizational structure to maintain the co-operation in Engineering Industry in the RCD region (Part III). Each Part contains the main conclusions and recommendations regarding the problem with which it is concerned.

Part I of the report deals with the rationalization of distribution of Heavy Engineering projects. A rather complicated system of distribution had to be worked out, because the problem has many complex dimensions. Various alternative recommendations and suggestions are submitted, in order to implement the distributional system, and to adjust the organization of the RCD Secretariat to this new tasks which the distribution of projects necessarily implies.

Part I of the report is divided into four Chapters. The Chapter 1 is a general, comprehensive view of the whole problem of project distribution in the RCD region. It illustrates the task of the UNIDO Team in the relevant field; the objective situation of the projects; availability of data, the industrial policy lines, the RCD co-operation postulates, upon which the experts had to work; the approach followed for tackling the distribution of projects, the main solutions and recommendations, including the type of technical assistance that may be requested from UNIDO in future work in this area.

The Chapter 2 deals with the criteria for distribution of projects, which represents the core of the analysis. After outlining the framework within which the analysis is to be carried out, this Chapter formulates the rules for singling out the projects considered viable for distribution, as well as the rules for distinguishing between "pre-determined" and "discretionary" macrolocations of

projects. It is proposed that the projects selected for distribution among the countries are to be allocated according to a main criterion for distribution resting on the net social value added created by the projects. The auxiliary criteria for distribution are also proposed, in order to take into account certain postulates of ECD co-operation stressed by the governments concerned, and some technological requirements of linkages among projects. In order to cope with the possibility that the distribution of projects may not ensure by itself equitable distribution of benefits for some of the member countries participating in the projects, a mechanism for compensation has also been proposed.

Chapter 3 illustrates the nature data and information required in order to apply the rational criteria for distribution. The main emphasis is laid on the procedures for drafting the multinational projects, which moreover will undergo an evaluation for the sake of multinational distribution. Since it is argued that proper evaluation needs of a set of "accounting prices" in order to price correctly the project-items, a method for calculating the accounting prices in the ECD region is suggested. Other relevant aspects of the information base concern the construction of inter-industry tables, special investigations on the utilization of engineering capacity in the ECD engineering industries, on the import content of the engineering products related to the projects being distributed as well as on transportation facilities and costs.

Chapter 4 contains an attempt to distribute the engineering projects which have been made available to the experts. Due to severe scarcity of actual project data and of other relevant statistical informations, distribution criteria and methods had to be devised in such a way as to suit the present level of information in this area. This is no more than a "second-best" type of solution with respect to the rational distribution system already proposed in Chapter 1.

Part II of the report consists of four Chapters. Chapters 5 and 6 contain explanations on the specific characteristics of the engineering industry in developed and developing countries and main features of the engineering industry in the ECD region. The experts refer to the fact that the engineering industry is facing many problems common to most developing countries which have no tradition or practice in co-operation. In addition, they include a short investigation into the underutilization of existing capacity which is one of the major problems facing the engineering industry, particularly with respect to several newly established engineering plants. It was necessary to refer to the existing capacity of the engineering industry as it strongly influences the co-operational arrangements among the twelve projects.

In the next chapter (Chapter) the experts evaluate the suitability of the twelve projects from the standpoint of establishing a co-operational arrangement. The criteria (economic, technical, etc.) which the experts have used are presented which is followed by a evaluation of the main economic and technical findings and conclusions of the project reports. For those projects lacking documentations, i.e. project reports, the experts did some market study within the ECD region and roughly estimated the relevant market, technical and investment data regarding these projects. Finally, each project is analysed in terms of co-operational arrangement from which relevant suggestions and recommendations emerge.

In analysing the viability of the projects for co-operational arrangement, the experts started mainly from the technical and economic characteristics of the projects and proceeded to what is more convenient and feasible to realize for co-operational arrangement in the ECD countries.

The experts found that the majority of the projects are suitable for co-operation, such co-operation can take various forms going from the trade arrangements and purchase guarantees to joint investments and joint production of goods.

Evaluation of these twelve projects led the experts to the conclusion that there are a few other industrial fields also suitable for a co-operational arrangement which are related to the twelve projects and to the general framework for co-operation in an ECD region. They indicate in Chapter 8 some specific branches of the engineering industry that are also suitable for a co-operational arrangement among the ECD countries.

At the end of Chapter) the main conclusions and recommendations regarding the co-operational arrangement among the twelve projects are summarised.

Chapter 10 belonging to Part II of the report contains a short explanation of the factors affecting the organizational structure of ECD. In Chapter 11 the experts explain and illustrate the present structure of ECD and its relevant historical experiences. The experts also emphasize the gap that exists in organizational structure of the ECD: at the inter-governmental level, ECD institutions are being developed to facilitate co-operation but at the non-governmental i.e. private business level, hardly any co-operational efforts are yet visible.

In the next two chapters (12 and 13) a suitable organizational structure for co-operation is discussed. The factors which are crucially important for any such organizational structure are highlighted in the specific context of each of the countries. The approach to the organizational structure chosen by the experts emphasizes the evolutionary process through which the organizational structure must evolve starting with the initial organizational form of the present RCD arrangement. The experts suggest that in developing the existing organization of RCD, particularly the regional Bureau of Commerce and Industry and the Joint Purpose Enterprise Scheme. The experts then analyze the proposals for various groups of engineering sectors viable schemes for regional organization such as regional associations of producers, various regional boards or committees indicating its function and the possibility of further improvement and expansion. For starting and maintaining co-operation in the engineering industry many additional factors are necessary, and in this study a few of them are mentioned, such as standardization, licenses, designs, etc.

In the last Chapter the experts put forward their tentative views on the supporting institutions which are likely to be important for successful co-operation in the engineering industry, such as the banking systems, some co-ordination in planning and economic policies, development of research and training, and so on. They capture some of the relevant dimensions for a congenial environment for industrial growth in this region.

Acknowledgements

The experts would like to express their thanks to all those in the RCD Secretariat and in the RCD countries who helped them in the fulfillment of the mission. First of all they acknowledge the understanding, the facilities and the friendly atmosphere they enjoyed at the RCD Secretariat, which greatly eased their work. The experts feel to thank H. E. F. S. Zuberi, Secretary General of RCD up to January 1971, H.E. V. Asiroglu, present Secretary General of RCD, Dr. A. A. Tavakoli, Deputy Secretary General, the Directors of the RCD services and all RCD staff. The experts also thank H. E. A.H. Batmanglidj, Dr. I. A. Mahmood CSP and Dr. I. Karaca, who were in charge of the RCD units for their respective Governments.

PART I

RATIONALIZATION OF DISTRIBUTION

OF HEAVY ENGINEERING PRODUCTS

CHAPTER I

A GENERAL VIEW OF THE PROBLEM, OF THE APPROACH, AND OF THE SOLUTIONS

1.1. Preliminary considerations:

The distribution[1/] of a set of industrial projects within the framework of multinational co-operation agreements, represents a new tool of economic policy in developing countries. It aims, together with other policy measures, to raise the efficiency of the industrial structure, to maintain a certain balance in the industrial growth among the member countries and to increase mutual trade through specialization. The creation of such complementary economic relationships among a group of developing countries, the objective of counter-balancing the prevailing pattern of relationships between developed and developing countries is brought down to the plane of reality.

The Regional Co-operation for Development has been exploring over the last few years, the possibilities of establishing and distributing some common industrial projects, under the scheme of the Joint Purpose Enterprises. The intention of the RCD countries to extend their co-operation to Heavy Engineering and Electrical Industries, has brought about the need to possess clearly defined and comprehensive principles which may guide the distribution of projects in these important fields.

1.2. The task of the UNIDO Team

The UNIDO Team has been requested, according to the RCD Terms of Reference and to the Job Descriptions INT-121-I (SIS) and INT-121-Y (S.S) (see attachments A1, A2, A3):

(a) to formulate criteria for the distribution of Heavy Engineering projects among the RCD countries, with reference to both the 12 specific projects and the new industrial areas for co-operation.

(b) to carry out the distribution of the 12 projects.

1/ All along the report, the terms "distribution", "macrolocation" and "allocation" of projects bear the same meaning.

The UNIDO Team has also been provided (through the RCD Terms of Reference) with some guidelines within which to carry out its work, particularly the principles of co-operation in Heavy Engineering and Electrical Industries agreed upon by the RCD Governments[1/].

Criteria for macrolocation of projects was originally tackled in a preliminary report, (Chapter V) on the subject. A broad framework for the macrolocation problems in RCD-region, and of the main limitations to its study, was also outlined there. A proposal was submitted to organize separate meetings with Experts of Iran, Pakistan and Turkey, in order to discuss the practical suitability of the outlined criteria, and to check the availability of various statistical information. This procedure was approved by the RCD Planning Council in Dacca on January 1971. Various postponments in visiting the RCD countries outside that of the duty-station, has noticeably delayed and slowed up the teams collection of statistics and other neceseary informations.

1.3. The problem of distribution of projects

The distribution of projects among countries is not analytically identical with the usual locational problem within one country. In the latter case there is, in principle, one economic structure and one pattern of prices, so that one may often reasonably assume, in the alternative locations, "rebus sic stantibus conditions" exist apart from the special complications introduced by distance and the associated transportation costs. However, in a developing country with a dualistic structure the impact of a project is expected to be different according to the sites chosen, which lie well beyond the differences in transportation costs. But this holds still more for a group of developing countries, each one having a different production structure, prices pattern, factors endowment etc. In such a case, the choice of the best location is the outcome of procedures that are closer to benefit-cost analyses, than to typical locational analyses where transport cost is the dominant consideration.

1/ "The member Governments are of the view that co-operation amongst them in the fields of Heavy Engineering and Electrical Industries could be beneficial and take effect only if all the three countries partake in the benefits resulting from such co-operation on an equitable basis, including a reasonable flow of products amongst the three countries." (RCD T. of R. par.2).

Taking this into account and leaving aside for the moment the practical difficulties mentioned in [illegible], the [illegible] experts faced, in fulfilling their [illegible] a set of special problems which shape the nature of their work regarding the distribution of industries. These are -

(1) No pre-determined project-sites within each country were initiated, i.e. the macrolocations have no center .

(2) Each OECD country is presently free to join, or not, with [illegible] share of its contribution either to the equity-capital or to the investments in the project to which it partakes, as no unified rule exists but is varies according to agreements reached in each individual case.

(3) There is substantial underutilised productive capacity in the engineering and metalworking industries, in the OECD-region as a whole.

(4) Only part of the [illegible] project-studies has been made available and even those project studies are deficient in several important respects.

(5) The compilation of the national-accounts and of the industrial statistics in the OECD countries is unsatisfactory.

(6) The OECD countries consider the distribution of the [illegible] projects, and of those in the related fields to be identified, as one unified by the same principles of costs and benefits, partaking of mutual exchanges, etc..

1.3.1. The three governments have not given a prior indication of how the "centre" or centres for heavy engineering projects should their country receive some projects. This relates to projects whose locations are not in some way 'predetermined". In such cases determination of the transportation costs related to the inputs and outputs of the projects' becomes actually impossible. It is unfeasable to look for some criterion which allows for an objective selection of theproject sites within each country, because each Government pursues its own policy of regional development and balanced industrial growth, independent of OECD agreements referring to specific industrial projects.

1.3.2. OECD is not a multinational organisation and it is not presently binding the member states in such fields as investment policies, the harmonisation of development plans, the choice of production structure. In the field of projects, (industrial or other), the regulations presently holding are those of the [illegible] 'Agreements on the Joint Purpose Enterprises of April 196[illegible] and June 196[illegible]. It appears

from such agreements that each time an [illegible] project is prepared, drafted, and negotiated among the major steel producers, each agreement is free to participate in the investment [illegible] in the equity [illegible].

[illegible] the other features of the Machine Tool Industry and of other industries more directly related to the steel sector, is the existence of a utilized productive capacity [illegible] the findings of Part I on various and diverse [illegible] which are in short disappearance [illegible] the present level. The degree of utilized capacity is not the same in all major countries and for all main engineering branches. This circumstance may bring to the attention of the countries, the possibility of profitable specialization [illegible] instead of being [illegible] each of them produces a joint products in fact given the repetitive production programmes. [illegible] last point, one must remember that engineering plants have a remarkable flexibility, due to the fact that usually they are built for the manufacture never a product of a time unit [illegible] several kinds of parameters (i.e., [illegible] parts of the machines have a large range of upper limit capabilities, [illegible] the [illegible] processes and the productive adjustment of existing plants whose degree of utilized capacity is substantially [illegible], there may be found in principle various possible which can be added alternatively to the present investment provided for the quantitative requirements of fabrication are met. The supplementary investment estimate to be made, in order to adjust the [illegible] plant to the mix of products a programme, are generally rather limited however, substituting the abutilized capacity for manufacturing different products instead [illegible] there, may arise, about a different effect both directly [illegible] on the costs as known as the profitability of the relevant plant and indirectly [illegible] on the output level of factories or [illegible] complex technological linkages with the relevant plants.

1.1.1. The [illegible] team should have been supplied with the 17 project-studies mentioned in the [illegible] forms of reference and in the [illegible] prepared. Actually, only one of the 17 projects has been made available, and, as it will be discussed in a moment, they do not [illegible] enough data for a satisfactory [illegible] analysis.

The [illegible] team should have been supplied with a comprehensive and detailed feasibility studies of the projects through since adjustments were expected (see terms of reference), to enable an immediate distribution [illegible] evaluation based on the project data. That means the projects should have been prepared as [illegible] projects, containing all necessary elements for carrying out the

evaluation of distribution in each member country (especially such elements as the factor proportions, the applicable technologies, the breakdown and the source of the inputs, etc.). Unfortunately, such requirements have not been met. Non of the available projects-studies may be considered, even the best feasibility-study for multinational evaluation purposes. Each draftee, were they either an Iranian or a Pakistanian or a Turkish consultancy-firm, has prepared the project entrusted to him as if it should be allocated to his country, as if mainly the national resources would be involved, and as if only the national effects of the project on the production structure should be considered. Moreover, even as national projects, the project-studies have not been drafted according to the normal requirements of project compilation. The data is generally insufficient in quality and quantity, apart from in only one case[1/] where sufficient data exists to resemble a usual feasibility study, although even this lacks information in important respects. (for all these aspects see the Chapter 4).

Another major shortcoming of the project-studies is that the production programmes (the assortments) proposed by the draftees, need to be revised, because neither the size of the RCD market, the prevailing technological requirements, or the features of the products have been sufficiently envisaged. The majority of the 12 projects are designed to produce several products belonging to the same class (f.i. Diesel Engines, Compressors, Boilers, etc.) as is to be expected in engineering projects. The screening of the available projects, and the breakdown of the classes of products for the unavailable projects has led to the suggestion of various solutions such as: - to merge some projects, to split other projects; to take some products out of the original production programme and to add them to the assortment, either among the given projects, or among already existing plants qualified to produce for the RCD market, and finally to drop some products from the list of those considered suitable for RCD co-operation[2/]. The need for re-patterning the production programmes of the original 12 projects, along the lines hinted at above, brings additional uncertainty to much project data, particularly to those concerning the inputs breakdown and the operational costs. In consequence, the calculation of production costs and of profitability, already unreliable in the original projects due to insufficient data becomes still less reliable. One must remember that the

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1/ The project XII on Hydraulic Turbins and Coupling Systems.

2/ For a more detailed illustration, see the Chapter 4 and the Part II of the report.

level of total costs plays a very important role in the present RCD industrial co-operation[1/], and that the social profit and value of projects are usually considered as the most meaningful indicators in the benefit-cost and in the locational methodologies. However, the profit indicator should be the outcome of calculations involving a detailed list of project-items and a correct pricing of these items. In fact, a profit variation of, let us say, 10 per cent, may be already decisive for preferring one project instead of another but that variation could have resulted from the omission of some items of the projects, or applying in correct prices. In such circumstances, the profit indicator would be misleading.

1.3.5. In order to allocate projects one cannot operate with the data contained in the feasibility studies alone, however detailed and correct these studies may be.

A larger data framework should also be made available. This should consist of industrial statistics, branch and sectorial and national accounting data and obtained either through relating to special investigations or directly from Government and entrepreneurial sources. In particular it is necessary to know, with reference to each RCD country, the structure and the main input-output relationships of the metalworking industry, the accounting-prices of some factors, the import-content of the goods directly and indirectly entailed in the projects, the transportation means and costs, the public facilities and incentives being relevant for the projects, etc. The UNIDO Team has deployed a considerable effort in this field during the assignment period, and the results have been embodied both in the preliminary report and in this final report. However, the major part of the above data-framework could not be collected or worked out due to lack of relevant data and time and more experts would also have been needed.

1.3.6. The rationalization of distribution (and also, on a broader framework, the rationalization of distribution and the mechanism for co-operation) is considered by the three countries as a unit. That appears clearly in the RCD Terms of Reference, Parts 1 and 2. The bid by the RCD countries for common principles concerning distribution, common benefits and the mutual exchange of the projects, indicates clearly the intention of the member countries to give a "package" solution

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1/ The RCD agreements on the Joint Purpose Enterprises require that these should sell their products at international prices.

(though not necessarily in the same period of time) to the distribution of an unlimited set of projects.

The aspects illustrated in 1.3.1 .... 1.3.7 may help to give a comprehensive picture of the background on which rationalization of project allocation in the RCD region is based. All these aspects should be taken into account in envisaging the approach and the solutions. This has called for a methodological treatment of the problem of project distribution.

1.4. The approach to the problem

The problem of formulating criteria for distribution of Heavy Engineering Projects is tackled by the UNIDO Team at two levels. Firstly, the system of distribution criteria most suitable to the requirements of multinational comparisons, and the conditions for implementing it. Secondly, an attempt has been made to distribute the projects available to the team by applying criteria which are based only on the scanty existing data but can still be considered as rough approximations of the more specified and precise criteria presented in the preceding analysis.

1.4.1. In the Chapters 2 and 3, the proper method for rationalization of project distribution is outlined. It consists of the criteria for distribution, of the statistical prerequisites for applying them, of the mechanism for compensation, and of some organizational measures concerning the institutional set-up of RCD.

The distribution of projects is such a complex problem that it must necessarily be analyzed within a clearly specified framework of simplifying assumptions and limitations. These are listed and explained at the beginning of Chapter 2. The main assumption is that each country agrees to indicate some industrial areas or industrial estates as eventual "microlocations" of those projects which will be assigned to the relevant country.

The distribution of projects concerns those projects which - through appropriate procedures - are considered as viable for investment and production. The viability test for the RCD projects must take into account three factors. The first is that the size of the RCD demand is compatible with the programmed output - size of the project; the second is that the total long-range production costs are internationally competitive and that the quality requirements are met; the third is that the projects through their direct and indirect impact will improve the balance of payments situation in the member countries joining them with respect to the rest of the world.

If the distribution of projects refers only to the products of newly built plants, it will occur that numerous products, though being the object of the RCD co-operational agreement, will remain outside the framework of the distribution criteria, we have in mind that those new products which, due to the peculiar conditions of largely unutilized engineering capacity in the RCD region, be manufactured in existing plants where capacity is available. Since it is advisable to take advantage of the available capacity to the largest possible extent, the consequences are expected to be noticeable in the fields of mutual exchange among the member countries, of the direct and indirect effects of utilizing such capacity, of the changes in the engineering production structure of each country, and of the eventual engagements for common foreign technical assistance (if different types of the same product are proposed to be manufactured in the various countries). If the consequences are relevant, each Government will probably be most eager to partake in the decisions about the new products to be manufactured in existing plants in their country and to co-ordinate them with products manufactured in newly installed RCD plants. Projects[1/] should be prepared indicating which can be manufactured in a given plant, the output size, the addition to total investments and operation costs, the changes in the inputs breakdown. However, to simplify matters, the less important cases can be dropped and left to the decision of the Governments and to the producers of the separate countries. The system of distribution should therefore encompass only those projects which indicate how a group of <u>new products</u> can be alternatively manufactured in existing plants in <u>all three countries</u>, and which require common foreign technical assistance. The experts are aware of the difficulties involved in this attempt to make the system of projects distribution more comprehensive, and they leave to the RCD Governments the option to accept this proposition, or to keep the distribution principles purely for projects implying the building of new RCD plants.

The decisions on the viability of projects, such as those concerning each country's willingness to join any RCD project, does not need to be considered in an overall detailed feasibility study. Pre-feasibility studies of the potential projects should be drafted, and when it is known which of them are viable for

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1/ One must remember here that with reference to industrial production the same goal (for the manufacture of a given product) may be attained either by building a new plant or by employing the unused capacity of an existing plant. For different situations the nature of the project is the same, but the technical study on how to organize the resources for obtaining the given product is very different.

distribution and how many countries are ready to join each of them, one may proceed to prepare the (cumbersome and costly) feasibility studies of the selected projects.

When the feasibility studies are ready and before starting the distribution of projects, the share of each MCD country in the total fixed investments needed for the project, has to be assessed. This is the main point of reference for carrying out the distribution.

In distributing projects a large number of alternative locations are usually involved. However, by tracing a distinction between "predetermined" and "discretionary" locations, the number of alternatives are reduced.

Predetermined locations are countries which offer in absolute terms the best conditions for starting a given project, discretionary locations are countries which offer in principle the same, or almost the same, conditions for starting a given project. The experts propose that the macrolocation of any MCD project be "predetermined" when the average production costs (making allowances for the installation period) are more than 10% lower than in other MCD countries. This is clearly the most comprehensive principle for identification since the idea of lower production costs is inclusive of such situations as vicinity of either the output market, the input market, or both. If the calculation of production costs were too difficult, the experts propose to identify a predetermined location when either the demand of one country is more than 50% of the total MCD demand for the relevant product, or when the direct and indirect supply of materials and intermediate inputs coming from that country are more than 50% of the total requirements of the project. In this way the evaluation of the alternatives is limited to those projects whose macrolocation is discretionary. The utilization of wasted capacity in existing plants within the limits explained above may be considered as a case of discretionary location.

1.4.1.1. <u>As a main criterion for distribution</u>, the experts propose that the net social value added accruing to each country from the projects be proportional to the share of each country in the total of fixed investments required by the projects. The net social value added is the sum of wages and salaries, gross profits, interests and rents, evaluated at "accounting" prices.

This principle takes into account the fact that each MCD country is free to either join or not join any project, and that each MCD country bears the largest share of the fixed investment costs (or of the equity capital) for the projects

which are assigned to it. All this will bring about considerable computational work since the added social value created by the projects is also a function of the alternative locations. However, the difficulties can be technically overcome in such a way that each country's share in both total investments and accrued social value are arrived at by successive tentatives.

The net social value added of projects is perhaps the most meaningful indicator of the impact on the RCD economies since it expresses the increase in national income engendered by the projects. However, one should remember that an increase in value added may involve different proportions of wages and profits and that both governments and private investors are not indifferent to the way in which such proportions are shaped. Indeed, the re-investment requirements represented by profits should always be taken into account.

1.4.1.2. Two auxiliary criteria for distribution are also proposed. The first one is related to the declared wish (see the RCD terms of reference of the RCD countries) to keep a balance in the mutual flow of engineering goods (perhaps in view of organizing mutual trade in the field by means of "clearing" agreements). The auxiliary criterion states that the flow of goods directly and indirectly related to the projects to and from each country must be reasonably balanced. Too strict an application of this criterion is difficult because some projects are joined by three countries and others by only two countries, for this reason the conception of "balance" must be kept within a certain range of variability. Another point is that in attempting to carry out the above criterion one should not go too far in re-distributing the projects because of the increased work load in re-calculating alternative locations. If a reasonable balance cannot be obtained by these means, it would be advisable to resort to the compensation method as outlined below.

The second auxiliary criterion is that the projects should bring about foreign exchange savings. This principle has a ready been mentioned as conditions for viability of the RCD projects, but it must again be stressed especially with respect to countries such as Turkey and Pakistan, for whom foreign exchange savings are very necessary criterion in the selection of national projects.

An additional auxiliary criterion for distribution might be envisaged, which relies on the advantages of locating a group of projects connected by technological links (the so-called "industrial complex") in each country. The identification of industrial complexes in the engineering industry is not as clear-cut as in other sectors, as, for instance, in the chemical and petrochemical sector. For this reason the third criterion is proposed only as an optional device.

1.4.1.3. In order to apply the above criteria, a background of various pre-conditions is necessary, which are more clearly indicated in Chapter 3.

The experts have prepared a standard breakdown of projects in order to show which items deal with multinational evaluation. It represents a basic starting point for correct evaluation of projects. Each project should contain at least two or three variants which indicate possible differences in each country in the use and cost of certain inputs, such as labour and services, with respect to the state of mechanization of certain phases in both the construction and production processes.

In order to price the separate project items one must apply accounting prices directly. By dividing all project inputs between traded and non-traded goods and by applying to the former the international market prices, the difference in accounting prices among the ECE countries is reduced to non-traded goods, wages, interest and foreign exchange. This second set of accounting prices cannot be determined for the ECE region as a whole because this is not a united economy and the relative factor-scarcities operate only inside the separate national economies. It is, therefore, advisable to carry out a two-step survey on the determination of the accounting prices. Firstly, to determine them with respect to each separate ECE economy taken in isolation; secondly, to reach an agreement over the accounting-price-level of the factors listed above when applied to evaluation of ECE projects[1/].

Further investigations are needed in the fields of input/output matrix, transportation costs and foreign-components of the directly and indirectly used inputs by the projects. A special investigation is particularly needed in order to assess the extent of capacity utilization in existing engineering and metalworking plants. The survey should single out in each country those plants which meet the technical and quality requirements in order that their available capacity may be used for ECE purposes. The survey will indicate the actual possibilities of using unutilized capacity, which would detex investment in new plants in the under-utilized industries. it would also show where "capacity bottlenecks" are to be expected in the course of the import-substitution process.

1/ One must remind that, in practice, subjective (policy) considerations always enter in the determination of accounting prices.

1.4.1. Since the number of RCD engineering projects is not very large and the projects themselves are not "divisible", the distribution of projects may bring about an over-allocation or under-allocation, in the sense that one RCD country may receive more, or less, of the social value added than corresponds to its share of total investments. The distribution may also bring about a surplus or deficit in mutual trade related to the projects among the member countries. In order to avoid such an imbalance, a method for compensation has been devised.

In the case of over- or under-allocation of projects, the method relies on a two-phase distribution of projects, and whenever this proves insufficient, on loans from the favoured country(s) to the other one(s). In the case of a lack of surplus in the mutual flow of goods (should the two-phase distribution not correct the imbalance), special bilateral trade agreements should be negotiated concerning engineering products.

1.4.2. In Chapter 4, an attempt has been made to distribute the available projects. As has already been emphasized, the unsatisfactory state of the project studies together with the need to re-pattern various production programmes and the scarcity of national accounting data and other statistics, make the costs and profitability evaluation of projects unreliable. This prevents the distribution of projects by the social value added criteria.

A main principle for distribution has been devised, which fit the available background data. This principle is based on the "backwards" effect, which is expressed in the gross output value of the projects in the national economy only. Since the domestic "backwards" effects are not the only gross output consequences indirectly created by the projects, it is preferable to name the distribution criterion as "market criterion", for indicating that projects are allocated according to their impact on the national market. The impact of each project is expressed, as the sum of its direct and "backwards" effects in the relevant country, and not of the import content of the relevant production. Various assumptions have been set and adjustments made in order to arrive at an estimate of these consequences in order to express them in comparable values, take into account investments and demand, and finally, to omit certain aspects(such as transportation costs and economies of scale) which cannot at present undergo any such speculation. Projects in each country are distributed in such way that the impact as expressed above is approximately equal. Another auxiliary distribution criterion is proposed, whereby the mutual flow of goods among the countries should also be reasonably balanced. The methodology

proposed for the distribution of available projects represents all that it has been possible to do within the present framework of data. The experts submit it with reservations for the purpose of supplying the RCD countries only with a distribution tool should they decide to allocate the available projects in the immediate future. The question may be raised as to whether it was possible to improve the methodology for distribution of available projects, by adjusting existing data or by inference, in order to bring it as close as possible to an optimal methodology for allocation. The experts, however, had no hesitation in abstaining from manipulating the existing data beyond certain limits, taking into consideration the risk of stripping the findings of any reasonable meaning.

Therefore, if more data had been available instead of the "backward" effects alone, it would have been possible to estimate the total direct and indirect gross output value stemming from the project and the direct value added of the rational criterion for location (see 1.4.1.). In this sense the methodology devised for the available projects may be considered as a kind of "second best" solution with respect to that which is proposed in Chapter 2. The former represents an introductory and crude expression of the latter. It could also be said that if, for various reasons, the RCD countries for the moment decide that the rationalization system proposed in 1.2.1. is unfeasible, they could eventually choose <u>gradual improvement</u> as other necessary data became available.

1.5. <u>Summary of the distribution criteria and methods</u>

Due to the specific status of the RCD Heavy Engineering projects, the UNIDO Experts have worked out a system of project distribution at two levels; from one side a rational distribution has been devised and the conditions for its applicability have been indicated. On the other side, a rougher "second best" methodology has been suggested for the projects actually made available for evaluation to the UNIDO Team, should the RCD countries decide to distribute these projects on a short-term basis before implementing the rational distribution system.

According to the proposed distribution system the fulfillment of certain pre-conditions should precede the allocation of the given set of projects among member countries. A background of statistical data and other information obtained by special surveys of the accounting prices on the inter-industry relationships, the structure of imports and on transportation costs should firstly be made available. Based on such information and by eventually utilizing the technical assistance of UNIDO or of other agencies, the RCD projects should be partly or wholly re-drafted in order to cope with the requirements of multi-national evaluation.

In the course of preparing the projects, certain points of reference of parameters have to be taken into account in order to assess the viability for distribution of the projects. Projects are said to be viable for RCD distribution when the long-run production costs are equal or close to international costs in the relevant production lines and there is an improvement in the balance of payments provided at any exchange rate that the RCD countries demand, and that the quality requirements are satisfied.

In order to simplify the calculations of the alternative locations and thereby reduce the burden of computational procedure, some parameters are laid down which allow the singling out of predetermined locations of projects from the discretionary ones. The predetermined locations are basically identified in terms of lower production costs or - whenever this indicator is lacking - in terms of the demand or of the supply met by any RCD country with respect to a given project.

The engineering projects should be distributed among the RCD countries according to the criterion that the social net value added accruing to each country be proportional to the share of that country in the total fixed investments to be borne for setting up the projects. The distribution should also satisfy two auxiliary criteria, namely, that the flow of goods among the member countries is in reasonable balance and that the projects bring savings in foreign exchange.

A compensation mechanism should operate in case the distribution of projects lead either to over-allocation or under-allocation of benefits with respect to the costs borne by each country. The compensation should rest preferably on a two phase distribution of the given set of projects and only if this possibility is discarded or does not bring about a balance, some measures should be set up in the form of either capital loans or special trade arrangements for compensating the less favoured country or countries.

The attempt to distribute the available projects is submitted by the experts with reservations because the findings are affected by the insufficiency and uncertainty of the background data. The distribution is carried out according to a "market criterion", which encompasses the direct and backward effects of the projects in terms of gross output value, after making allowance for the value of the import components.

1.6. Solutions and main recommendations

The experts submit some solutions and recommendations with respect to the distribution of projects and their time-phasing to the compansation mechanisms, to the institutional organization of the distribution, and to the eventual assistance by UNIDO.

1.6.1. Distribution of projects:

Solution 1: To re-draft the 12 projects into the newly identified fields of co-operation and to make a final distribution. In order to apply the criterion of social value added the projects should be drafted according to the principles of project drafting and be evaluated with the support of the statistics and information contained in Chapter 3. This would mean a delay of two years at least in the distribution of projects. A finalized distribution has the advantage of avoiding various computational complicacies related to a time-phased distribution of investments, and the need to devise a method of inter-temporal compensation among the member countries. However, a postponement of the distribution may affect the nature of the projects because of the eventual changes in the industrial and engineering industry structure which will have taken place meanwhile in the three countries.

Solution 2: To re-draft the 12 projects according to the guidelines of Chapters 2 and 3 and to make a final distribution; to draft and distribute the projects in the selected new fields for co-operation in Heavy Engineering Industry in the future. This will require taking into account the inter-temporal compensation in distribution which brings complications to the distribution system. As an advantage, the lag between the two distribution phases may help check on how the co-operation among the RCD countries is working and how its eventual shortcomings may be improved in the second phase of the projects distribution.

Solution 3: to distribute the presently available projects after attempting to improve their data and to adjust their production programmes quickly by applying the "market criterion" and the method outlined in Chapter 4. To distribute all other projects (including those in the new fields of co-operation), after preparing them according to the principles of Chapters 2 and 3. With this two-phases distribution, a mechanism for compensation would, in principle, be needed. However, since the initial distribution of the available projects do not give a clear quantitative expression of the eventual difference in benefits accruing to each country, it cannot be expected that the mechanism for compensation will work effectively.

Grading of solutions: solutions 1 and 2 are both recommendable ones, since they involve the application of the same allocation criteria and the relevant methods. Both solutions present some advantages and disadvantages which will have to be considered by the three Governments. The experts believe that, in principle, solution 1 seems the more practical one, as it allows all the various steps of the distributional procedures to be co-ordinated and simplifies the organizational aspects. Solution 3 could only be envisaged if the RCD countries decide to distribute the available projects for a short period, which would put the major emphasis on the urgency of carrying out industrial co-operational measures, and less emphasis on a precise evaluation of such undertakings. The experts have put many reservations on such solution.

1.6.2. Mechanism for compensation

Possible alternatives in the mechanism for compensation will depend on whether an RCD Investment Bank is created. If the RCD Bank does not exist (as most probably is the case), the member countries will mutually undertake the compensation when there is an over-allocation of value added and when there is a large deficit in the flow of engineering goods. In case the Investment Bank is created, it may be asked to carry out the compensations for unbalanced distribution of the value added benefits by means of loans to the less-favoured country(ies).

1.6.3. Organizational set-up

The task of following-up and co-ordinating the implementation of the whole system of distribution of engineering projects should, in principle, be entrusted to the RCD Industrial Committee (RCD-IC). For this purpose, the RCD-IC should be appropriately strengthened with permanent technical staff, mainly economists and engineers.

This body should prepare and release detailed instructions about the preparation of the projects, check their implementation by the draftees and eventually centralize the preparation of some other projects. It should also co-ordinate the complex work of preparing and supporting statistical framework by co-operating with the relevant national institutions and by centralizing some surveys. The RCD-IC should, moreover, (which represents its main task) assess the viability of the multi-national projects and evaluate them in all possible alternatives for the sake of distribution among the member countries. Once the distribution has been accepted, and it has started being implemented, the body should steadily

follow-up the results [illegible] whether the occurrence of possible changes will [illegible] compensation among the countries [illegible] compensation agreements.

If [illegible] will request [illegible], [illegible] institutions, to assist the experts in [illegible] distribution, the experts should preferably work together [illegible] Industrial Committee.

1.6.4. Technical assistance by UNIDO

The CMEA secretariat could ask [illegible] for a team of industrial economists and engineers, to work together with [illegible] technical staff in preparing feasibility studies and evaluating projects for distribution. The experience of the present UNIDO team suggests that highly qualified specialists are needed for preparing feasibility studies.

The CMEA secretariat could also [illegible] for individual experts, with the task of carrying out special investigations whose results will help in evaluating the projects. Qualified international experts would be required in order to carry out the three following investigations: [illegible] economist, for working out the set of accounting prices in the CMEA-region; an industrial economist, for studying the extent and degree of the un-utilised capacity in the engineering and metal working industries of the member countries; a transport economist, for carrying out comprehensive study of the transportation facilities and transportation costs in the CMEA-region.

[illegible]

[illegible] DISTRIBUTION OF PROJECT

[illegible]

[illegible] industries [illegible] [illegible] just [illegible] limitations [illegible]

[illegible]

[illegible] OECD [illegible] imports for [illegible] world, [illegible] output is [illegible] [illegible] illustrated [illegible] payments [illegible] import-substitution [illegible] "import-using" [illegible]

[illegible] equal [illegible] rather simplified approach [illegible] economic structure, [illegible] and rate of growth [illegible] level of [illegible]. However, considering that the [illegible] three [illegible] this [illegible] without [illegible] sophisticated indices of [illegible] countries.

[illegible] their impact [illegible] national [illegible] Possible consequences [illegible] country in terms of [illegible] inequality [illegible] structure [illegible] analysis, [illegible] Government should avoid this possibility by properly indicating the [illegible] industrial [illegible].

(d) It is taken into account that within the near future the three countries will provide the necessary infrastructures for the operation of RCD multi-national projects. This refers especially to the creation of transport facilities among the RCD countries and to the eventual training of skilled manpower and technicians.

(e) Each RCD country is developing its own steel industry even if not to the extent of satisfying the whole internal demand. Casting and forging activities are also being developed.

(f) Prior to the distribution of projects, each Government agrees to indicate a few industrial areas or industrial estates where the projects (with no specific unique location) should be sited if they were assigned to the relevant country. The indication of these industrial areas falls to the relevant Government and the only condition set forth is that they be provided with facilities and easy communication to and from the country and the RCD region. By preliminary indication of a few industrial areas in each country, the calculation of transportation costs would not become too complex as in the case where a project is alternatively sited in a large number of industrial areas.

(g) The distribution of projects is envisaged to take place either at one time or in two phases. Avoiding the "continuous" distribution of projects will simplify the evaluation of costs and benefits and eventual compensations.

(h) The economies of scale are only taken into account where the direct effect of the projects occur, that is in the relevant plants. No scale-economies are analyzed in connexion with the indirect impact of the projects, or with the installation of a certain number of RCD projects in the same country.

(i) No "down-grading" of projects from RCD into national ones is envisaged and no recommendations are made in this field. It is considered to be an internal matter for each Government to decide on projects which have been appraised as unsuitable for RCD co-operation.

(j) The scope of the evaluation of costs and benefits arising from the projects as a whole is part of the national economy. To attempt to gauge the impact of the projects on the national geographical sub-divisions would imply the existance of an advanced statistical regionalization system and regional input-output tables whose implementation can only be foreseen in the distant future.

(k) No evaluation of the welfare created by the projects, is made due to the increase of wages and of consumption.

(l) No attempt has been made at evaluating the maximum benefit from the distribution of the given sets of projects. Indeed, the distributional system appears so complex that no simple method for attaining these benefits is foreseeable. It seems adviseable to avoid the problem which would require a large number of alternatives.

(m) The types of machinery, equipment and intermediate inputs required by the projects produced by the RCD countries are utilized in the construction and operation of the projects if they meet the qualitative standards eventually established by the RCD Standardization Institute.

2.2 Two-country or three-country projects

We have already seen in Chapter 1.3 that according to present practice, each RCD country is free to join any RCD project.

The preparation of multi-national projects involves considerable work and expense. The first step is to know how many RCD countries are ready to join a given project. For this purpose a study should be drafted which may be called the "opportunity-investment study" and circulated among the RCD countries. This opportunity-investment study should include a broad analysis of the market possibilities of the project, the most probable production programme and output size, the possible supplies of intermediate inputs and (indirectly), of basic materials like steel, cast iron, etc. Thus, each country can check such preliminary production proposals against its development plans regarding the structure of the engineering industry and the structure of the related inputs. In fact, some Governments may decide, for various reasons, to manufacture certain engineering products on a national basis only, or may feel that certain

intermediary outputs are more needed for supplying the national engineering plants than the RCD ones. The decisions taken on the basis of the opportunity-investment study will allow the actual number of potential macrolocations for each project to be known.

2.3 The viability of projects for distribution

2.3.1 The concept of international costs

The distribution of heavy engineering projects needs a preliminary test in order to assess their viability to become multi-national projects. Indeed, there is no reason to distribute projects which do not have this basis feature. The most evident rule is that the projects should produce at costs allowing them to be competitive on the international market and should give a profit at that cost level. It must be remembered that the RCD agreements on Joint Purpose Enterprises contain the clause that each RCD enterprise should sell at international prices and international quality standards· these two requirements are appropriate and should be applied also to the RCD heavy engineering project. Moreover, the RCD projects are not expected to produce solely for the RCD region market. It is adviseable that at least a minor share of their output (for instance 10-20%) be planned for export to the rest of the world; of course, this requires that both quality and costs are close to the international levels, i.e. of the firms operating in the international market with similar products.

The domestic price policies of the RCD projects should be left to the RCD Governments. Taxes or subsidies or other elements may affect the selling price of the RCD projects with respect to the consumers in the country of location. In this sense the selling price should be taken into account in order to ascertain whether the profitability of the project is the international one, and should be the subsidised average price applied in the RCD countries outside the country of location and the price applied in the country of location.

The concept of international cost is not a fully objective one. It is usually derived from the international prices by making allowances for a conventional profit margin. However, various monopolistic situations and price manipulations by the large international conerns make such calculations wholly unreliable. Taking into consideration that precise parameters are out of reach and that an external tariff

between the RCD region and the rest of the world will always exist, one can propose a cost level which is 20% higher than that of the international market. This would be the upper limit of the viability of RCD projects, provided that the RCD demand is met by the output size, that the quality standards are respected, and that there is an improvement in the balance of payments with the rest of the world.

The production costs mentioned above are at optimum output size and at full capacity utilization: in other words, it is a matter of production costs which incorporate the economies of scale and which are attained by the project after the so-called "installation period" which is usually three to five years after the start of production. They are usually called the long-run production costs.

2.3.2 Improvement in the balance of payments in relation to the rest of the world

In order to ascertain the effect of a project on the balance of payments a separate evaluation has to be carried out involving the knowledge of the import content of the direct and possible indirect input and of the foreign exchange reserves existing in each country. For this reason it is necessary to establish the output size and basic input breakdown of projects. The importance of improving the balance of payments in relation to the viability for distribution depends on whether such improvements concern all RCD countries. In principle, it would be adviseable to reject a project only if the balance of payment deteriorates in all three countries, or in both countries in the case of a two country project. If there were no improvement, the situation could be improved by low production costs or by indirect effects on the economy, such as the enlargement of the industrial structure, the increase of industrial employment in relation to other employment areas.

2.3.3 Long-run pre-feasibility studies

In order to compare international costs, a more advanced analysis than that of the opportunity-investment study has to be carried out. The pre-feasibility study should avoid the almost certain high expenses in assessing the viability for distribution. Each project should be worked out in all economic and engineering details. The long-run pre-feasibility study should highlight:

- the probable revenues during the life-time of the project.
- a comprehensive scheme for each potential macrolocation of the intermediary inputs in the RCD area.
- the possible variants of technology in the potential macrolocations. (In practice, eventual noticeable differences in technology may only be envisaged in Pakistan, where an abundance of unskilled manpower makes it convenient to introduce low-mechanized operations for some sections of the construction-process and the operation-process. For Iran and Turkey there is no reason for proposing substantially different technologies;
- a more precise determination of the production programme and optimum output-size;
- preliminary cost estimate of potential macrolocations according to the geographical source of inputs should correspond to the relevant potential macrolocations.

2.4 Types of location

The distribution of products should be less collective and therefore less cumbersome, if the number of projects are distributed among the member countries. The literature on project allocation has for a long time provided a distinction between "pre-determined" and "discretionary" locations. We call predetermined locations those countries which offer optional conditions for commencing a project. Discretionary locations are those countries which offer less favourable conditions for starting a given project.

2.5.1. Means of identifying predetermined locations are numerous. The level of operational costs is the most straight-forward indicator since lower costs mean higher profits and therefore a gain for all member countries. The principle may be set that potential macrolocation is predetermined if the relevant project indicates that their costs are at least 10% lower than the alternative macrolocation (with a preliminary evaluation of transportation costs). The difference in profit would be so noticeable to represent the decisive factor for

choice[1]. A lower production cost is due not only to the technology and to the internal structure of the relevant project, but also to the vicinity of the markets of both outputs and inputs. Indeed, the more direct the knowledge of markets by the management, the quicker the relations with the customers or suppliers and the shorter the periods of storage, the easier the harmonization of input supplies with the phasing of production process, and therefore simpler administrative procedures with respect to transportation. This will certainly increase the efficiency and profitability of a project.

However it may occur that the operational costs cannot be easily and clearly calculated, or that the differences in operational costs among potential macro-locations are noticeable (less than 10%, for instance). In such cases a predetermined location may be indicated by the capability of relevant country either to absorb a large share of the whole RCD demand for the project's output or to supply a large share of the direct and indirect inputs, or even to meet both requirements. In such a situation a macro-location is predetermined alternatively when:

(a) more than 50% of the total RCD demand for the project's output is absorbed by the relevant country.

(b) more than 50% of the materials and intermediate inputs[2] and 50% or more of the inputs for manufacturing the former come from the relevant country.

(c) the relevant country displays the highest share of demand and the highest share of input-deliveries, though in both cases less than 50 per cent.

1/ Considering that a 20-30% rate of gross profit may be taken as normal in developing countries, a 10% reduction in operational costs will entail an increase in gross profits between one-third and one-fourth.

2/ Machinery, equipment and services are not included.

The importance of condition (b) rests on the fact that, though the location of engineering projects is not directly dependent on such "immobile" factors as natural resources (minerals and raw materials, which are often a key factor for the location of industries such as chemical, metal smelting, food stuffs processing, and so on) and also on production of basic metals, it may be indirectly linked to natural resources and basic metals peculiar to any RCD Country through the materials and intermediate manufactured inputs. This would noticeably reduce the transportation costs involved in the project from the inputs side.

2.4.2 The discretionary location means that a project may be shifted alternatively in any of the RCD countries, without engendering appreciable differences in benefits and losses for the region as a whole.

The peculair conditions of the engineering industry in the RCD Region (high unutilized capacity in some branches), brings about a special type of discretionary location which needs illustration. As mentioned in Chapter 1, and more clearly illustrated in the Chapter 3, a certain number of engineering products which fall within the output range of the 12 projects do not need to be manufactured in newly-built plants. There are 4-5 products or classes of products (centrifugal and special filters, heat exchangers, small and medium sized pressure gauges, small and medium sized compressors up to 250 cw/m/hour, which can be manufactured with other products in existing plants where their capacity is under utilized. It is possible for some existing plants in each RCD country to produce one or more of such products and to this extent we have included a special case of discretionary location which does not involve the distribution of new plants.

2.5.3 In order to identify predetermined locations, feasibility studies of projects, together with statistics and ancillary information, are needed.

It would be unusual if macro location of all projects is pre-determined under the parameters given above or contrarily, if no location of projects is predetermined at all. (For the sake of simplifying the distribution procedure, it is necessary for part of the projects to have a pre-determined location). If the above circumstance should occur,

it is advisable that the parameters proposed above for identifying the predetermined locations be changed.

2.5 Measuring the share of investments

Investments measure the contribution of the RCD countries towards creating the RCD projects. It is important to know each country's share of total investments for the projects, since this is one of the elements in which the distribution of projects is carried out.

The investment contribution of the RCD countries may be represented by:

(a) direct fixed investment in the projects.

(b) direct and indirect fixed investments in the production branches should be enlarged in order to create the projects.

(c) direct and indirect fixed investments plus other funds for eventual loans and short-term financing of the RCD projects.

Situations (b) and (c) are so complex that they can be satisfactorily encompassed only by implying the creation of an RCD Investment Bank. We will therefore only discuss situation (a) involving direct fixed investments.

Fixed investments are mainly borne during a construction period of 1 to 3 years so that in order to express them in a uniform present-value figure, a discount rate has to be applied. Once the detailed data on fixed investments are known from the feasibility studies of all projects which are considered as viable for distribution, then the total investments and the share of each country in this total can be determined. However, one must not forget that this outcome will be arrived at through a very complex computational procedure. Indeed according to the accepted principle that each country should bear the largest possible share of investment costs for the projects which are assigned to it, many trials have to be made in order to assess the satisfactory criteria that the values added accrue to the various countries in the same ratios as the fixed investments. In order to simplify the procedure, it is advisable that each country finances 80% of the projects assigned to it, while the remaining 20% of investment

costs are borne equally by the two other members (in case of a three country project) or by the other partner (in case of a two country project).

2.6 The main criterion for distribution

We propose that the main criterion which regulates the distribution of the heavy engineering projects be distributed in such a way that the net social value added created by the projects accrue to each country proportionally to its share of the total fixed investments.

2.6.1 Definition and measure of social value added

The social net value added involved in the distribution is made up of three components: the V.A. directly created in the project, the V.A. created indirectly in the same country where the project is located; the V.A. created indirectly in the rest of the RCD region. Indeed, each RCD project is expected to buy inputs of various kinds (materials, intermediate manufactured products, possibly machines and some kinds of specialized services) not only in the country where it will be located but also in the other member countries. The net value added, as known, is the sum of gross profits, wages and salaries, interests and rents.

As said above, the net social value added (SVA) of a project is the sum of the direct and indirect value added of that project throughout the whole RCD region. It can be calculated through either of the two basic devices: namely, the accounting prices or the input-output relationships. We do not propose to discuss the merits and shortcomings of each method[1/], and prefer to calculate the social value added by means of accounting prices, since this involves a quicker procedure. In order to get the magnitude of the social net value added, all project items have to be priced by means of accounting prices which (for the sake of multi-national evaluation) must be uniform to the whole RCD region. The way in which such accounting prices are determined is

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1/ The "Manual on economic development projects" of the UN, pp. 209-210, suggests treating the two methods as practically equivalent. We deem that the accounting prices are a better and more straightforward method and that the inputs, outputs, relationships, should be employed for checking the results of the former method.

illustrated in Chapter 3. Let it suffice to indicate firstly that they are derived from current prices and after they are mutually adjusted. In this way the SVA for each project in the country of location will be obtained by applying that country's accounting prices, and the SVA in the other countries by applying the relevant accounting prices.

The SVA in the country of location measures the value added created directly by the project and indirectly by the economy at large. It is obtained from wages, interests, rents and gross profits, of the project. The SVA in the other two countries[1] measures the value added created indirectly in the economy at large. It is obtained from the magnitude of the value of inputs supplied by the two countries.

The SVA, as defined above occurs during the period when fixed-investments of the projects are borne and during the operational period. During the construction periods very little value added will be created outside the country of location (only in the case where some machineries and specialized services are supplied from the RCD Region). As far as the value added created in the country of location is concerned, it is limited to some items of investment-costs (buildings, services and eventually some machinary and equipment).

The SVA occurs in principle, during each year of the construction period and of the operation period. In order to have an overall impression of the SVA relating to the whole lifespan of the projects and to handle it for distributional purposes, one must obtain the present SVA by applying a proper discount rate. Usually, it is easy to calculate the yearly SVA for the construction period and for the first few years of the operation period because they are relatively close to present conditions. It is more difficult to know the value added in the distant future of the projects' activity. If it is impossible or too uncertain to record these magnitudes in the feasibility studies one can resort to the device of capitalizing the value added calculated upon the first year (or years) of the operational period.

1/ Or of the other country, if it is a matter of a two-country project.

2.6.2 Distribution of projects with predetermined locations

By means of the steps illustrated in paragraphs 2.3., 2.4 and 2.5, one can firstly pass on to distribute the projects with predetermined locations. Projects are supposed to start together, both the construction and the operational periods for the sake of simplifying the illustration. It is necessary to separately determine the value added created during the construction and the operation period for the group of projects allocated to each country in order to reduce all magnitudes to "present" values added and sum them up in order to obtain the total social value added from the projects with predetermined locations. The total SVA for each country, expressed in relative terms, will be compared with that country's share in total fixed investments. Since the two sets of ratios will certainly not coincide, the projects with discretionary locations will be distributed in such a way as to make the total SVA for each country, expressed in relative terms, coincide with or be closest to the fixed investment ratios.

The predetermined locations are identified by means of the rules proposed in paragraph 2.4 of this chapter. Since there are no alternative locations of the relevant projects, there are no alternative calculations of the SVA created by the projects in the alternative locations. Correspondingly, there is no need to apply the accounting prices of each country to the inputs of the relevant projects.

2.6.3 Distribution of projects with discretionary locations

The projects with discretionary locations are alternatively assigned to those countries which have already received (or at least are expected to receive) some projects with predetermined locations. They have to be allotted to the member countries in such a way that the total SVA accruing to each country, thanks to both types of projects located there, is proportional to each country's share in total fixed investments.

Projects with discretionary locations are expected in principle to obtain different amounts of SVA according to the alternative macrolocations. In fact, some aspects of the technological processes in both the construction and the operational periods of the projects may be at variance in the different member countries; moreover, the indirect effects of the projects' activities are certainly different

in each alternative macrolocation as is reflected in the various patterns of accounting prices. In other words, the distribution of projects with discretionary locations among member countries, whilst involving the same method as already outlined will certainly require several trials and computational work.

2.6.1 Equitable distribution of social value added

Since the number of heavy engineering projects which are to undergo distribution is not very [illegible], it cannot be expected that the various combinations of projects allocated to the three countries will satisfactorily fulfill the main criterion for distribution. Moreover, a reasonable degree of uncertainty has to be expected. By taking these facts into consideration, the suggestion is made that if the magnitudes of SVA in their mutual ratios accruing to the three countries stand in proportions which diverge up to 5% from the ratios of the shares in fixed investments, these should still be considered as an equitable distribution of social value added, and therefore as an equitable distribution.

If, however, the two sets of ratios diverge for more than 5%, one can say that the SVA is over-allocated in some member countries, and under-allocated in others. This will entail resorting to a mechanism for compensating the countries where the SVA is under-allocated.

2.7 Auxiliary criteria for distribution

The auxiliary criteria for distribution of projects may be either quantative or qualitative. In the latter case, they are simply broad guidelines which loosely bind the member countries. We submit below one quantitative and one qualitative criterion for the distribution of the RCD heavy engineering projects.

2.7.1 The first auxiliary criterion is that the flow of goods directly and indirectly engendered by the projects distributed among the three countries be reasonably balanced. This principle repeats what is clearly stated in the RCD Terms of Reference, as a condition for the RCD co-operation in the Heavy Engineering Industry. As stated earlier, each RCD country is free to join in any RCD project, so that the principle of balance in the flow of goods cannot be a tripartite one, but must be bilaterally applied for each pair of countries. The importance of this auxiliary criterium may be questioned as it seems to bind the

relationships too strictly between the three countries in rather composite situations when not all projects are expected to be on a three country basis. However, since one must respect the will of Governments as expressed in the Terms of Reference, the experts have taken this into account.

The analysis of goods flow in relation to the RCD projects starts from the findings of the distribution of the projects with pre-determined and discretionary location. This distribution has been carried out so as to satisfy the main criterion of allocation. In the preceding paragraph, we have seen that such distribution is very composite and cumbersome, since it entails various successive methodological steps and the calculation locations. Therefore, if the distribution of projects is considered equal according to the main criterion, the auxiliary criterion should be satisfied through slight adjustments of the previous distribution so as not to undermine the main criterion; where this is not possible, the auxiliary criterion should be carried out by resorting to other devices than re-distributing the projects (this is discussed in the next paragraph 2.9 dealing with the compensation mechanism). It is not easy to ascertain the flow of goods as it is difficult to forecast beyond a reasonable time-horizon of mutual trade. If the mutual trade related to the given set of RCD projects should progress through relying on purchases and deliveries freely decided upon year by year, it would be impossible to make any precise calculation or even any projection of the flow of goods and the application of the auxiliary criterion would be unfeasible. It is necessary, therefore, to establish appropriate agreements to follow the distribution of the projects as a working hypothesis for distribution, in order that purchases and deliveries of all products related to the main products of the projects, be fixed over a period longer than one year.

The calculation of the flow of goods on a bilateral basis will indicate surpluses or deficits in trade among pairs of countries engendered by the distribution of the projects. At this point some objection should be raised as at the beginning of section 2.8.1. regarding the inconsistency of the criterion requiring "reasonably balanced flows of goods" with the fact of allowing each country to

petro-chemical industries. In the engineering industry the identification of industrial complexes is less easy, because the peculiar flexibility of mechanical equipment makes engineering activities not so rigidly complementary as in the sectors mentioned above. One can only indicate here some possible engineering complexes such as:

(a) gas-turbines, steam turbines, turbo-compressors;
(b) steam turbines, alternators, steam boilers;
(c) large diesel engines, large piston compressors, large casting and forging shops;
(d) large sized boilers, heat exchangers, machinery for chemical industry,
(e) valves, steam-turbines, forging and casting shops, welding shops.

It is clear at first sight that the engineering and metal working branches are not particularly suitable for the creation of too many industrial complexes. It has been proved that in practice, the engineering plants can be freely combined in the majority of cases. However, where it is possible to set up any of the abovementioned combinations of projects or plants, a reduction of investments can be achieved. In particular combination (b) could obtain a saving in investment up to 20-30% of the cost which would be borne if the plants were separately installed in different locations. This leads to the conclusion that the distribution of projects should take into account the principle of industrial complexes.

2.8 The Mechanism for Compensation

The mechanism for compensation can be basically envisaged in two situations. Firstly, where there is under-allocation or over-allocation of SVA; secondly, where there is a deficit or surplus in the flow of goods. If both or either situation occurs, there are various ways for carrying out the compensation. Some solutions are proposed according to the distribution of projects being carried out either in one or two phases.

2.8.1 Two-Phase Distribution Case

In principle the devices for compensation are the following ones:

(a) The distribution of projects is carried out in two phases, so that the second distribution phase will attempt to balance the misallocations of SVA or the imbalances in the bilateral trade relationships among the RCD countries. The advantages and disadvantages accruing to the countries who receive the projects either before or after should be taken into account and an interest rate should be applied to the benefits gained during the first phase.

(b) If, in spite of the above device, the distribution of projects is still unbalanced,

(i) a capital loan should be granted by the favoured country to the unfavoured one or ones in the case of under or over allocation of SVA,

(ii) some bilateral agreement should be reached between the interested countries in order to foster the trade of these goods in the direction of the deficit country in case of surplus or deficit in the mutual trade of engineering goods.

With reference to the issue dealt with in (ii), account should be taken of the flow of goods which may refer basically to two classes of engineering products: either final ones or inputs used by the RCD projects. The first only encompasses the products manufactured by the RCD projects and sold in the RCD countries where the relevant projects are not located, either as final goods to consumers or as inputs for other RCD projects. The second encompasses the main inputs which are directly needed for manufacturing the former ones. In this case, if mutual trade among the goods belonging to the former does not result in a balance, the possibility of enlarging the concept of flow of goods also to the second class of products can be envisaged. However, these are not easily recorded because the mid-term purchase and delivery agreements (already hinted at before) are likely to be established among the RCD projects, and less likely among private producers. In this way, the RCD geographical sources of various intermediate inputs of the projects may vary from year to year.

It will depend, therefore, on the practical importance in quantity and value terms of the project's intermediate inputs, whether to extend

the conception of flow of goods also to the second class of products in order to try filling the deficits or surpluses through bilateral trade agreements covering these goods, or to find some surer means of compensation.

2.5.2. One Phase Distribution of Projects

This case has been dealt with in the preceding sub-paragraph under b (i) and b (ii).

2.5.3. Final Remarks

The distribution of projects in two phases is certainly complex and cumbersome but it may help avoid the need to set up compensation either through capital loans or through special bilateral trade agreements, which may be unwillingly accepted by the RCD Governments specially if large volumes of loans or trade are entailed. On the other hand, the distribution of projects in one phase is undoubtedly simpler but will raise the need for means of compensation in the form explained above.

Common sense has to be used in choosing between the two alternatives. In principle, the experts suggest the distribution of projects in one phase because the procedure is greatly simplified. In the findings of this procedure, according to the main and the auxiliary criteria for distribution and within the limits of the parameters suggested in this chapter for identifying the pre-determined location, will lead ultimately to large allocations of SVA and large unbalances in the flow of goods, it is advisable to change the parameters and to redistribute the projects accordingly. In this way, it is possible that the redistribution will make the misallocations and trade unbalances less important. When the point is reached that these are not large, then the mechanism for compensation can be applied, either in the form of capital loans or special bilateral trade agreements. Indeed, the favoured countries will be more likely to accept such measures when they do not entail noticeable financial sacrifices.

CHAPTER III

INFORMATION BASE REQUIRED FOR THE APPLICATION OF THE GENERAL DISTRIBUTION CRITERIA

This Chapter illustrates the set of preconditions which are necessary to compile the heavy engineering projects and to carry out evaluation for the distribution of these projects. We shall examine successively the break-down of multi-national projects, the accounting prices for pricing project items, the input-output relationships, the import-content investigation, the survey on transportation costs, and the survey on the utilization of productive capacity.

3.1 The preparation of multi-national projects

As already mentioned in Chapter 1, the projects hitherto prepared for RCD purposes do not meet the requirements of multi-national evaluation. The basic shortcomings of the projects are firstly, that they are drafted in a cursory way in all but a few exceptions, over many details which are of great importance from the standpoint of distributing projects; secondly, they have been prepared on a strictly national basis, by considering only the national resources (including the importations of inputs from the "outer world"), and taking into account the productive effects of the projects on the national market only.

The project studies were prepared between the years 1967 and 1970. In this period, trade among the RCD countries for all products in general, was very limited and even more limited in the field of engineering goods. However, there is a certain increase every year of the RCD industrial intertrade and as soon as the railway connections between Turkey and Iran are ready at the end of 1971, and the highway connections between the three countries well advanced by the end of 1972, the exchanges in this field will certainly increase noticeably even if projects not common to RCD were created). There are, therefore, grounds for taking into account that various inputs of heavy engineering projects (materials, manufactured intermediate goods, and probably also some simpler types of machinery) will be supplied by the RCD countries in the feasibility studies of the RCD projects to be drafted in future.

Below is a standard breakdown of a feasibility study. It is not too detailed, but aims at showing which items should be accounted for by the project draftees in order to allow for a more comprehensive and correct evaluation of the projects later on. The main reason for proposing a standard breakdown of projects, is to point out that too cursory and incomplete project studies are useless if the distribution of projects is to be carried out on the basis of value indicators such as value added, or profitability.

The experts would like to point out that three main features should be embodied in the feasibility studies of the RCD projects. The first, is the time phasing of the construction and operation periods, of costs and revenues which will involve the use of the discount rate (or rates). The second, is a detailed specification of machinery, materials and intermediate inputs required by the projects. The third feature is a further indication of the separate inputs and the domestic linkages, the import content and the RCD source of supplies. If the feasibility studies contain these elements, there will be grounds for a correct evaluation of distribution (provided that a set of accounting prices has also been determined).

3.2 A cursory breakdown of multi-national projects

The indications laid down below are not overall project designs. It is presumed that those who will prepare the RCD projects will know, in general, how a project has to be prepared. We aim at pointing out those project items which cannot be overlooked in the feasibility studies of the RCD projects, since these need to undergo multi-national evaluation for the sake of distribution. The following project items are singled out and examined separately:

- projection of demand;
- production capacity and output;
- technology of construction and production processes;
- specification of materials and intermediate inputs;
- geographical sources of machines, materials and other inputs;
- operational costs;
- revenues and profits.

This list, as experts in project compilation will realize, encompasses many but not all the main items of a feasibility study.

(a) The projections of demand for the product (or products) of a given project should be very accurate and should possibly be carried out in the form of a proper market survey. In fact, the correct measurement of demand may be decided as the viability of the project for the economies of scale which are linked to the optimum size of output, and for the predetermined location of the project in one of the member countries. In studying the demand, one must not fail to explore the possibilities of exporting to the rest of the world, especially to other developing countries.

(b) As for production capacity the length of the construction period must be specified and the various phases of implementation of the production programme established. Revenues and therefore profitability will depend largely on a clear design of the production plan of the programmed capacity. Output will in general follow the trend of capacity in normal situations. It is necessary to indicate the progression both of the installation period, as distinguished from the total execution period.

(c) Fixed investments are usually specified in detail. For the RCD projects, the length of the construction period should be indicated and general indications given on the types of fixed investments to be undertaken as well, during this period i.e. construction, machinery and equipment and services. This will allow the calculation of the value added during the construction period, and describe the eventual sources of imports for the RCD area.

(d) The technology of the production process and certain aspects of the construction phase of the project, is of special importance for multi-national projects. Indeed, each member country has different factor proportions, and this cannot but affect the way in which production factors are employed by the projects. Thus, a substantially higher availability of unskilled labour, as existing in relation to turnkey installations, has a direct influence on the technology and therefore on the investments and

production costs. This does not mean that labour-intensive projects exist only in Pakistan and capital intensive projects only in Iran and Turkey. What we suggest is that the different labour-mobility in the RCD countries be taken into account for certain operations of the construction and production process, without affecting the modern and multi-national character of the RCD projects. An income class will be able to possess fixed capital if cheap mechanical equipment can co-exist with highly mechanized operations, and if this would reduce overall costs. Indeed all incentives are feasible, they must be introduced in the feasibility studies since they are elements leading to project location.

(e) The specifications of materials and intermediate inputs are important in order to follow-up the indirect effects of the projects (if the accounting prices cannot be determined) and for ascertaining whether the relevant projects will eventually be import substituting or import using projects. The above physical specification is necessary in order to clearly distinguish between "traded" and "non-traded" goods in the project's inputs. As already known, this distinction is the basis upon which a precise determination of many accounting prices can be carried out.

(f) The geographical sources of the physical inputs and of certain services, is a further step in making a detailed specification of inputs. It is indicated here which part of the machines and equipment, materials and intermediates may be supplied by the 'outer world', by the RCD countries where the project can be alternatively located, and by the rest of the RCD region. This will ascertain the extent of RCD trade which is directly and indirectly related to a given set of projects. For projects whose location is predetermined, there is no need to show the alternative geographical sources of inputs in the feasibility study.

(g) A distinction should be made between the operational costs referring to the installation period (i.e. up to the "break-even" point of profitability) and those referring to the normal operation period. A clear time phasing of operational costs, together with a clear time phasing of revenues from the sale of products, is decisive for correct calculation of a project's profitability. Certain items such as interest rates, exchange rates, etc., have to be added to operational costs in order to obtain a full picture of the project's production costs, especially in the long run in order to assess the viability of the project. Operational costs should be calculated as far as possible into the future and at least five years from the start of production. For the remaining life span of the project, the capitalization of the operational costs of a year can be applied.

(h) Corresponding to the time phasing of costs, yearly revenues should also be specified to the farthest possible extent. This requires projection on market prices which will prevail in the future. One must remember that the final criterion of an evaluation is to ascertain both the value added and the profits of the project and this is important not only in order that Governments may know the prospective rate of return of investment entailed by the projects, but also in order to encourage private investors to join CDO undertakings.

In principle CDO projects may take the form either of newly built plants (which represent the large number of cases) or of production programmes to be undertaken in existing plants whose capacity to some extent is underutilized. As already emphasized in I.3.3, this second group of projects is very limited. This is because only those manufacturers of CDO products who, through the utilization of their existing capacity, qualify for distribution under RCD criteria. The existing utilization of capacity should:

(a) entail all three countries;

(b) concern products not previously manufactured in the RCD region;

(c) imply a considerable volume of output, which will meet the demand of the three countries;
(d) require fixed investments for adjusting existing plants to new products;
(e) call for foreign technical assistance.

If the majority of these conditions exist, we believe the impact of RCD specialization "schemes" for the use of production capacity would be relevant in the distribution system. Indeed, the Governments are expected to partake in decisions and weigh the overall consequences of specialization agreements which will affect the national composition of their country's engineering production, foreign trade, eventual relations with foreign firms supplying know-how and the domestic capability of feeding input requirements to the new productions.

For the sake of distribution and for evaluating the impact on the RCD region, the "schemes" for common utilization of production capacity have to be expressed in projects. It will certainly be a matter of special project types which will probably lack several items usually included in projects which entail the building-up of new plants. At any rate, various economic and technical aspects should be taken into account as the basis for evaluation.

A project for manufacturing products in existing plants under a common RCD scheme might be outlined as follows:

Imagine three existing engineering plants (one for each RCD country) with production programme and a partially unused capacity. On the assumption that the three products can be alternatively manufactured in each plant (for instance, some types of diesel engine, pumps and compressors, heat exchangers and small and medium sized pressure vessels) the project should attempt to highlight some basic technical and economic features for manufacturing the three products in each plant alternatively. One may indicate tentatively that given the output size of each production which will meet the RCD dmand, the project should investigate:

- the addition to fixed investments in the plant (new machinery and equipment, change in plant layout, etc);
- the inputs required for manufacturing the new product;

- the change in man-power;
- the eventual economies of scale obtained by adding the product to the previous production programme.

Since the cost structure of the relevant plant is supposed to be known already, this information could in principle lead to changes in profitability. This should allow an evaluation of the social value added to be carried out by utilizing the existing capacity for manufacturing each product.

One must be warned against specialization schemes with their corresponding projects as they can be most successfully implemented if corporations or associations of producers are created from the institutional side.

3.3 The set of accounting prices for evaluating RCD projects

Current market prices in the RCD countries are largely distorted by the influence of protective tariffs, import-quotas and restrictions, other market imperfections, especially in the capital goods sector and by different factor proportions. This brings about a rather difficult problem of which current prices to assign to RCD projects and which prices to use for the sake of carrying out their evaluation. Indeed, there are difficulties of two types. The one, is that the domestic prices in each RCD country are not directly comparable with international prices, as is expected in developing countries. The other is that the sets of domestic prices for each RCD country are not directly comparable with each other because the tariff structure, the system of import regulations and also various aspects of the fiscal and monetary policy, are different.

At this point it must be stressed that there are no previous experiences or agreements in multi-national areas in developing countries which cover the pricing of multi-national industrial projects i.e. projects which can be alternatively located in various countries. The literature on this issue is scanty and mainly theoretical, and limits itself to recommend the determination of "standard" prices. The problem however is how to obtain them. On the one hand, the projects will operate and give profits or losses basically under the price structure of the country where they are located, since

only part of the inputs (those coming from other IDCD projects, or from the "outer world") will be purchased at international prices; in this sense, current domestic prices cannot be completely omitted when evaluating the so-called "private profitability" of the projects, which at any rate must be carried out for the alternative locations. On the other hand, current domestic prices are of no use for the social evaluation of projects i.e. for obtaining such aspects as the social net value added created by the projects.

It is not within our task to find a complete solution for such a complex problem. All that can be done here is to outline a possible solution and to recommend a thorough study on this subject, which is a necessary precondition for carrying out the distributional evaluation of the projects.

The suggestion can be summarized in a few words:

(a) the "current pricing" of the projects should take into account the fact that international prices are applicable to the largest possible extent, while a "local" ratio among the national currencies should be established for the remaining prices;

(b) the "accounting" (or "social" or "shadow") pricing of the projects should also take place by applying the international prices to the greatest extent through tracing a distinction between the so called traded and non-traded goods. The accounting prices of non-traded goods should firstly be calculated for each IDCD country, and then mutually adjusted to get a closer representation of the relative scarcities of production factors in the IDCD region.

Situation (a) can be tackled more easily if the number of products manufactured and used by the projects is smaller and do not undergo tariff and other foreign trade regulations, disincentives and other changes. It is taken for granted that the output of the IDCD projects, inclusive of those going to be used as inputs by other projects, will be sold at international prices. It would be advisable that all inputs purchased by the IDCD projects in an IDCD country which are

different from that of location, are sold free of tariffs and other export-import charges. It would also be advisable that the inputs purchased by the projects in the country of location be exempted from indirect taxes or else charged an indirect-tax margin averaged for the whole industry so to avoid the effects of any eventual discrimination against the engineering industry. As for the inputs purchased from the 'outer world' they should be exempted from national tariffs and other charges allowing them to be calculated at international prices. In this way, if a large share of what a project buys outside the country of location is calculated at international prices, the remaining share of the inputs (i.e. those bought in the country of location, inclusive of labour and services, and minor inputs bought in the other OCD countries) can be charged, alternatively for each country at domestic prices adjusted for the nominal value of the national currency according to a ratio with respect to the other currencies as agreed upon by the member countries.

Situation (b) cannot be tackled through determining a set of accounting prices directly for the whole OCD region. The region is not a united economy and the relative scarcity factors do not have an overall impact. Building up a system of accounting prices would have no economic meaning at present. As matters stand, it is advisable to determine the international prices of the largest possible number of inputs used by the OCD project. This is done by tracing a distinction between traded and non-traded goods. When the non-traded goods are singled out (labour, domestic services, transportation, cement and other construction materials and some other inputs), the accounting prices can be determined, firstly with respect to the separate countries (by taking into account the relative scarcities in the national markets, i.e. where they are actually effective), and then by adjusting the three sets of accounting prices through comparative estimations. In this way, the distributional evaluation of projects will use "adjusted" accounting prices referring to each country. Other accounting prices such as the discount rate, amortization and the foreign exchange rate, can be determined in the same way.

3. [illegible]

[illegible] OECD [illegible] still [illegible] [illegible]
[illegible] suggested [illegible] input-output [illegible]
metal working activities [illegible]
[illegible] [illegible]
the evaluation [illegible] Value
Added, the input-output [illegible] [illegible]
for carrying out [illegible] [illegible]
decide to disseminate [illegible] [illegible]
prices, the input-output [illegible] [illegible]
a measure of the [illegible] [illegible]
tables for engineering [illegible] [illegible]
advanced countries [illegible] OECD Governments however, have
worked out among their [illegible] [illegible]
enlarged inter-industrial [illegible] [illegible]
that such tables [illegible] [illegible]
possibly of international [illegible]
which input-output [illegible]
be any evaluation [illegible]

3.5 Import content of the OECD projects

One condition for [illegible] OECD projects is that, primarily, they will improve the balance of payments of the member countries. The knowledge of the import content of the OECD projects should, in principle, enable not only the [illegible] but also their [illegible] inputs.

The input-output industrial matrix mentioned in the preceding paragraph is very detailed. The share of indirect import content of the separate OECD products may be computed by means of such a table provided of course that the [illegible] is broken into the matrix.

If, however, the industrial matrix is not [illegible] in detail, a separate survey of the import content should be carried out for those products related to the projects. Great care will be necessary in preparing the survey, because the same goods have, in principle, a different import content for each OECD country and the structure of industry in general, and for individual industries in

effectively only between [illegible] and [illegible]. At any rate, we may reasonably foresee that the future communication facilities from the TCD countries will largely shift to highways and railways. Between the end of 1972 and the end of 1973 highways will [illegible] in these countries and maybe also railways. It would be advisable to make a survey just before such infra-structural work is accomplished, and not after the actual conditions prevailing in order to calculate the future TCD trade distances from the potential sites of the exporters to the potential output and input markets.

CHAPTER IV

ATTEMPT AT DISTRIBUTING THE AVAILABLE IDCD PROJECTS

4.1. Status of the twelve Projects

As already pointed out in Chapter I, the status of the twelve projects is unsatisfactory. This is partly due to the fact that they were not compiled according to the proper procedures and partly because certain technological links were wrongly assessed in the proposed production programmes.

In chart I below a detailed examination is carried out on aspects of the twelve projects from the standpoint of their distribution.[1] As is evident from the chart, the project studies give little information. More numerous data exist (or have been worked out) for projects I, III, IV, V and XII. However, it should be recalled that the last three projects have been repatterned (see Part II of the Final Report) so as to retain only their most aggregate sizes, while their input and cost breakdowns need to be redrafted. Moreover, project I will not be distributed for reasons explained below.

In such a situation, a certain amount of information is available only for project III (marine diesel engines) while for all the remaining projects we possess only general data. In principle, quantitative information is almost completely absent on IDCD sources of inputs, domestic linkages, alternative technologies and the time phasing of flows and various cost items referring to the field of project data. As for background data referring to the economic environment, no comparative analysis of accounting prices has yet been carried out for the IDCD area. Under such conditions a "social" evaluation and distribution of the twelve projects by means of the rules illustrated in Chapter II become impossible; the only solution open, if one wants to distribute the available projects, is to devise simpler distribution criteria and methods to fit them best. Moreover, the situation of the twelve projects from the

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1/ The existence of relevant data is indicated by "yes", the lack of data by a blank.

Table I

The State of the Twelve Projects from the Viewpoint of Distributional Evaluation

Q = Quantity
V = Current value
D.V. = Discounted value

(.) Third countries only
* Located in Turkey

Projects	Production Capacity				Output								Demand		
	Yearly Average Production Period				Normal Operating Period		Yearly Average		Prod. Installation Period		Phased Prod. Operating Period		Country	ROD	Rest of (*)
	Q.	V.	Q.	V.	Q.	V.	Q.	V.	Q.	V.	Q.	V.			
I - Locomotives	yes	yes					yes	yes			yes	yes	yes	yes	
II - Centrifugal and special filters													yes	yes	
III - Diesel Engines	yes						yes	yes	yes		yes		yes	yes	
IV - Rotating Electrical Machinery	yes				yes								yes		
V - Turbo-Generators	yes				yes								yes		
VI - Oil Drilling Equip.													yes		
VII - Boilers Pressure Vessels															
VIII - Pumps and Compressors													yes		

Table 1 (Cont'd)

The State of the Tulove Projects from the Viewpoint of Distributional Evaluation

Q = Quantity
V = Current Value
D.V. = Discounted value

(a) Third countries only
* Included in Italy

Projects	Production Capacity						Output						Demand		
	Yearly Average		Installation Period		Normal Operating Period		Yearly Average		Time Installation period		Phased Normal operating period		Country	EEC	Imports (a)
	Q.	V.	Q.	V	Q.	V.	Q.	V.	Q.	V.	Q.	V.			
L - Special valves	yes		yes		yes		yes								
I - Pumps for chemical Ind.	yes						yes							yes	
XI - Boilers large size													yes	yes	
XII - Mech. equip.	yes	yes					yes	yes			yes		yes	yes	

Table 1 (Cont'd)

Projects	Value fixed investments					Working Capital	Discounting factors		Technology	
	Total	Construction		Machines and Equipment			Constant period	Current period	Single	Alternative
		Overall	Time phased	Overall	Time phased					
I	yes	yes		yes		yes			yes	
II										
III	yes	yes		yes		yes			yes	
IV	yes	yes		yes		yes			yes	
V	yes	yes		yes		yes			yes	
VI										
VII										
VIII										
IX	yes	yes		yes						
X	yes									
XI										
XII	yes	yes		yes		yes			yes	

Table 1 (Contd)

Projects	OECD sources of imports		Domestic Linkages		Quantitative terms					
	Machines	Materials	Quantitative	Non Quantitative	Yearly payments	Time Period	Discount rate	Installation period	Gestation period	Depreciation rate
I		Partial			Yes					
II					Yes					
III		Partial			[illegible]					
IV					[illegible]					
V										
VI										
VII										
VIII										
IX										
X										
XI										
XII					[illegible]				[illegible]	

Table 1 (Contd)

- 51 -

Products	Intermediate Inputs			Investment	Exports			Total Output
	Total value	Specification	Value	Number	Total	Direct	Indirect	
I								
II								
III								
IV								
V								
VI								
VII								
VIII								
IX								
X								
XI								
XII								

	Personal Investment										
	Loans		Equity Capital	Interest	Rents	Taxes	Other				
	Private Domestic										
I				Yes		Yes					
II											
III	Yes	Yes	Yes		Yes		Yes				
IV											
V											
VI											
VII											
VIII											
IX											
X											
XI											
XII	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

view that of distributional evaluation is such that a tentative distribution could be examined only for some of them, namely, for the six projects listed on page 57.

The findings of the distributional analysis cannot be too precise just because the elements on which the analysis rests are too few and do not look very reliable. The experts have already emphasized in Chapter I the approximate and "second best" nature of this distribution and the reasons why they have decided to carry it out in spite of all shortcomings.

1.2 The "market" criterion for distributing the available projects

The experts suggest that the projects be distributed according to their impact on the national market at large in proportion to each country's share of the total investments. This impact is represented by the sum of the domestic content of the direct and indirect increases in gross output engendered by the projects. We call this method of distribution "market" criterion.

Distribution according to the market criterion is carried out within various stock limitations, according to available data. The "auxiliary" criterion for location (that referring to the relative balance in the mutual flow of goods) has been applied either because the data on some projects' outputs are uncertain or because there is no information about intra-CCD trade of main inputs. No accounting prices are applied to the project items. No transportation costs are calculated. Moreover, the impact of the projects refers to the so-called "backward" effects on the national market; no "forward" effects are envisaged. In addition, the backward effects taken into account here are only those occurring in various engineering branches (dealing with the production of capital goods) and a few other related branches, mainly metalworking industries; no larger scope of the backward effects is envisaged, as can be seen in Tables B, C and D of Appendix 2, where the engineering branches and related ones are listed. The backward effects within the limits just now outlined are taken as representative of the impact of the CCD projects upon the economy of the country where they are located. Such backward effects are net of the eventual expenses (in terms of imports) borne for the sake of obtaining the increase of output in those branches

which are encouraged by the close cooperation of the projects. Another important limitation, as will become clear as illustrated in Appendix 2, is certainly the uncertain character of the benefits calculations and the nature of the investment productivity coefficients.

Let us now pass to indicate which projects will be distributed according to the market criterion. Looking at the twelve projects one can see that certain data exist either in the project studies or have been worked out by the experts. This refers to projects III, VIII and IX, while projects IV, V and XII have been subdivided into three different projects (see Part II of the Final Report). The remaining projects will undergo distribution either because they did not pass the viability test (projects II and VII) or no relevant data could be worked out (project VI, which refers to oil refining equipment), or they need to be merged into other projects (such as projects X and XI). In regard to project I it is concerned (locomotives), its exclusion from the list of those being distributed is due not so much to the fact that it is already booked in Turkey, as that it is entirely financed by Turkey. In such a situation, although Pakistan has committed itself to buying parts of the locomotives manufactured by Turkey, one may consider this project rather as a national project exporting one share of its output to another RCD country.

Besides the seven of the twelve original projects, the experts have singled out four new fields for RCD co-operation, the production of heavy transformers, which belong to the same class (rotating electrical machinery) as turbines and generators of various kinds and for which some general project data could be worked out.

Ultimately, the following available[1] projects have been singled out for an attempt at distribution:

1/ "Available" in the sense that a certain set of data has been provided, or worked out, in order to distribute the projects according to the "market" criterion suggested in this chapter.

1. Marine diesel engines
2. Steam and hydraulic turbines
3. Hydro-electrical and steam generators
4. Heavy transformers
5. Large [illegible]
6. Special industrial valves.

7.3 The method for distribution of projects

It is now to be succinctly illustrated how the impact of each project in the sectoral country is calculated. The elements under which the calculation is carried out are:

(a) project data;
(b) data on engineering industries and related branches;
(c) the formula hypothetically expressing the impact of the projects.

(a) Project data are the following:

- value of yearly output;
- domestic content of output;
- value of fixed investments;
- percentage purchases (according to element) of the yearly output by the OECD countries;
- number of OECD countries joining the relevant project

These data are contained in Table 1 of Appendix 2 except the domestic content of the output which is peculiar to the separate countries of location.

(b) Data on various engineering industries and related branches are:

- value of output
- domestic content of output
- degree of utilization of production capacity
- inverse production co-efficients.

The data for the first three items are contained in Tables B, C and D of Appendix 2 while the inverse production co-efficients are contained in Table 2 of the same Appendix.

(f) [illegible] expression, the impact of each project [illegible] industrial market is (for further explanation see Appendix 2):

$$v_{jk} = F_j + \sum_{\substack{i=1 \\ i \neq j}}^{23} v_i$$

where v_{jk} is the total impact of project j in the RCD country k; F_j is the domestic content of the project at unit value and the last term is the sum of the backward effects calculated on 23 engineering branches and related ones.

The experts have been instructed to work out a more composite indicator of the project impact because the data contained in the last term of the formula (the sum of the backward effects) is obtained by means of a matrix of inverse production co-efficients which are not those of the RCD countries. Tables B, C and D of Appendix 2 also contain the extent of installed capacity and the degree of capacity utilization; however, they are too uncertain to be made use of here and they have been recorded only as a statistical point of reference for deeper investigation in this field in the future.

7.3 The findings of the distributional procedure.

The procedure for distributing the six available RCD projects is illustrated at various steps in Appendix 2; for the relevant data see Table A of Appendix 2. Considering that the "market" criterion for distribution requires that the benefits accruing to each country from the projects are proportional to each country's share of total investments, the findings are the following (see also Table F and Section 7 of Appendix 2):

Country	Share in investments	Share of profits
Iran	34.5	34.5
Pakistan	27.5	34.2
Turkey	38.0	31.3
	100.0	100.0

The above distribution has been arrived at by largely taking into account the factors which make for identifying predetermined locations

(Roman, Spanish, Greek, etc.) [illegible] imbalance between [illegible]. The objectives of Turkey and the other [illegible] countries could be by taking into consideration [illegible], thus involved [illegible] of the Turkish products. The Public [illegible] the expected activity in [illegible] Turkish petrochemical industry. However, no such [illegible] criteria for [illegible] have been published (see 4.2) the distribution of projects. One could know that their inclusion might have appeared [illegible] foreign exchange savings [illegible] account.

When the number of distributed projects is limited, one should reasonably expect that distribution [illegible] whatever distributional criterion is applied. Hence, the need to resort to some compensation for the loss [illegible] specific case [illegible] would be advisable to carry out the comparison [illegible] distributed by assigning the project [illegible] benefits accruing to Turkey or more than one national [illegible] and thus according [illegible] criteria.

4.3 Remarks on the distributional [illegible]

The purpose of the distribution criteria [illegible] in this Chapter is - as already stated in the [illegible] I - to supply PCD with a tool for [illegible] decision is taken to distribute the available projects [illegible] short period even if the [illegible] conditions [illegible] allow for [illegible] evaluation. Although the method [illegible] represents the best that could be done, the experts [illegible] with reservations for reasons already explained in Chapter I.

However, apart from the fact that [illegible] it for immediate action, the [illegible] criterion for distribution and the method built upon it may be considered still as a rough and introductory device which could gradually be improved and enlarged to the extent that the [illegible] projects will [illegible] more comprehensive and complete [illegible] and the national accounting data

PART II

EVALUATION OF THE VIABILITY OF 12 PROJECTS FROM THE STANDPOINT OF ESTABLISHING CO-OPERATIONAL ARRANGEMENTS

CHAPTER II

[illegible]

Specific Characteristics of Engineering Industry in the Developed and Developing Countries

It is not necessary to emphasize the importance of the engineering industry in the national economy of [illegible] In addition to the explanations given in the preliminary report [illegible] the characteristics and problems of engineering industry, we would like to [illegible] which [illegible] operation in heavy engineering industry.

Engineering products [illegible] because of its [illegible] the large volume of auxiliary [illegible] process, the diversity of the use of [illegible] in fact.

From the point of [illegible] engineering industry [illegible] with the average [illegible] the average growth [illegible] trends [illegible] that there will [illegible] share in the [illegible] more uneven [illegible]

The engineering industry [illegible] supplying machinery [illegible] to the [illegible] increasing productivity [illegible] over [illegible] Asia, Africa and [illegible]

countries. Pakistan, Iran and Turkey belong to this group of countries which have a large number of existing concerns, and concerns still in the planning stage, with a rapid diversification of engineering industry and a wide range of engineering products manufactured in the country.

The heavy engineering industry requires wide markets. A successful development of this kind of industry, infra-structure facilities and specialization can be achieved more easily within a large region. Experience shows that it is not possible to produce all types of engineering products in one country.

There are some technical problems involved in the development of the engineering industry. In certain cases research and testing are required. The technical level of engineering production varies from one factory to another. Generally speaking the level of technology is higher in the larger factories and in those established in co-operation with foreign firms.

The total world market demand for capital goods such as machinery and equipment, increases at a faster rate than for other goods. The value of world trade in engineering products is not only constantly rising, but its trend for growth is higher than for other goods. It can also be observed that there is a rather increase in the prices of engineering goods as compared with others. Thus, if the unit value index for 1963 was 100, it was 107 for 1967 for all products, 111 for the total of manufactured goods and 114 for engineering products. The rising prices offset the increase of imports in developing countries.

In developing countries the import of engineering goods rose more rapidly than the value of general imports. There is also a greater increase in the import of parts, components, elements and intermediate goods compared with finished products. These trends are due to the orientation towards import substitution and increased industrialization. By restricting the export of machinery and equipment from the standpoint of credits, we can see that medium and long-term credit covers about 30-40% of the total export of machinery and equipment.

Due to the fact mentioned above, the import of engineering goods in developing countries is increasing at a slower rate than in developed countries. The gap between the developing and the developed countries is becoming wider. This is a problem that can be partly solved by a more rapid increase of domestically produced capital goods.

Sub-contracting in the production of engineering goods is mainly used for the sake of efficiency and increasing the volume of production. Unfortunately this method is not practised in the ECE Countries due to both the level of development and to business practises and relationships between indigenous contractors. Co-operation and sub-contracting with foreigners seems to be more successful.

Looking at the economic structure for engineering goods, we note that expenditures for material are generally lower in proportion to those of the manufacturing industry as a whole, while those for manufacture are generally higher. The value added is also proportionally higher in the engineering industry compared to the manufacturing industry as a whole. The fact that the engineering industry is one of the relatively labour-intensive types of industries may be considered as advantageous under the economic conditions prevailing in developing countries and in the ECE region as well. The higher share of value-added is also in accordance with the economic policy of the ECE countries.

In the economic structure of the engineering industry we also note that the share of fuel and power is relatively low in the total cost. Products with a very high level of consumption in the engineering industry are ferrous and non-ferrous metals, foundry products, and products of the metallurgical and engineering industries. Although the engineering industry requires a great amount of capital, the returns are, in general, not as high as those of industry as a whole. Product capital ratios are generally higher in the engineering industry than in the manufacturing industry.

The book "Engineering Industries and Infrastructure", UN, New York, 1982, gives some interesting data on the capital coefficient, fixed yield and the utilization of capacity in the engineering industry. The product capital ratio increases considerably with better utilization of capacity. It may therefore conclude that economic efficiency and profitability in the engineering industry depend largely on the utilization of capacity. The economic effect of a better use of capacity in the engineering industry is more pronounced than in other industries. The use of capacity is a serious problem in many of the engineering firms in the ECE region.

The size of the plant in the engineering industry is a very complicated problem; it depends on the environment, on the type of products to be manufactured and the technology available, and on sub-contracting. From general experience it is known

that large or medium-size enterprises are surrounded by small workshops producing components or medium products on a sub-contracting basis; these small firms are usually highly specialized.

There is a specific problem in the heavy engineering industry and that is economics on a large scale which involves not only the type and size of production but also the use of capacity, cost-price relations, organization, management, etc. It is a known fact that large markets usually bring substantial benefits to producers and consumers because of a reduction in production cost per unit of output, whereas limited markets have to raise production costs. This affects the efficiency and profitability of the enterprise. Economies on a large scale are particularly important in the engineering industry in relation to the following:

a) the length of the production-run for a given product;

b) the scale of the overall output of a given plant;

c) the sharing of organizational resources.

Specialization and co-operation in industrial production, which enable enterprises to produce large series and consequently to use a more efficient technological process and high-production equipment, are characteristics of the engineering industry. The very wide range of engineering products necessitates considerable and highly diversified specialization in their manufacture. Furthermore, the structural peculiarities of modern machines which comprise a large number of multi-purpose units, mechanisms and elements that are used in the manufacture of highly diversified machines, lead to an intensification of co-operation between specialized enterprises.

The economic efficiency afforded by specialization leads to an improvement in the following indices:

a) an increase in the output and productivity of labour;

b) a lowering of production costs and an increase in the profitability of production;

c) a reduction in the share of wages in production costs;

d) better utilization of fixed capital;

e) greater regularity of production;

f) more rapid turnover of working capital.

[illegible] specialization entails [illegible] concentration of production in a small number of enterprises or in a small number of enterprises on a single type of production which was formerly divided among many enterprises, it inevitably leads to the [illegible] number of highly important technical [illegible] management [illegible] of the enterprise.

5.2. Main Features of Engineering Industry in the [illegible] Plan

Like many other countries, the [illegible] Plan experience [illegible] with trend in engineering industry. [illegible] engineering industry [illegible] engineering industry represented over [illegible] establishments persist in Turkey, of [illegible] about [illegible] Existing [illegible] formulated in the [illegible] Plan [illegible] of the [illegible] emphasis [illegible] priority given to the development of the manufacturing sector [illegible] the engineering industry [illegible] instance, the Iranian 5-Year Plan states: "The government will play an increasingly active role in the manufacturing sector, particularly as relates to the establishment of Heavy Industry". Pakistan Development Plan [illegible] reducing the import of capital goods from about [illegible] of the total consumption of capital goods. Such policy contributes [illegible] investment in this sector. However, the import of engineering [illegible] is still high. It represents about 50% of the total manufacturing imports in Turkey, and about [illegible] in Iran and Pakistan.

We should like to make a brief survey of the present situation in the engineering industry in the [illegible] countries, [illegible] given in the Preliminary Report.

[illegible] Region, particularly Turkey and [illegible] Pakistan and Iran, has a tradition in metal industry. The Turkish metal engineering industry is very diversified with respect to extensions or production of some products in the last 10 years such as steel constructions, radiators, boilers, some durable consumer goods, pumps, engines, machinery for sugar, cement and textile factories, transport equipment, mining equipment, agricultural equipment and machinery, electrical goods and machinery, etc. For many of the metal products domestic production can meet about 70% of the national demand. The following table indicates the development and structural changes of the engineering industry in Turkey:

Table I **

(value in mill. T.L.

Ind. Invest.	1967 value output	1972 value output	% of increase	1967 relative share	1972 relative share
Total products	2000	3 992	199	30 %	34.5
Machinery	1 600	4 3	269	4	4.5
Electrical Machinery	730	1 8	247	11.3	12.7
Transport Equipment	2 34	4.130	180%	44 4	2
Total	6.810	14 402	212%	100	100

** Source S.P.O. - Second Five-Year Plan 1968-72.

During the current Five-Year Plan (expiring in 1972) the largest increase is evident in the production of heavy machinery and equipment, road construction and mining equipment, in the production of boilers, compressors, ventilators and pumps, internal combustion engines, machine tools, etc. According to the Turkish Five-Year Plan, the total demand of mechanical machinery will be about 1750 million in 1972. The domestic output of mechanical machinery will be nearly 1400 million or about 80% of the total demand. The balance represents the import. The following table indicates the development and changing of demand, domestic production and import of mechanical machinery in Turkey:

(Mill. T.L. (price value 1968)

	1967	share of demand %	1972	share of demand %	index 1967-100	annual rate of increase
Domestic demand	3.154	100	6.700	100	212	16.2%
Domestic production	1.315	41.7	3.500	52.2	266	21.7
Import	1.854	58.3	3.300	47.8	178	12.2

There is a large expansion in the production of agricultural machinery in Turkey. The production of tractors reached 15,000 yearly, but the domestic content is still about 50%. The production of harvesters has also started. Domestic demand for agricultural equipment will reach 900 mill. T.L. with a rate of increase in the last five years of 17%. Domestic production will be about 850 mill. with an

annual rate of increase of [illegible], Turkey will be nearly self-sufficient [illegible] produce a larger number of tractors with a higher domestic value-added, Turkey should solve the problem of the production of diesel engines, gear boxes and other components.

The electrical machinery and equipment sector is only newly established in comparison with the mechanical engineering sector, but it is developing rapidly. Many private firms - in some partnership with state enterprises - are engaged in the production of electrical cables, network distribution appliances, internal installation goods, durable consumer goods, electrical meters, telecommunication equipment, etc. Although domestic production keeps more simultaneously with the growth of demand, about 20% compared with 10% in Turkey still has to be met by imports, particularly of heavy duty electrical machinery. In the production of vehicles, cars and buses, the assembling represents the largest part of the work. The problem is how to increase the domestic component by setting up the production of engines, gear boxes, transmissions, etc. The target is to become self-sufficient in the production of trucks (15,000) and buses (5,000) in 1972 and to meet 50% of the demand for 40,000 passenger cars.

Turkey is well advanced in the production of passenger and freight wagons. The production of large diesel-electrical locomotives is started in 1971. The ship-building industry has a long tradition in Turkey, but it is only recently that it has taken more impetus. There are a few state owned shipyards and several private concerns.

During the last decade the development of industry has been one of the major objectives of the government of Pakistan. The tradition of some parts of Pakistan in the metalworking industry contributes to the faster development of engineering industry. Up to recent times the production was limited to light engineering goods such as simple machine tools, agricultural machinery, telecommunication equipment, pumps, diesel engines, etc. Production has now been extended to motors, transformers, rollers, textile, sugar and cement machinery, automotive parts, shipbuilding, etc. In the near future Pakistan will produce a wider range of engineering products, including some heavy mechanical and electrical machinery.

The gross output value of the engineering industry in Pakistan was, according to the industrial census of 1964, as follows:

		%
Metal products (without basic metal)	200 mill. Rs.	28.0
Machinery (excluding electric machinery)	147 mill. Rs.	16.0
Electrical machinery	248 mill. Rs.	26.5
Transport equipment	270 mill. Rs.	29.5
Total	925 mill. Rs.	100.0 %

The total output value in 1970 is estimated at around 1,500 mill. Rs. The aim for 1974/75 is to reach 2,500 mill. Rs. The domestic engineering industry can supply about 25% of the requirements for capital goods.

The Pakistani engineering industry consists mainly of small production units. It is estimated that there are about 1,700 production units with about 21,000 machine tools. However, there are among them about 20 very large production firms, private as well as public, with over 50% of the total employment in this sector (or about 100,000 employees).

Several large machinery factories have already started production; others are about to start. Among them can be listed:

(i) The heavy-mechanics plant in Texilla, designed to produce steel structures, rail equipment, equipment for cement and sugar mills, boilers, bulldozers and rollers.

(ii) The machine-tools factory near Dacca, which will start producing in 1972 textile machinery spare parts, lathes, milling machines, transmission gears and rear axles for trucks and other vehicles.

(iii) A factory in Karachi, presently on trial production, is designed to manufacture gearboxes and machine tools.

(iv) The diesel-engine plant in Dacca (with German assistance) will be producing engines of up to 100 H.P. for irrigation purposes and shipping use. The plant will produce 4,000 pieces yearly in the first production phase.

Pakistan started diesel engine production over 25 years ago. There are several large private producers of diesel engines and about 100 manufacturing workshops.

A wide range of machine tools is being produced in Pakistan in the public and private sectors. A similar situation prevails in the agricultural equipment sector. Similar to the other DC countries, Pakistan has been unable to solve the problem of tractor production and is still in an assembling-manufacturing stage. At present, the production of electrical equipment in Pakistan includes electrical motors (up to [illegible] , portable diesel generating sets (1[illegible]5 KVA), transformers (up to 1500 KV[illegible], LT and HT switchgears, wires and cables, etc.

Two telecommunication equipment manufacturing plants have been set up in Pakistan under the public sector. One is situated in Jessore (East Pakistan) and the other is in Haripur (West Pakistan). These plants have been manufacturing telephone sets and exchange equipment. Some equipment is reported to have been exported to Nepal and the Middle East.

In the shipbuilding industry there are at present 22 dockyards operating (7 in the West and 15 in the Eastern region) with a total construction capacity of 24,000 DWT of larger vessels. Nearly 80% of this production value belongs to the two largest firms: Karachi Shipyards and Engineering Works Ltd. - Karachi, Dockyard and Engineering Works Ltd. - Narayanganj (East Pakistan).

The automotive industry in Pakistan is still in the initial phases and looks more like the assembling of import parts than the production of such goods. The government has sanctioned 7 assembly plants for cars, jeeps and trucks. The local production component is about 30%. Recently, the Ghandhara Diesel Ltd started to build a new plant for the production of diesel engines.

The development of engineering industry in the last decade is very impressive in Iran. The development of the light industry and consumer goods industry was immediately followed by investment in the production of intermediate goods, transport equipment and capital goods. The total value of domestic output of engineering goods has increased rapidly in the last few years, particularly in transport equipment. However, the domestic demand is high, and the production of mechanical machinery, equipment and electrical equipment is far below the domestic demand. Therefore, the import of such goods is still very high. Some factories in this field which have already started production (Tabriz Machine-Tool Factory) or else are about to start (Arak Building Machines) will contribute to the improvement of the ratio in domestically produced and imported value of engineering goods.

In metal goods production has improved in the various types of containers, steel construction, electrodes, etc. The Iranian production of durable consumer goods such as refrigerators, heaters and TV sets is well advanced. In 1970, the production of refrigerators was about 200,000 units and 119,000 space heaters.

Machine tools are on trial production in the Tabriz plant and some drilling machines, pumps and meters have already been produced. The Arak machine building plant is near completion and will produce about 30,000 tons of various semi-heavy metal products.

The production of diesel engines is well advanced in Iran. Two factories co-operate under license with Dorman Diesel Engines and Mercedes-Benz and a third project is underway in partnership with Leyland.

The production of agricultural equipment and the assembling of tractors has already started in the Tabriz Tractor Factory and the John Deere Tractor Factory Plant. The latter will produce two models of combines.

The production of compressors for refrigerators is a joint venture with Westinghouse. In the field of electric equipment the production of transformers has already started and the level of production in 1970 was 1065 units of transformers with a total power of 460,000 KVA. There is also production of electrical meters and electric fans. Iran has a capacity for producing 60,000 telephones and 45,000 telephone exchangers.

The production of transport equipment is well advanced and the production of passenger cars in 1970 reached 30,000 units, buses 4,000 (50% of which were mini-buses), and 2050 trucks and oil tankers. Iran is also developing capacity for the production of wheel-rims, vehicle transmission, pistons, vehicle electrical equipment, etc.

From the above short summary of the present situation in engineering industry in the CD Countries, we can conclude that this sector is rapidly developing a well-established basis for further expansion. This is due to government policies, a free market demand, sufficient manpower and, with a few exceptions, to favourable conditions for the supply of raw material and intermediate goods for this industry. The engineering industry consists of a large number of small establishments, mainly

family-owned and several large firms, mainly state-owned with modern equipment. The engineering industry is mainly domestic market-oriented.

In summarizing our views on the characteristics of the engineering industry in the ECE Region, we should like to stress that

a) Most of the small privately-owned factories consist of machine shops producing limited quantities of items, often operating on an order basis. There is no quality control of material, no design office and the quality of the finished product is mainly of a low standard.

b) Some of the privately- owned factories, mainly medium and large-sized as well as state-owned firms are better equipped with machinery; they make use of foreign licences and know-how and often operate in collaboration with foreign firms.

c) In analyzing the various stages of the establishment of a factory, it was observed that not enough planning goes into the preparatory stage. The time relation between the preparatory stage and the construction stage is unfavourable. Compared with world practice the time of construction is double what it should be. As a result of insufficient planning during the preparatory stage many activities in the construction stage are adversely affected: the increase of investment, the starting of the factory and its efficiency, the national economy (through the tying up of national capital for too long a period without production and turnover).

d) Regarding some of the technical aspects, there is no keeping up with modern technology and market requirements (although some firms are using modern equipment), the quality control is, with a few exceptions, at a low level, there is no organized research or design activities in the firm.

e) Looking at the economic structure of the industrial products we can see that the share of the imported input in sales value is still high and that the domestic value-added is low. Some of the industries are still at an assembly phase, although

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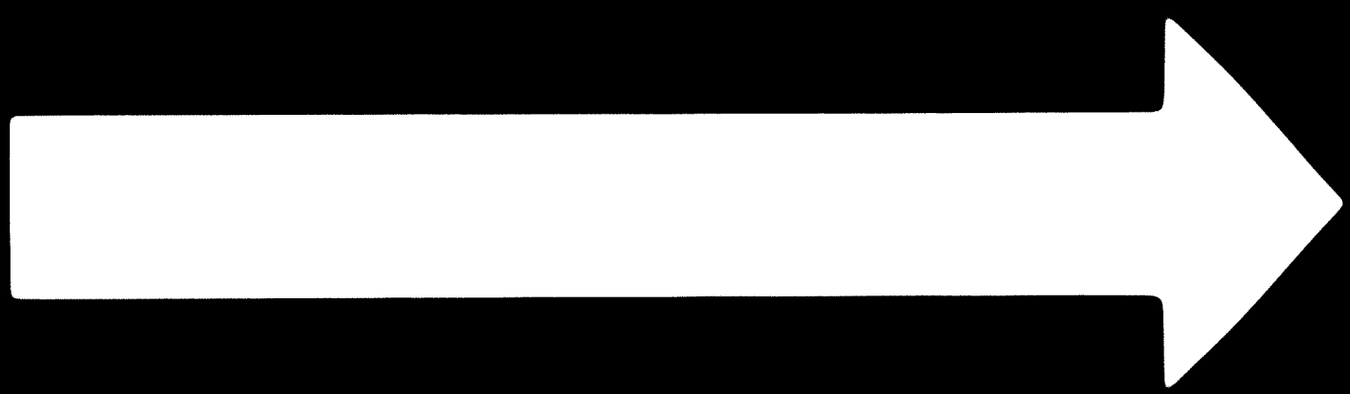

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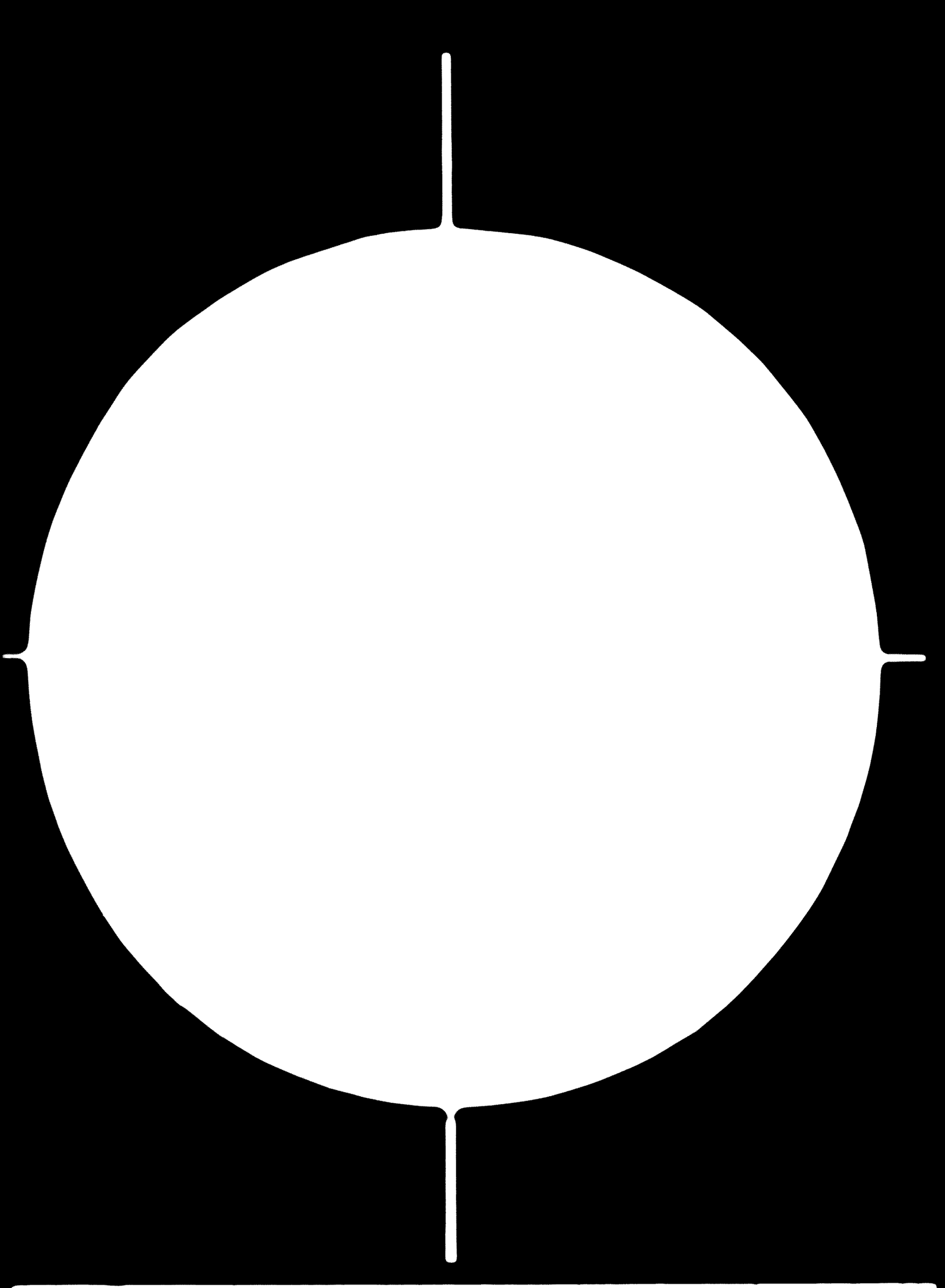

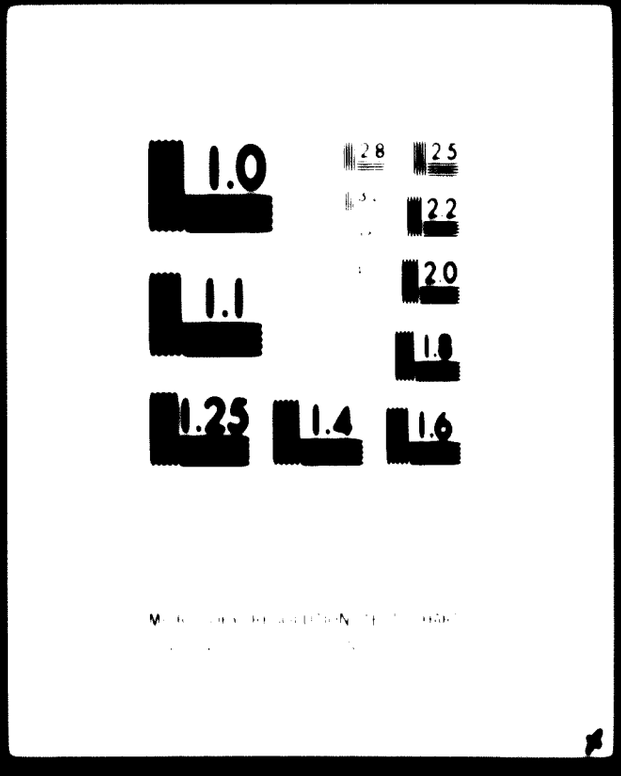

the firms are facing many problems, particularly regarding higher domestic costs, they tend to follow the government policy to increase the value-added. This is one of the problems of the future development of the domestic engineering industry.

f) Production costs and competitiveness on the market of domestically produced engineering goods are becoming a serious problem to the firms. The factory price is higher than the imported c.i.f prices; this is due to the high price of domestic raw material or to duties on imported material, to low productivity, low use of capacity, etc. Domestically produced engineering goods are characterized by low competitiveness due to high costs, import regulations, tax system, etc. Although many economic indicators and evaluations of the engineering industry are not favourable, co-operation, merging or sub-contracting among domestic firms has not yet started.

g) We can also observe that the organization and management of the factories as well as marketing are not satisfactory and add to the many difficulties of the engineering industry.

The engineering industry in all the RCD Region, in spite of a successful development up to now, is facing many problems in meeting the requirements of modern technology and economy, increasing efficiency and competitiveness contributing to the overall successful development of the country. These problems are arising in each RCD Country, in each industrial firm and in each production unit. The question is how to meet these challenges and avoid mistakes commonly made in the development of the engineering sector in many countries.

Many of the problems of present and future development and of the increase of efficiency in the engineering industry of the RCD Countries are linked with wider market and co-operation and the use of capacity. In our further work we should like to make a short summary on the rate of capacity use in engineering industry before making an analysis of the co-operational arrangements among the RCD Countries regarding 12 projects.

5.3. Some Views on the Use of Existing Capacity of the Engineering Industry in the RCD Region

While discussing the subject of capacity, it should be emphasised that apart from the existing differences between industries in the various countries, there are differences in the methods of measuring capacity. From the available data on the RCD countries it can be deduced that the degree of capacity utilisation is not high and tends to become lower. The persistence of idle capacity is a great waste of invested capital and resources within the RCD countries, with an adverse effect on national development and efficiency. Under-utilisation of capacity also adversely affects employment opportunities, the cost price relation and competitiveness on the market, and lowers the rate of industrial growth.

The difficulty in measuring the rate of capacity affects the reliability of data. For continuing production processes (in some chemical industries) there is no difficulty in measuring capacity and the three-shift working day is usual. For some other industries a one-shift capacity is considered as normal work. There is some disagreement, mostly theoretical, on the definition of designed capacity, technical capacity, maximum capacity and real capacity. It is not our purpose here to discuss the theoretical aspects and measures of used capacity in the RCD Region.

There are indications that idle industrial capacity is a serious problem in Pakistan and Turkey, and to a lesser extent in Iran. From the economic reports of the RCD countries it can be seen that the utilisation rate of installed capacity in the engineering industry is generally low, and that productivity and quality remain generally below the designed standards. This fact is also reported in the Five Year Development Plan of the RCD countries.

On closer analysis of this problem we come to the conclusion that the under-utilisation of capacity in the engineering industry in the RCD Region depends mainly on: technical factors, including know-how; limited availability of raw materials due to the lack of financial resources or lack of domestic supply; availability of auxiliary inputs and spare parts; shortage of foreign exchange; insufficiency of infra-structure, bad management and organisation, marketing factors, etc.

Of all these factors, the shortage of imported raw material is considered as one of the most important, especially in Pakistan and Turkey.

The following data, collected from the survey of the state of industries in Pakistan (1947-1968), Volume 2, November 1969, indicate the utilization of capacity in Pakistan:

Production	Capacity Utilization in % 1966-1968
Metal structure	15 - 56
Gas appliances	40 - 60
Wire products	30
Metal containers and drums	56
Machine tools and ancilliary equipment	60 - 80
Stationary and marine diesel engines	60 - 80
Agricultural machinery and equipment	45 - 65
Tractors and components	20 - 25
Pumps (assorted)	40
Textile machinery, parts and accessories	25
Air conditioning and refrigerators	35
Electric KWh meters	45
Electric motors, switch gears and transformers	45 - 70
Electric wires and cables	68 - 83
Electronic equipment and devices	50
Electric machinery, apparatus and appliances	60 - 75
Machine propelled vehicles and components	50 - 60
Ship building and repair	55 - 61
Light engineering workshop	53 - 61

The data collected by the World Bank experts at the beginning of 1970 on their visits to the plants indicate nearly the same capacity utilisation in Pakistan.

In Turkey, the average industrial capacity utilised in the private sector is 70 per cent but in some branches based on two shifts, utilization is about 50 per cent. This is the case with many firms producing agricultural equipment and electrical products. The used capacity in firms of transport components is very fluctuent. Machine tools industry, privately and State-owned, is also characterised by a low use of capacity (60 - 65 per cent).

In Iran, the utilisation is slightly higher. Statistical surveys in 1966 and 1968 indicate that the utilisation capacity by firms ranges from 55 to 90 per cent.

The average use of capacity in the engineering industry can be estimated in Iran between 70 and 75 per cent, in Turkey 60 - 70 per cent and 50 - 60 per cent in Pakistan.

In addition to the general problem of the use of capacity, the RCD countries face in particular the problem of the use of capacity in newly established factories which have already started or are about to start production. Many of them are very large with a huge investment (mainly Governmental) A normal feature is that the newly established capacity cannot be fully used until a few years after the commencement of production. It is confirmed in many cases through analysis that the implementation of designed production programmes will be faced with difficulties due to market limitations and difficulties or to the unsuitability of some technical solution or standards which affect high costs, or else due to inadequate organisation and management. Also the present contact of such firms with foreign partners (sellers of licences and know-how) are not suitable for bringing about a fast solution of existing problems regarding the use of capacity. It is no wonder that the use of capacity in newly established heavy engineering plants in the RCD region is becoming a very serious problem.

We should like to mention a few factories in the hope that RCD co-operation will contribute towards finding a solution for efficient produotion.

1. The Machine Tool Factory, Karachi, has commenced production of high speed turret lathes, universal silling machines, gear boxes and other heavy engineering products. The plant has a capacity for the production of transmission gears, rear axles for automobiles and trucks, die-cast and forging items as well as for some other machine tools and automotive industry components. This factory does not have a sufficiently wide market in Pakistan and it is already in contact with the RCD countries for selling gear boxes and other produots and components for the automotive industry. The factory is modern, well equipped and has a huge potential for co-operation on the RCD market. Quality and prioes are competitive with those of the world market. Higher capacity could be reached, particularly through RCD co-operation in the production of components of automotive industries, and machine tools, more so since the other RCD countries are importing such goods.

Another machine tool factory is being set up in East Pakistan near Dacca. This factory is designed to produce universal lathes, column drills, radial drilling machinery, etc. This factory has not started production yet but will be facing the same problems as the one in Karachi as far as the use of capacity is concerned. This plant will also be suitable for co-operation.

2. The third largest heavy mechanical plant in Pakistan is located in Taxilla, which has already started production. This factory will be producing heavy mechanical products such as rollers, railway equipment (i.e., axles), and machinery for some processing industrial branches such as sugar mills and cement plants. In addition, this factory will be able to produce cranes, boilers, pressure vessels, etc. It is also well equipped with forging facilities. The management is very good and the factory has possibilities for co-operational arrangements in heavy mechanical products and components. In the proximity of the plant a large capacity foundry will be set up. The factory has already made some contacts with domestic private firms for sub-contracting. This will strengthen the factory's capability for interregional co-operation. Some division of work and specialisation of equipment is absolutely necessary among these factories and the MKEK in Turkey and the Arak machine building in Iran.

3. In Iran there is a new large machine tool factory in Tabriz which is on trial production and will soon be completed. There is a huge investment in this factory and its production programme is expected to be as follows:

Production Programme

Items of Production	Pieces/yr	Tons/yr
Machine tools	2,750	2,419
Farming machines	350	303
Pumps	10,000	2,142
Compressors	1,000	129
Electric motors	50,000	1,372
Diesel engines	4,300	1,392
Auxiliary and spare parts	-	-

The factory will have steel and non-ferrous metal casting, grey cast iron and forging.

This factory will be capable of producing many heavy engineering goods, including large electric motors. For a more suitable production programme, this factory should make large co-operational or joint venture arrangements within the RCD Region and with some foreign firms. Some capacity could not be used without co-operation with larger markets. Specialisation in similar factories in the RCD Region is necessary.

4. The largest machine building plant in Iran is established in Arak. This factory is about to start production. The production programme of this factory is expected to be as follows.

		Tons/yr
(1)	Material handling equipment such as conveyors, elevators, mine cars	2,175
(2)	Boilers and auxiliaries, storage tanks, pressure vessels and heat exchangers	9,750
(3)	Earth moving and construction equipment (bull dosers and loaders)	4,500
(4)	Road making and construction equipment (vibratory rollers, crushers, concrete mixers)	1,350
(5)	Crane crabs, hoist gears, steel structures	4,850
(6)	Aluminium and steel vessels manufactures for the chemical and food industries (evaporative operations)	700
(7)	Various processing, forging and casting products and services	?

Moreover, the factory will be able to produce some casting, forging and welding components for wagons and agricultural machinery. The factory has large possibilities for co-operation in the RCD Region. The management of this factory should seek new patent rights and enter into a joint venture with some world firms which are already looking for a RCD market. The present programme of the factory is too large. Co-operation and specialisation arrangements with other similar firms in the RCD can contribute to the establishment of a more suitable and profitable production programme.

5. A few new capacities for the production of medium and heavy diesel engines for cars, trucks and buses have been established in Iran. Although the factories primarily assemble diesel engines, the carrying out of the production programme depends mainly on markets and co-operation among the RCD countries. These are the Perkman Diesel Iran Company, the Leyland Diesel Manufacturing Company, the Iran Diesel Engines Manufacturing Company, Daimler Benz Tabriz.

Each of these factories already faces a market limitation in Iran. On the other hand, these heavy diesel engines are not yet produced in the other RCD countries. Even if such production were to start, it would not meet the domestic demand of the two other countries. Moreover, the production of smaller series in existing diesel engine factories is not economical and could not compete with the imported diesel engines. An RCD agreement on co-operation in the production of diesel engines is the only solution for the existing factories in the RCD Region and for a successful production of equipment with the use of diesel engines.

6. In Turkey, the main producers of machine tools and other heavy mechanical products is the MAKİNA firm which has many production units for various types of machines and equipment for the processing industry. Although this is an old firm, co-operation and sub-contracting with other firms is not significantly practiced. This firm's experience in a wide range of production capacities could be very useful and suitable for co-operation in the RCD Region.

The firm has a capacity for special steel production, casting, forging, welding, etc. It has experienced workers and its products are of a very high quality. It is experienced in the production of equipment for cement factories, mines, food industries and tea processing machinery. It also started producing rollers, rubber earth moving equipment such as scrapers, graders, loaders, steel constructions and wire products, etc. As many of the above products are imported or in the programme for production in other RCD countries, contacts between producers and traders are urgently needed. On the RCD markets there are a great number of foreign firms operating in this type of product. In any co-operational arrangement some foreign firms should be included.

Without going into further detail it is clear that co-operation and specialisation in a wide range of possibilities could contribute towards solving many problems of existing factories. In addition to the measures that could be taken by the RCD, the enforcement of economic policy in each country separately should stimulate and

maintain various co-operational arrangements. It is obvious that a large RCD market would give a chance to each country to solve its numerous problems in the existing factories and to increase its efficiency without any loss to the interests of their national economy.

One may wonder why the use of capacity of existing factories and some of the problems of new establishments have been dealt with before the analysis of the twelve projects. We are of the opinion that the analysis of the twelve projects, from the point of view of co-operation will not be sufficient without taking into account the existing capacity in the heavy engineering industry. Furthermore, some of the capacity and production programmes of the existing factories (including those mentioned above) are closely interrelated with the products of the twelve projects. We also believe that a short summary of the present situation can contribute to a more complete and viable solution. We consider this to be a more realistic approach because in addition to the problem of national distribution of the projects among the RCD countries, there persists the predominant problem of under utilised capacity in the heavy engineering industry in the RCD region, which can be reduced through the programming of production through various types of co-operational arrangements and specialisation within and between the RCD countries. An integrated approach must consider all these aspects of the problem simultaneously and not through piecemeal planning.

CHAPTER VI

ANALYSIS OF THE TWELVE PROJECTS FROM A CO-OPERATIONAL POINT OF VIEW

In the terms of reference submitted to UNIDO by the three RCD countries and in the job descriptions it is pointed out that the twelve engineering projects should be analysed from the standpoint of their availability for the establishment of a co-operational arrangement. As we explained in the introduction, UNIDO experts did not receive all project reports for the twelve projects, so to make the analysis as complete as possible, additional economic and technical data for several projects had to be collected. The available data for all projects are analysed from the economic and technical point of view bearing in mind the factors important for co-operation within the RCD region.

In the analysis of the twelve projects a short description of the projects and the method used in preparing the project report are given first. Further, the experts evaluate the main technical and economic data, particularly the market demand and capacity of the project, searching for those RCD projects and co-operational arrangements which require a market larger than any one RCD country can provide. Finally, the more convenient co-operational arrangements for each project and production are analysed and adequate recommendations made for starting the co-operational arrangement.

1. Locomotives

A. Background Information

At its sixth Session held in January 1967, the Regional Planning Council of the RCD entrusted Turkey with the preparation of a regional study on locomotives and recommended procedures for setting up co-operation in the production of locomotives.

At its ninth Session held in Ankara in December 1968, the Regional Planning Council noted that Turkey had circulated the project reports, the RPC at its tenth Session in June 1969 recommended the visit to Iran and Pakistan by Turkish railway experts and their re-writing of the report in lines with the recommendations of the RCD sub-committee on locomotives. At the RPC's twelfth Session in Ankara, June 1970 it was noted that Turkey had circulated the new project report.

From the various RCD documents and reports from Turkey it is clear that Turkey has ceased to import diesel electrical locomotives and has embarked on its own production at Eskishehir. The first small diesel locomotives (shooting) were produced in 1967 with 360 HP. Now Eskishehir is the center for maintenance, repair and production of looomotives. Turkish railways shifted steam locomotives activities to Sivas.

The last project report on locomotives and locomotive diesel engines was prepared by the Turkish State Planning Organisation and published in 1970. The report has 64 pages including appendices, and contains some elements for a brief feasibility report.

The UNIDO experts had an extensive discussion with the Pakistani and Turkish officials concerned and visited some of the main railway workshops in the two countries.

B. Short Description of the Project

With the establishment of these projects, Turkey will be able to start production of both types of diesel electrical locomotives - the Coco 2400 HP and Bobo 1800 HP - and later on of diesel locomotives of about 900 HP.

From the project report we can see that West Pakistan Railways have 8,970 km of various size railway tracks, mainly broad. In 1968 Pakistan had 619 steam locomotives, 337 diesel locomotives and about 80 steam locomotives on the narrow gauge lines. Some of these locomotives are used for shooting purposes. West Pakistan Railways plans to replace all steam locomotives with diesel locomotives as early as possible. However, if they want to replace them in the next 20 years they will need 18 locomotives yearly; if they want to replace them in the next 10 years they will need 37 locomotives yearly. If we add the requirements for an increase of traffic and some specific needs, the demand for diesel locomotives in Pakistan will increase by about 10 locomotives yearly.

The project report estimates a total demand of 30 locomotives per year for West Pakistan Railways for the next 20 years. At present West Pakistan has various diesel locomotives, and out of a total number of 337 locomotives, 250 are of the American Alco type.

Pakistan Eastern Railways have 1.475 km of the broad type and 2.118 km of the meter-gauge railway tracks. The present fleet of locomotives consists of 300 steam locomotives and 190 diesel locomotives (including 40 newly ordered from Canada). The HP of diesel engines in East Pakistan is about 1.000. The project report anticipates a demand of ten locomotives per year for East Pakistan.

The Iran State Railways had about 3.500 km of standard gauge railway track. Iran has completely replaced its steam locomotives with diesel electric locomotives from the General Motors Company. Iran possessed some 250 locomotives in 1969. According to the project report, an annual demand of 5-10 locomotives is expected in the future.

The Turkish State Railways had some 8.000 km of standard gauge railway tracks. In 1969 their fleet consisted of 785 steam locomotives and 170 diesel electric locomotives. Some of their steam locomotives are very old. In order to replace all their steam locomotives in the next 18 years they will need an average of 30 locomotives annually.

The project report estimates a total demand for diesel locomotives in the RCD countries at approx. 75-80 locomotives in the next 16-20 years.

The project report does not include any data on major inputs material or other material relating to this project. This may be due to the fact that Eskisehir production is starting with an approximate domestic content of only 25%.

Thus, the increase in domestic content can be [illegible] the coming years Turkey will have no problems supplying input material [illegible] parts for production of locomotives.

The project report contains some technical data on the [illegible] including specific requirements [illegible] to the Pakistan road gauge railway track, special [illegible] larger fuel tanks and more powerful engines [illegible]. It is stressed in the report that most of these requirements can be met by the locomotive produced in Eskisehir. The report also gives some information regarding the [illegible] agreement with the French Traction Export Firm. The purchase and manufacturing agreement is for a period of [illegible] years. Turkey will be free to manufacture locomotives with no limits on local components. The necessary manufacturing, designing and technical data are supplied by the French [illegible] free of charge. However, in the agreement on diesel engines the licensing agreement stipulates that a license fee will be levied for each engine manufactured in Turkey. There will be similar engines, according to the report, to those that were in service at the end of 1967 in France and their countries such as Algeria, Cameroon, Ethiopia, Congo, the Ivory Coast and Iraq.

The present estimated capacity of the Eskisehir factory is [illegible] diesel electric locomotives and 40 additional smaller diesel engines with [illegible] local content. In the later stages the capacity can be increased [illegible] locomotives with [illegible] local content by an additional investment of [illegible] million. It can even be increased to a higher number of locomotives but with a lower local content.

The total investment is estimated [illegible] approximately [illegible] for [illegible] locomotives and 50 diesel engines per year with 45% local content, and approx. $27 million for a capacity of 60 locomotives and 100 diesel engines per year with 45% of local content. The working capital investment is not included in this study. The project report gives data on annual operating costs for a capacity of only 60 locomotives and 40 additional diesel engines with 45% local content. The total cost is estimated at TL 134.4 million or about $ [illegible] million (using the rate of exchange of 9 Liras per $ 1 which was the official exchange rate when the report was prepared). The calculation of the estimated cost for one locomotive of the Coco type was $ 260,000 and the selling price $ 273,000 including 5% profit. The estimated price of the Bebe type diesel locomotive is $ 225,000 and it selling price $ 236,000 (including a profit of [illegible]). It can be seen from the report

that Iran has bought from General Motors locomotives with 1,XXX HP for $ 2X6,000 each, while French Traction offered similar locomotives for $ X,X3,000. Pakistan recently bought 1,1[illegible] HP diesel locomotives from General Electric for $ 2X,000. For the calculation of pay-back period Turkey used the production of XO locomotives and $ 2XO,000 average selling price and estimated the pay-back period to be 11.4 years.[1]

The project report on locomotives includes some possibilities for RCD co-operation with an emphasis on the possibility of collaboration from a technical point of view, since Turkey can meet the specific requirements of other countries and from a juridical point of view, the licensing agreement allows Turkey to let the other RCD countries manufacture some locomotive parts. There is also an emphasis on co-operation between Pakistani and Iranian engineers on the design and manufacture of some locomotive spare parts.

It is also said in the conclusions of the report that Turkey and Pakistan require about 1,000 electric locomotives for the next X years and that it is a feasible project since the pay-back period is 1[illegible]-16 years and would save about $ [illegible]-10 million each year on foreign exchange with additional benefits. It is also confirmed by Turkish Railways that the price of locomotives will be low enough to be competitive internationally.

C. Evaluation of the Project from a Transportational Point of View

The production of main line diesel electric locomotives for railways is from both the technical and the economic points of view a serious undertaking, and a limited number of countries and firms particularly in developing countries, have such production. Consequently, the efforts of the Turkish Railways to make main line diesel electric locomotives in Eskisehir, based on a specific agreement with the French Traction Export Firm, can be justified as an important and serious undertaking for Turkey and the RCD Region as a whole. The production of such locomotives is fully in accordance with national policy, not only in Turkey but also in other RCD countries. This project can also be justified from the point of view

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[1] The business practice among firms is to calculate the period (T) over which the capital cost of the original investment is recovered from gross profits (G) (gross profit consists of amortization plus profits before tax). If the "i" is the internal rate of return on investment and "n" the expected life time of the plant, the approximate relation between them is [illegible]

of modernization of the Turkish Railways (and those of Pakistan) and from the point of view of future foreign exchange savings. Furthermore, the production of locomotives belongs to the sector of heavy engineering industry which requires wider markets as the domestic market is usually insufficient for production to be economical. Other economic and social benefits of production and even some non-economic factors justify the setting up of such production and establishing this project as an RCD project.

As for the criteria regarding the selection of Eskishehir for the production of diesel locomotives, the location is chosen by taking into account some main locational factors such as the major input of material, transport of input in terms of volume and weight and some basic infra-structure facilities. Eskishehir can be considered a Center, all the more because it is situated in the developed area of Turkey between Ankara and Istambul close to the Karabük Steel Industry Center. Moreover, the backward linkages of this project are good, production is carried out by a railway enterprise which already has extensive experience in maintenance, repair and production of some spare parts for diesel locomotives.

As far as market analysis and estimation of future demand are concerned, we approve the method used but not some of the elements and conclusions. We believe that the period forseen for the replacement of steam locomotives in Turkey is too long. Modernisation of Turkish railways should go faster, and consequently there should be a faster replacement of steam locomotives. Instead of the 18-20 years period we would propose an approximate period of 10-12 years for the replacement of most steam locomotives. Thus, the demand for diesel electric locomotives in the next 10-15 years will be higher than it is assumed in the said report (40 instead of 30 locomotives per year). The annual demand for locomotives in all the RCD countries will be higher than it is assumed in the final conclusions of the project report.

The report neglected the shooting diesel electric locomotives which should be part of modernisation and should increase efficiency on the State railways. This problem is particularly important in Pakistan where old, uneconomical shooting locomotives are used. During discussions between Pakistan and Turkey, on the Pakistani inquiry as to whether 700-1.400 HP locomotives for shooting purposes could be manufactured for East Pakistan, Turkey replied that 900 HP locomotives will be manufactured from 1974 onwards. We should like to suggest that this type of locomotive should be produced as a co-operational arrangement between Pakistan and Turkey. Some large firms in Iran will need shooting locomotives also.

The estimation of 5-10 diesel electric locomotives annually for Iran is also low if we consider the extension of railways, rapid increase of economic activities in Iran and the setting up of some new industries (mining) which usually require huge transportation facilities. Our estimation of future demand of locomotives by the RCD region does not stipulate that all requirements should necessarily be met by the production in the Eskishehir plant (there can also be some import) but we should like to indicate the necessity for a wide market, good prospects for setting up such production in the RCD region and above all the possibility of co-operational arrangements among the RCD countries to meet market demand. We should assume the electrification of some railway lines in the future.

It has already been mentioned that for the production of locomotives wider markets are required and that such production is suitable for various co-operational arrangements. World experience confirms this statement and the present condition in the RCD countries, particularly in Turkey and Pakistan, favour such co-operation. Firstly, as the Turkish Government confirms in the report, there are no juridical obstacles regarding an agreement with the French Firm on licence. Secondly, Turkey - in establishing such a project - is facing some problems of efficiency and profitability with a level of production at 30-40 locomotives. In the project report, as mentioned earlier, annual expenses and estimated costs for one locomotive and pay-back period are calculated on the basis of a capacity of 60 locomotives. Even with this level of production we can justify the minimum profitability of the project. Some European firms have capacity and production of about 200 locomotives yearly. Respecting all specific conditions and arrangements with the French Firm, we can estimate that the capacity should be about 100 locomotives yearly. If the average yearly capacity is 30 locomotives, we come to the conclusion that the cost of one locomotive would be $ 40,000 higher (or 15-20 %); the break-even point will be reached at the production level of 5[illegible] locomotives yearly. The necessary amount of working capital should be added to the total investment. A minimum of $ 3-4 million should be foreseen.

Although the Turkish railways have a good possibility for increasing the domestic content by additional investment in Eskishehir and by sub-contracting with other domestic firms, we believe that it would take longer to reach 80-85% domestic content. On the other hand, Pakistan also has various workshops for maintenance, repair and production of some locomotive parts. There is a railway mechanical workshop in Lahore. There is the new central locomotive workshop in

Rawalpindi and there is also a new carriage factory there. There are other firms, private and State-owned, suitable for producing some parts for locomotives such as the Taxilla Heavy Engineering Complex, PER, Phartali Diesel Workshop, BECO Firm, PER Saidpur Mechanical Workshop, Shipbuilding Karachi. All these firms have a good possibility for co-operation with Turkey and Pakistan in producing diesel locomotives. The representatives of the Governments and railways are already in contact.

The Iranian Government stated that due to its standardization of the General Motors diesel locomotives, Iran would not participate in the production or co-operate in the Turkish project located in Eskishehir. The Iranian standpoint is understandable; however, we should like to suggest that some spare parts needed for Iran, which are either similar or the same, should be produced on a co-operational arrangement basis among the three countries. Eskishehir would be suitable for this kind of co-operation. We would therefore like to propose that Iran should, once it has started produotion, reconsider the possibility of joining in the co-operation for producing some spare parts.

The report mentions a flexible capacity in the range of 30-60 locomotives. A higher capacity requires an additional investment of $ 6 million that would affect the percentage of domestic content. We are of the opinion that the domestic content will be, for a period longer than expected, 50-60%, which compares quite well with other sectors. In addition, Turkey is facing the problem of the lack of highly qualified personnel, particularly engineers for design and other purposes. These facts point to the necessity of co-operation with Pakistan. There is a demand for 60-70 main line diesel locomotives for the next 10 years as well as a demand for a similar number of shooting locomotives on the RCD market. With some repair and maintenence activities, production of diesel engines, possibilities to export locomotives to other regions, extension of co-operation in the RCD and with the French Firm, the production capacity could reach a minimum economy level.

Only under such arrangements can these projects be profitable. Even then the rate of profit would be about 5% (profit before tax as percentage of the total investment); the pay-back period would be about 18 years. All the above calculation of economic profitability is the minimum that can be approved in this kind of production for the initial period in developing countries, assuming that the annual operating costs are calculated realistically, that the produotion will be at a minimum of 60 locomotives and that the average selling price will be $ 250,00 per locomotive.

In discussions with the relevant experts in the Turkish railways the experts were told that it is cheaper to produce spare-parts and components for diesel locomotives in Turkey than to import them. This is quite probable as Turkey has some tradition in metal working and the import duty on locomotive parts is 65%. The devaluation of the Turkish Lira will promote greater domestic production of the components for locomotives. The domestic production of locomotives in Turkey is protected by a 50% duty on imports, therefore, we believe that the production of locomotives will be competitive on the domestic market. As far as the world market is concerned there may be some uncertainty, but should the Turkish Government be willing to make concessions for exports by way of reimbursing import duty on the imported parts, the export price would be lower compared with the domestic price and could become competitive on the RCD market (many countries practice reimbursement in such cases, including Turkey).

The Eskishehir factory is already in production for main line diesel locomotives. Ten locomotives were assembled and the next ten will be produced in the current year with about 25% local content. From information received from Turkish railways, for every 20 locomotives produced the domestic content will be increased and Eskishehir factory will reach a capacity of about 50 locomotives in 1975 with a domestic content of about 80%. The Turkish experts believe that the capacity could reach 70 locomotives per year but with a lower domestic content. During 1970 new machinery and equipment were to be installed. In the Turkish annual programme for 1971 there is provision for new bids to be invited for the remaining machinery and equipment so that the factory could be completed by 1972.

D. Practical Co-operational Steps

As Iran has already announced the standardization of its General Motors diesel locomotives, Turkey and Pakistan are left to co-operate between themselves in the production of locomotives for the time being.

As discussions between Iranian and Pakistani experts progressed, particularly with regard to the suitability of locomotives for Pakistani conditions, we should like to suggest practical steps to ensure that this co-operation takes place as soon as possible. It is our belief that Turkey and Pakistan could co-operate from the very beginning in the design of locomotives, in the production of heavy mechanical parts, in the production of shooting locomotives, etc. We should like to make the following proposals:

(a) The first step should be made in joint work on the design of locomotives. Turkey already has one design bureau which is the leading institution in the production of diesel locomotives. This bureau is short of engineers and technicians. Pakistan railways also has engineers and technicians dealing with the same subject. We propose that engineers in both countries working on diesel locomotives should join their capacity, knowledge and experience in an effort to co-operate for the production of diesel locomotives. Unification could be achieved in many ways. As a first step we suggest that engineers and technicians join the Turkish design bureau; later on, an office of the same bureau could open in Pakistan or a joint design bureau could be established with separate units in each country.

(b) The existing capacity for maintenance, repair and production of locomotives in both the countries permits great possibilities for co-operational arrangements in the production of locomotives. Moreover, some other State-owned or private firms in the railways organization could be considered as suitable for co-operational arrangements in the production of locomotives.

Agreement for co-operating in locomotives will prove beneficial to both the countries, not only in foreign exchange savings but also in solving some technical and financial problems so that the increase in capacity could be achieved without any larger investment. Thus, the production of diesel electric locomotives for manoeuvre (shooting) could start much sooner than foreseen in the original Turkish plan (in 1974).

Thus, Pakistan could start production of heavy mechanical parts, underframes, hoods, boggies, pipe-works, driving caps, painting work, spring pistons, rings, etc. An agreement between Pakistan and Turkey could be reached by stipulating that some of these parts be produced only in Pakistan while others would be produced only in Turkey for the total production of locomotives. We recommend that a group of experts from both the State railways meet to deal with this suggestion.

Turkey and Pakistan could start co-operation in assembling and producing shooting locomotives which are urgently needed in Pakistan. Pakistan can produce all necessary spare-parts.

(c) Should some problems arise due to the practice in developed countries of selling locomotives on a credit basis, they could be solved through greater co-operation, a greater exchange of capital goods between Pakistan and Turkey and through efforts made by the Turkish Government and the RCD to sell locomotives an a short term credit basis.

(d) In the co-operation between Pakistan and Turkey for locomotive production, the production of various types of wagons should not be neglected. Iran could also be involved in this. There is presently a large capacity in Pakistan and in Turkey for the maintenance and production of various types of wagons. Pakistan is producing coaches. Iran intends to establish capacity for about 450 wagons yearly. They should be of the boggie type, 4-axles, with possibility to increase in the second stage to 800 pieces yearly. We strongly believe that contacts between the three countries could result in some arrangements in co-operation to meet the demand for various types of wagons in all the RCD countries. We, therefore, recommend that RCD contacts in locomotives should be extended to other railway equipment, primarily to wagons. Thus, for example, the possible production of double wheels for locomotives and wagons for all the RCD countries should be studied.

6.2. Centrifuges and Special Filters for the Chemical Industry

A. Background information

The RPC at its Eighth Session held in Teheran in April 1968 recommended that centrifuges and special filters for the chemical industry be a joint purpose enterprise and that Turkey prepare a detailed project report on the subject by the end of August 1968.

It was noted at the Tenth Session of the RPC, June 1969, that Turkey had recently circulated this study and the RPC recommended that it be submitted to the subcommittee for consideration.

The Study on Centrifuges and Special Filters for the Chemical Industry was prepared by the RCD group of the State Planning Organization of the Government of Turkey in April 1969.

Turkey and Pakistan signed the Memorandum of Understanding regarding filters for the chemical industry in November 1969. They agreed on the utilization of existing facilities in Turkey. The required investment capital mentioned in the Memorandum of Understanding is $4.2 million, provided by Turkey. The production of filters will operate under the Turkish Sugar Factory A. S. Pakistan agreed to purchase for a period of five years starting 1 January 1970 all import requirements for centrifuges and special filters for the chemical industry. The price was to be competitive with the c.i.f. price. The UNIDO experts were not able to obtain any data on the implementation of the Memorandum; apparently, it has not yet been implemented.

It was noted at the Eleventh Session of the RPC that Iran was not participating in the project. This is due to the fact that the Arak machine plant will be producing these items.

B. Short description of the study (Project Report)

The Study on Centrifuges and Special Filters for the Chemical Industry is a work of 20 pages and can not be considered either a project report or a pre-feasibility report. It is stated in the introduction of this study that it was impossible to compile all the information on the manufacturing capacity of filters in the region. The study is mainly concerned with manufacturing capacity, current and future demand and the classification and description of

centrifuge and special filters. The study classifies the processes of mechanical and technical separation and specifies that in mechanical separation various filters, centrifuges and presses are used. This is followed by a description of centrifuges and filters used in the various sectors outside the chemical sector. This part covers about nine pages of the study.

In the chapter entitled "Existing Industry in the Region", it is said that the Turkish Sugar Mill Industry owns four factories which manufacture centrifuges and filters (in Ankara, Eskishehir, Turhal and Erzinzan).

The newly established capacity of the Turkish Sugar Mills at Etimesut near Ankara now producing filters is equipped with modern machinery such as lathes, rolling machines, plate edge shaping machine, automatic arc welder, radial drilling machine, an X-ray welding control unit and highly sensitive balancing machinery. The total investment is about .4 million.

In Iran, according to information obtained during the preparation of the study, there is not a single factory manufacturing centrifuges and filters for the chemical industry. In Pakistan only plate and frame type casts and iron presses are manufactured, but there is no factory manufacturing rotary drum cell and non-cell filters.

The chapter dealing with the demand for centrifuges and filters provides an analysis of current sugar consumption, future sugar consumption and capacity in all the RCD countries. The total demand for centrifuges, drum and mud filters up to 1975 in the sugar industry alone is estimated by this study as follows:

	Turkey	Iran	Pakistan	Total number
Centrifuges	35	150	425	610
Drum filters	6	25	75	106
Mud filters	12	60	150	222
Bag filters	60	300	1050	1410

According to the report, the same rqquirements are foreseen for the next five years for other food and chemical industries.

The study contains value data on total demand estimated annually as follows:

Demand (US. Million)

	Turkey	Iran	Pakistan	Total
Centrifuges	0.112	0.480	1.360	1.952
Rotary drum filters	0.048	0.200	0.600	0.848
Filter presses	0.038	0.192	0.480	0.710
Bag filters	0.036	0.180	0.630	0.846
	0.234	1.052	3.070	4.356

The study states that the European price for centrifuges, including motors, is $6,000 per ton and that the average European price for filters is $1,500 per ton. The cost price for centrifuges in Turkey, without the motor, was $1,730 per ton in 1968, and the cost of the motor $1,000-5,000 per ton. It was concluded that the Turkish price was competitive with the world market price.

The Turkish production price for rotary drum filters is $1,320 per ton and 1,300 per ton for bag filters. This means that the Turkish filters are cheaper in comparison with the European. The report specifies that a great number of centrifuges and filters for the chemical industry are manufactured in the factory established by the sugar industry in Turkey.

Centrifuges, rotating drum filters, filter presses and bag filters are manufactured in Turkey under license of Saltz-Gitter Maschinen A.G., Federal Republic of Germany, and are of a good quality. The study ends with the following statement: "Finally, it can be said that there is no pressing need to establish new plants to produce centrifuges and filters for the RCD countries. The total centrifuge and filter demand can be manufactured in the machinery factories of sugar mills at the European standards". (page 20 of the study)

We deduce that on account of the final recommendations of this study, no data were given on locational factors, major input material, investment, finances, efficiency, etc.

The RCD Study on Centrifuges and Special Filters does not provide any data on the capacity of existing plants and their production programme. The new study should contain technical data about all types of filters produced in Turkey and Pakistan. From these data it will be possible to assess the percentage of coverage of all centrifuges and special filters in the various RCD countries.

C. Evaluation of the project from the co-operational point of view

As mentioned before, this study is incomplete and it is difficult therefore for the UNIDO experts to make a full evaluation of the project. Moreover, the limitation of the study to the production of centrifuges and filters for the chemical industry only is not justified since the food industry as well as some other industries also use centrifuges and special filters. Thus, although the study prepared by the State Planning Organization went beyond its task (limited to chemical industry), we consider it both useful and necessary.

A demand for such goods exists in the RCD Region and will be growing; therefore, the selection of this production for an RCD project is in accordance with the market demand and with the national policy of each country in the development of the engineering industry. As far as the market analysis in the study is concerned, we cannot accept as viable the method used for assessing the total demand, particularly the requirements for centrifuges and special filters for the chemical industry.

No data for the sugar industry in Iran seems acceptable. The total daily operational capacities of the existing beet and cane sugar factories as well as the forecast of capacity are as follows:

		1968/1969	1972/1973	1977/1978	1982/1983
Sugar beet and sugar cane	t/day	37,250	54,100	61,500	70,000

Since there are no available data, some other method should be devised. For instance, looking at the structure of investment in chemical plants, we find that requirements for centrifuges and filters share about 0.5% of the total investment. Each RCD country has a Five Year Plan and an estimate of the total investment in the chemical sector. Data on the total import of centrifuges and filters, not related to the chemical sector, are available in some countries.

The import of centrifuges, machines and filters as well as parts for such equipment in Iran from March 1969 to March 1970 was about $10 million, and about $5 million in the previous year. Data concerning the imports of the other two countries were not available.

Iran's Import of Filters in Past Years

Tariff No.			1967/1968	1968/1969	1969/1970
838A1	Mineral, animal and vegetable oil filtering equipment	Pcs.	56	126	1,192
		Kg	104,942	143,941	284,130
		Rls	12,750,976	35,823,720	26,502,371
838A2	Water filtering equipment (other than domestic filters)	Pcs.	398	374	396
		Kg	568,814	874,297	121,907
		Rls	32,520,182	49,636,797	21,277,174
838A3	Other fluids filtering equipment	Pcs.	83	762	471
		Kg	345,175	303,282	97,887
		Rls	29,860,521	46,555,447	18,447,806
838A4	Parts of filtering equipment	Kg	1,043,537	1,877,956	1,899,876
		Rls	124,455,122	278,145,161	253,793,165
838B3	Domestic filters	Pcs.	1,247	3,438	59,393
		Kg	11,250	3,680	34,064
		Rls	2,217,690	1,760,166	456,888,089

The chemical industry is another important consumer of centrifuges and filters. From the forecast of investments in the chemical industry in Iran it is estimated that in the years from 1972 to 1976 the average value of the consumption of centrifuges and filters will reach approximately $660,000 per year, and in the years from 1977 to 1981, the average value of consumption will be approximately $860,000 per year.

If we consider the requirements for the replacement of old equipment in the chemical sector and requirements and investments in other sectors which use centrifuges and filters, the annual demand amounting in value terms to $4.3 million is an underestimation and the figure will be higher for all RCD countries. To justify the future requirements for filters and centrifuges, we should like to point out that some of these products are imported by foreign firms as part of complete sets of machinery and equipment for a factory. We should also draw attention to the fact that some special types of centrifuges (high rotating) and certain filters for laboratories cannot be produced locally and have to be imported.

As to the main question dealt with in the conclusions of this study, i.e. that the present capacity can meet the demand and that there is no pressing need to establish new plants for the chemical sector, we should like to mention that the new capacity in Arak, Iran, concurs with this conclusion. If we add to this the possibility of a further increase in the production of filters and centrifuges in the existing factory in Turkey, the main conclusion of this study can be partially approved. Looking at the present situation within the RCD region, we find that some kinds of filters are produced, for example, filters for automobiles, particularly in Pakistan. Regarding the production programme of the Taxila heavy mechanical complex in Pakistan, we admit that this factory can produce equipment for sugar mills, and we believe that it can include the production of filters and centrifuges.

Production of domestic filters as well as filters for the automotive industry is not recommended within the frame of an RCD joint venture project.

The demand for centrifuges and filters for chemical plants is relatively small in comparison with the large demand for sugar and some other industries. According to the estimate made by Chemical Consultants Ltd., the annual demand for filters for the chemical sector in all the RCD countries will be about 500 tons. Moreover, filters and centrifuges are common equipment used in the chemical and other sectors of industry. Only a small part of this equipment could be considered as specifically for chemical plants. Thus, the existing production capacity for filters and centrifuges in the sugar industry or elsewhere can supply the chemical plants with these products.

From the technical point of view the production of drum filters for the chemical industry and filters for other industries can be organised on a domestic production basis. This would require a shaping machine, automatic welding equipment, horizontal milling and boring machine, some lathes, radial drilling and balancing machines.

Bearing the above facts in mind, particularly the demand and the existing and future capacities in all the RCD countries, we should like to improve on the main conclusions of the Turkish report:

a) The requirements for centrifuges and filters for the chemical sector is only part of the total market demand. This is common equipment, used in various industrial sectors including the chemical sector. It is, therefore, not necessary to build factories which would manufacture these products for the chemical sector. It is preferable rather from the economic as well as technical point of view.

b) The existing capacities in Turkey and in Greece, Iran, would meet the demand of the RCD region. Additional necessary capacity could easily be established in the existing factories. There will be no problem with the supply of raw material, manpower, etc., for the production of centrifuges or filters. This kind of production is not technically complicated and can, therefore, be organized in any of the RCD countries.

c) We should like to suggest that the arrangements between the three countries in the field of trade should be made so that existing capacity supplies the whole of the RCD market. Economic policy measures should be devised to stimulate such trade. A Memorandum of Understanding between Turkey and Pakistan regarding these goods has already been signed with the stipulation that the Government of Pakistan purchases for a period of five years all imported requirements for centrifuges and special filters for the chemical industry from Turkey. This agreement should be implemented.

d) We should like to recommend that a special meeting on the production and trade arrangements in centrifuges and filters be held in RCD. The main producers and consumers of centrifuges and special filters together with the representatives of the RCD and Government officials should participate in this meeting. The RCD Secretariat should take care of the preparations for such a meeting.

It is most advisable to solve the problem of centrifuges and special filters on the basis of trade contracts and not as an RCD joint venture project.

b. Diesel Engines

A. Background Information

The National Planning Council, at its sixth Session held in Ankara in January 1967, requested Pakistan to circulate a study on diesel engines by the end of April 1967. The study prepared by Pakistan was distributed in 1967.

At its tenth Session, held in June 1969, the RPC recommended that member Governments should inform each other through the RCD Secretariat of their production plans and import requirements for diesel engines. At the same meeting the RPC requested Turkey to circulate a project report on marine craft diesel engines.

The UNIDO Experts received the project report on the Diesel Engines Factory, manufacturing the Yalçın Marine Diesel Engines as well as a study from the Pakistan Government on diesel engines manufactured in the RCD countries, prepared by Chemical Consultants in May 1967. According to the Terms of Reference, the task of the UNIDO team is limited to diesel engines above 250 HP. In line with these requirements the team should deal with traction diesel engines covered under project No. 1 "Locomotives", then with marine diesel engines, heavy auxiliary or stationary diesel engines and a limited number of diesel engines for heavy trucks and earth-moving equipment. The team believes that the limitation of their study to diesel engines above 250 HP does not correspond to co-operational arrangements among the RCD countries, and it is felt that this study should be extended to other diesel engines. Consequently, under this project we shall deal with:

1. marine diesel engines and 2. other diesel engines.

Our approach is based on the recommendations of the RPC at its thirteenth Session which recommended that the three Governments should exchange views on the nature, possibility and scope of their co-operation in the field of diesel engines.

1. Manufacturing of Yalçın Marine Diesel Engines

The project report contains a summary of the project for establishing a diesel engines production in Pendik, Turkey. It is a work of 30 pages with seven maps as annexes. The report is result of joint work between the Turkish Government and the Yalçın Brothers Ltd. firm. The description of the project contains explanations for the location of the plant in Pendik on the east coast of the Marmar Sea (about

30 km south-east of Istanbul). The choice of the site was determined by the existence of the Pendick shipyards and co-operation with them in the metal sheet works. The report also mentions that the entire technological project should be run on the experience of Sulzer. The largest size engine which can be built is the 9RND 90 type with an output of 26.100 BHP. The total capacity of the factory and its production programme will be as follows:

Engine type	Cylinders per year	Total BHP per year
RN 90	6	17.400
RN 68	27	44.500
RN 76	24	48.000
A 25	75	13.800
A 25 (5-10 cyl.)	72	13.200
AV 25 (12 + 16 cyl.)	72	13.200
TOTAL		150.100

There is a possibility for later expansion of yearly production up to 240.000 BHP. The factory will employ a total of about 500 persons. For the first engines most of the components will have to be imported and the percentage of the local content has to be increased continuously.

In the Chapter on market analysis it is said that Turkey has a programme for increasing the Turkish merchant fleet because at present only 30% of their export and import is shipped on Turkish vessels. In 1968 Turkey spent $90 million in foreign exchange for freight charges.

Although there is a certain additional capacity mainly for smaller size naval diesel engines in Turkey and Pakistan, the RCD countries also have a large market for Sulzer Navy Diesel Engines. The report also states in its Conclusions that the RNA type can be used in other fields, particularly with gas and fuel.

The total investment is expected to be £17 million of which £ 7.4 million will be foreign exchange. The total investment in building will be £4 million and £6 million in machinery. The working capital is estimated at £2.5 million.

It is also assumed that at a later date when adequate foundary and forging facilities are available in Turkey, the domestic component will be about 65-69% and that of imports 31-35%. In the Conolusions of the report hope is expressed that the Turkish Government will support this project and offer special encouragement by providing any necessary facilities.

Finally, in the Summary of the project report can be found financial schemes for the project which cover a total equity capital of $7.2 million of long-term loans provided by I.F.C. and $5.9 million long-, medium- and short-term loans provided by the Turkish Banks.

No other data regarding the technological process, cost and prices are included in this short summary of the report. We should also like to add that infra-structure works exist and will partly be carried out by the State. It should also be mentioned that spare-parts and other services for the Sulzer Navy Engines for the RCD and other international ships will be available in this factory.

Evaluation of the project and recommendations

This project is suitable as an RCD project. Shipbuilding capacity is being enlarged and the requirements for navy engines of high HP are increasing. Thus, we can approve the estimation for a demand for 10-12 large diesel engines for the RCD region in the future. However, in endeavouring to meet the real demand for navy engines, one should be born in mind that there may be a demand for engines other than Sulzer diesel engines, as well as a possibility of selling on a credit basis. By putting into execution some special measures for the protection of the domestic production and providing some facilities regarding credit we can conclude that this project, from the point of view of demand, is feasible. We should like to propose the market analysis in a more serious way, to set up the production programme of the plant.

For Iran this study should be undertaken from the point of view of the utilisation of these diesel engines for natural gas and oil.

In analysing locational factors such as land, micro-locating, transport facilities, supply of water and electricity, backward and forward linkages and supply of raw materials, we can conclude that none of these factors are unfavourable for the establishment of the project in Pendick on the Marmar Sea. Regarding the technical data and characteristics of Sulzer R.M. diesel engines we have no comment to offer as Sulzer is one of the largest producers of marine engines in the world.

We should only like to propose that in a further study, an enlargement of the project (by the inclusion of the new diesel engines in the production programme should be considered. We should also like to propose that in the agreement with Sulzer Bros. provision should be made for the supply of castings and components as well as technical assistance as far as high quality grey cast iron castings are concerned, steel castings and forging will be available in Turkey.

As to investments, we believe that the total investment is under-estimated and should be above $20 million. For the cost of production of diesel engines, we calculate that one engine would cost a minimum of $750.000. From the available data we noted that the c.i.f. price of similar engines in Istanbul and Karachi was also about $700.00 - $750.000. If we add to the imported c.i.f. price 30% of import duty, the selling price of the imported marine engine should be between $950.000 and $ 1.000.000. Turkey should sell marine engines at world market price to the other RCD countries; thus the total income from the sale of six engines to Turkey and six engines to the RCD countries would bring about $10.5 million. The total cost of manufacture will be about $9 million ($750.000 multiplied by 12). The total profit (assuming it is tax free) will be about $ 1.5 million. The pay back period would be 10 years. This project would bring savings in foreign exchange which depend on the increase of domestic component in producing such engines.

On the basis of these data and in considering other social benefits we believe that this project will have a positive effect on the overall national economy, on the development of a necessary merchant fleet and on sea transportation in all the RCD countries. In our opinion, this would be suitable as an RCD project from many points of view. This kind of production cannot be economically established in each RCD country because of limited market demand. The RCD countries are building shipyards and their national policies emphasize the urgent need for increasing their merchant fleet. From the technical point of view, the Sulser licence and the production of engines with their co-operation is a full guarantee of good quality product.

The production of diesel engines could be included in the co-operational agreement which has already been established in shipping. Some other form of co-operation in heavy engineering industry, partioularly in diesel engines. We propose that Turkey make certain adjustments in the project report on account of the revaluation of the Turkish Lira and due to some new elements on the market, as recommended.

The production programme given in the project report entitled "Manufacturing of Sulzer Marine Diesel Engines in Pendik, Turkey", prepared by the Sulzer Bros. Ltd., Winterthur in 1969, is limited to these types and ranges: types A25 and AV25-four-stroke, medium speed engines from 550 up to 2.960 HP; types Z-four-stroke, medium speed engines from 2.600 HP up to 6.000 HP, types RND-low-stroke, low speed engines from 7.500 HP up to 26.100 HP.

There is a gap between 240 HP and 550 HP - these are stationary diesel engines mostly used as stand-by engines. The project should be revised and the production of stationary and marine diesel engines from 240 HP up to 550 HP included into the production programme of this project.

2. Other Types of Diesel Engines

Although, as we have mentioned before, the task of the UNIDO Experts is primarily linked with diesel engines above 250 HP, we cannot overlook other types of diesel engines, particularly in view of the RCD market demand, existing capacity and future production. With these facts in mind and the normal technical consideration we should like to divide our analysis of the other diesel engines into:

a. Automotive Diesel Engines
b. Tractor Diesel Engines
c. Various Stationary Diesel Engines

a. Automotive Diesel Engines

These diesel engines cover a large range of engines from 40-250 HP. The total requirements of automotive diesel engines in the RCD countries is 40.000 (Turkey: about 15.000, Iran: 12-14.000, Pakistan: 14-16.000) and will continue to increase. Automotive diesel engines are used for light and heavy trucks, for buses (and mini-buses) and earth-moving equipment.

Iran is progressing in the setting up of new capacities for diesel engines for such purposes. There is a Mercedes Diesel Engines Factory in Tabriz with a production of 4.000 diesel engines and with the capacity to produce 12.000 diesel engines in two shifts. Tabris Mercedes Benz has, in a one-shift production programme, the following types:

V.M.	314	33-88 HP	1.600 pieces
V.M.	352	50-140 HP	1.600 piece
V.M.	327	70-176 HP	1.500 pieces
V.M.	346	108-240 HP	1.300 pieces

Iran reached an agreement with Leyland to produce, in two shifts, 4,000 diesel engines. This factory will start production in 1972 However, the market in Iran can absorb only half of this capacity.

In Pakistan, the Government has granted permission to the Ghandhar Industries to produce Bedford diesel engines for trucks, automobiles, etc. Pakistan has other smaller producers (mainly assembling) of automotive diesel engines. A similar situation prevails in Turkey. The plan was to produce 8-10,000 diesel engines of 60-120 HP in 1971/72 The Turkish Government had a discussion with Perkins over the new capacity.

We have noted that much of the capacity is already established or is about to start production particularly in Iran and Pakistan and in the Perkins Diesel Engines in Turkey if they come to a final understanding over the production. The present capacity with a proposed expansion of production units will nearly provide for the total present demand. However, as some of the capacities are either late in starting production or late in reaching the designed capacity, the import of diesel engines is still high in the RCD Countries. The domestic content is very low and the import of components for diesel engines is very high in all the three countries. This indicates a need for mutual contact within the RCD framework as soon as possible.

As far as future demand is concerned we can forecast an increase in diesel engines of about 8-10 % yearly for the next 10 years. Thus, the future demand for diesel engines will be as follows: --

Forecast of Demand

Country	1972	1977	1978
Iran	12,000	21,000	34,000
Turkey	15,000	22,000	33,000
Pakistan	18,000	27,000	38,000
Total	45,000	70,000	105,000

From the technical and economic points of view, we recommend that for future demand the existing capacity be expanded. The production in Iran of diesel engines for heavy trucks is well located because the demand in Iran is about 70 % of all diesel engines for heavy trucks. The expansion of the

Ghandhar Industry producing Bedford diesel engines for light trucks should meet most of Pakistan's demand as well as some of the RCD demand.

Having reviewed the situation regarding diesel engines in the RCD countries we have noted that steps have already been taken in establishing co-operation and making arrangements for the production of traction diesel engines for railways. There is an urgent need for contacts and agreement for the establishing of co-operation and standardization in automotive and other diesel engines in the RCD Region.

In the Conclusions on automotive diesel engines we can observe that the RCD Region has already established a large capacity for the production of automotive diesel engines. When the designed capacity has reached full production, it will meet the demand of the whole RCD Region. However, some excess capacity exists in Iran for heavy truck diesel engines and will increase when Leyland Diesel Engines starts its production in 1972.

It should be pointed out that a large range of types of diesel engines is used in the automotive sector in the RCD countries. For instance, in Iran alone some 22 types are used.

Some of the existing producers could not attain profitable production due to market limitation (Leyland), while others are experiencing a higher cost in starting the production of some components compared to the imported items (Mercedes Benz). Some components and parts of diesel engines such as fuel injection pumps, governors, nozzles, electric equipment, etc. will be imported to all the RCD countries as the market in any of these countries is too small for economical production.

It is advisable to produce some of these components and parts in specialized factories for all the RCD countries. A study on the present situation and on prospects for this production should be prepared in future.

In this situation the usual steps to be taken are:

a) establishing close contact between producers in the RCD countries and division of work and specialization in the production of diesel engines for the whole RCD market.

b) exploring the possibilities for co-operation in the production of some components for diesel engines and establishing mutual agreement among firms on the production and delivery of some components or intermediate goods.

c) seeking possibilities of sub-contracting with specialized firms in the production of some parts such as pistons, piston rings, gear boxes, electrical equipment, etc. Some specialized firms for parts mentioned above already exist in Pakistan and Iran

d) discussing the trade arrangements within the region as well as further development programmes based on regional co-operation and co-operation with foreign firms.

e) establishing some joint activities in research or market study which will be of interest to each firm and country

b. Tractor diesel engines

The agricultural sector is one of the largest in the economies of all the RCD countries and the increase in the use of mechanization in agriculture is the main policy of all countries. Thus, the demand for tractors is constantly increasing. Unfortunately, the RCD countries have not finalized the production of diesel engines for tractors. The tractor fleet is very diversified in each country. Some estimation gives a figure of about 100,000 various tractors in the region. The total demand in Iran for diesel engines for tractors is between 5,000 to 6,000, in Turkey it is about 16,000 and in Pakistan about 7,000 to 8,000 per year. Thus the total demand will be for about 30,000 tractors.

Iran made an agreement with Romania for production of about 5,000 Universal 65, Romanian tractors. Another agreement is signed with John Deere Company for the production of tractors. Both licensing agreements will allow for a production of about 9,000 tractors.

In Turkey negotiations were going on for the preparation of an agreement on the production of Perkins diesel engines for tractors. According to the latest information, the negotiations have not yet been concluded. We should like to stress that Perkins diesel engines are suitable for this region, that among the present fleet of tractors Perkins diesel engines make up the largest number. It should therefore be in the interest of all the RCD countries to set up Perkins diesel engine production. However, should it not be possible to reach an agreement with the Perkins firm, there are other firms equally well qualified for this undertaking.

Pakistan is assembling Bedford diesel engines and recently the Pakistan Government approved the agreement between the Ghandhar Industry and Bedford for establishing the production of Bedford diesel engines for tractors and vehicles.

Forecast for future demand for tractor diesel engines

Country	1972	1977	1982
Turkey	16,000	25,000	34,000
Pakistan	8,000	12,000	17,000
Iran	7,000	11,000	17,000
Total	31,000	48,000	68,000

All these facts confirm the efforts of the RCD Region to solve the problem of diesel engines for tractors. We believe that one of the reasons why they are late in this field is lack of co-operation as well as lack of a unified plan in looking for suitable solutions that would help in the production of tractor diesel engines in the RCD Region. It is certainly not too late to start co-operation between the RCD countries, taking into account all existing capacity in the production of tractors.

We can observe that in the production of the various components for tractors (as for other machinery), the RCD countries are faced with the problem of high costs mainly due to low series of production and market limitations. Therefore the main producers of tractors should join their efforts in the quest for new targets and ways to carry out a programme in the production of tractors in the most appropriate way from the technical and economical points of view so as to contribute to the efficiency of firms in accordance with the national policy of each country.

Many types of tractor diesel engines are used and required in each country. There is a possibility for standardizing some of the tractors in cases where specialization in the production of tractors should not prove economical for all types of tractors in one or the other of the RCD countries. Furthermore, the development of mutual trade is advisably based on excess demand and capacity which exist in the RCD Region.

Each RCD country could have arrangements with some foreign firms. Sometimes the most suitable solution would be to synchronize their requirements and to insist on the use by foreign partners of the existing domestic capacity in producing diesel engines for tractors. By following the above suggestions many of the problems of production would be solved. These problems are also connected with co-operation in the production of tractors; this will be discussed later on in this report.

A detailed study on how to establish co-operation in the production of diesel engines for tractors by using the existing capacity in the RCD countries should be prepared. The study should work out the problems and find better economic and technical solutions that should prove beneficial to all RCD countries.

c Various stationary diesel engines

This group of diesel engines covers a wide range of engines which are used for agricultural and irrigation purposes, for various machinery and equipment, power generating, etc. They are normally divided into: -

- small diesel engines up to 30 or 40 HP
- medium stationary diesel engines between 40-240 HP
- large stationary diesel engines above 240HP

In all RCD countries we find a capacity for small diesel engines with a range upto 30 HP. In Turkey, a few private producers can meet the local demand which is about 9,000 to 10,000 engines per year. There is a new capacity about to start production that will meet the new demand of Turkey. In Iran, small engines are used for various purposes and the annual demand is about 10,000 per year. There is no production of diesel engines up to 6 HP. The Tabriz machine factory will produce 4,300 diesel engines of 9 HP, 18 HP and 27 HP. This factory is able to increase its production up to 6,000. In Pakistan, there are about 50 producers of small diesel engines mainly used for tube-well in West Pakistan and pumping purposes in East Pakistan. A new factory under a German license has been established near Dacca. The local demand can be met with existing capacity, which is not fully used. Pakistan is exporting small diesel engines in many countries including Iran. It is normal that each country should develop a production of small engines to meet its own requirements, leaving an open market for selling some

types of diesel engines to other countries to meet market demand.

The demand for medium stationary diesel engines with a capacity of 40-240 HP is much lower and can be estimated at 4,000-5,000 for all the RCD countries. In Pakistan, Karachi Shipbuilding can produce diesel engines belonging to this group. However, the larger producer is Dorman Diesel Engines Factory in Tabriz, Iran. The capacity of this factory is 4,000 engines produced in two shifts. Until now the factory has used only a small part of its capacity due to lack of market demand. The total demand of this type of diesel engine in Iran is estimated to be about 1,500 pieces for 1972.

The demand for large stationary diesel engines above 240 HP is lower and can be estimated at a few hundred yearly for all the RCD countries. These diesel engines are mainly used for generating electricity and for stand-by purposes. We have already suggested that the future Pendik Marine Diesel Engines Factory should produce this type of diesel engines. Usually this production is included in some other existing diesel engines production. The expansion of grid for electrical lines will have a negative effect on the demand of these diesel engines for electrification purposes.

The demand and also the present capacity for stationary diesel engines also indicate that there is a possibility for RCD specialization and co-operation in production and supply of the market.

We refer to the various types of diesel engines in order to illustrate:

a) the possibility of co-operation and specialization between the RCD countries in several types of diesel engines;
b) the need for co-operation and sub-contracting among firms in the production ofcomponents for diesel engines;
c) to explain the possibility of trade arrangement and co-operation among the RCD countries by using excess capacity and demand for some other type of diesel engines,
d) to indicate the possibility of co-operation in the production of various types of equipment which use diesel engines, for example tractors, earth-moving equipment, etc.
e) the standardization of diesel engines within the RCD countries and specialization among various firms already engaged in production of diesel engines. This would contribute to a domestic content in the production of diesel engines.

f) A large market no doubt exists for diesel engines in the RCD countries. However, a serious problem is the volume of production in the existing production units. The current production in many plants is far below the economic scale. The increase in efficiency and competitiveness of the domestically produced engines largely depends on specialization and volume of production.

g) According to our analysis the production of diesel engines, for the time being in the existing capacity, would not be competitive with the import price. With the protection of tariffs and possibilities of using the RCD market and with the suggested co-operation and specialization, there are good prospects for this production to be profitable in the future.

The implementation of some of the above mentioned suggestions regarding specialization, trade and other co-operational arrangements in equipment which use diesel engines will result in higher production of this equipment also.

6.4. Rotating Electrical Machinery
and
6.5. Turbo-Generators (Steam/Gas)

A. Background Information

The Regional Planning Council (RPC) at a meeting held in January 1967, discussed the study on electrical machinery equipment and recommended that the feasibility studies on Electrical Rotating Machinery and Turbo-generators should be prepared by Iran.

At its 9th Session held in December 1968, the RPC discussed the main findings submitted by the Research Centre for Industrial and Trade Development (Ministry of Economy of Iran) on power equipment plant. The RPC also recommended that Iran should circulate a feasibility report of this project not later than June 1969 (p. 20, RPC report, 9th Session). The RPC, at its 12th Session held in June 1970, in Ankara noted that Pakistan replied to the questionnaire circulated by Iran and that Turkey would do the same shortly. At its 13th Session held in Dacca in January 1971, the RCD noted that Iran would circulate its project report in 1971.

The UNIDO team contacted several times the Ministry of Economy of Iran for information on the progress of the report. Finally, in April 1971, the UNIDO experts requested the RCD Secretariat by letter to take urgent action so as to obtain the report on Rotating Electrical Equipment. On 26 April the RCD Secretariat sent a letter to the Iranian Ministry of Foreign Affairs on this subject (copy attached as Annex III). A similar letter was sent to Pakistan and Turkey. The Iranian Government replied that they wished to discuss this subject at the forthcoming Committee on Industry which was to be held between 28 June and 1 July 1971. In the report of the Committee of Industry on Rotating Electrical Machinery the following conclusions can be found.

> "The Committee noted that having received the relevant information from Pakistan and Turkey, Iran has asked for the sub-contracting of this project and would circulate the project report in 1972".

The UNIDO Experts are of the opinion that project No. 5 (Turbo-generators) should be submitted for consideration jointly with project No. 4 (Rotating Electrical Machinery) because technically they are closely connected and also because all generators belong to rotating electrical machinery. For lack of a

suitable feasibility report during their period of appointment, the UNIDO team consulted other documents, such as the Iranian study on Power Plant Equipment, the Turkish report on Hydraulic Turbines, industrial profiles and statistical data, etc., to make some preliminary observations and suggestions regarding this project.

B. Demand for Rotating Electrical Machinery

The usual approach to the demand for electrical machinery considers the current and future production and consumption of electricity, the future increase and the structure of electricity resources in each country.

We identify the following consumption of electricity in the RCD in 1970.

Consumption of Electricity in 1970

Country	Millions of kWh	Consumption per capita kWh
Iran	6,600	230
Turkey	8,500	290
Pakistan	7,200	600

The annual increase of electricity production in the last few years was 20 per cent in Iran, 14 per cent in Pakistan and 12 per cent in Turkey, on the average.

The structure of energy resources in 1970, roughly evaluated, is as follows.

Country	Hydro-resources	Thermo-resources (including coal and gas)
Iran	35 per cent	65 per cent
Turkey	45 per cent	55 per cent
Pakistan	65 per cent	35 per cent

The total consumption of electricity is low in all the countries. We can estimate that the future demand for electricity will be high in all these countries if we take into account industrial requirements, needs of other economic sectors, electricity consumption of the population, etc. We can expect that the trend of a 20 per cent increase of the last few years in Iran will continue during the Five Year Plan and then decrease to 15 per cent. For Pakistan and Turkey we foresee an annual increase of 11 per cent to 12 per cent during the next ten years.

On the basis of the above trend we expect the total consumption in 1975-1980 and 1985, in each of the RCD countries to be.

[illegible] Estimation of Total Consumption
[illegible] Electricity in [illegible] MWh

Country	1975	1980	1985
Iran	15,000	[illegible]	52,000
Turkey	15,000	27,000	48,000
Pakistan	12,500	[illegible]	35,000
	42,500	77,000	135,000

From the above figures we see that the requirements for newly produced electricity will be about 35,000 million KWh from 1975 to 1980, and from 1980 to 1985 about 58,000 million KWh in all the RCD Region. Some changes can be expected in the structure of the resources for electricity in the next 10 years as the hydro-resources will increase in Turkey.

In Pakistan the structure will be almost the same. On the other hand, an increase in the thermo-resources in the next 10 years in Iran can be forecast.

On the basis of the above data and after a study of the demand for electrical equipment (described at the end of this chapter), we estimate that the demand for steam generators will be approximately 900 - 1000 MW and 300 MW for hydro-generators annually for the RCD Region from 1975 to 1985. In addition to this the demand for 100 - 150 MW of large electrical motors and 40 - 50 MW of diesel generators can be foreseen. The RPC at its 9th Session recommended that 110 and 200 MW units for thermo plants be considered as a standard for the RCD Region. Some large units should be imported. Taking into account this recommendation, we conclude that about 5 to 6 turbo sets will be needed for the RCD Region yearly for the next 10 years starting in 1975.

The capacity of one unit of hydro-electric plant depends on the locational conditions of the hydro-electric plant, the flow of water and other factors. Looking at some future programmes of hydro-electrical plant construction, we assume that about eight generators will be required. Assuming that some of the generators will be imported, we estimate that a minimum of six hydro-turbines and

six hydro-generators could be supplied from domestic production in the RCD countries. Taking into acoount additional requirements in large electric motors and diesel generators as well as the possibility of combined production of some other equipment for generating electrical power and establishing hydro and thermal power stations, we conclude that the recommendation of the RCP to study the possibility of production of rotating electrical equipment in the RCD Region is well founded.

The Research Centre for Industrial and Trade Development, Ministry of Economy, Imperial Government of Iran, prepared in May 1968 a "Feasibility Report - Power Equipment Plant" with the production programme: steam turbines, condensation heating and piping, gas turbo-units, turbo-alternators, hydro-alternators, induction motors and diesel generators.

The estimated demand for steam turbo-sets (inoluding alternators) and hydro-alternators is given in this study for all RCD countries, the estimated demand for large electro motors and diesel generators is given only for Iran (as at the time of the preparation of this study no interest was shown for a considerable use of the diesel generators in Pakistan and Turkey).

Estimated Demand of Steam Turbo Sets, Hydro-Alternators, Large Electrical Motors and Diesel-Generators

		1972	1973	1974	1975	1976	1977	1978
Steam Turbo sets (RCD	MW	1080	280	640	820	1005	1020	1200
Hydro-Alternators (RCD	MW	280	1011	307	827	827	930	930
Large Electrical Motors (Iran)	MW	85	32	72	90	105	115	135
Diesel Generators (Iran)	MW	-	10	13	33	33	30	30
TOTAL	MW	1445	1333	1032	1770	1960	2095	2295

The production of rotating and other electrical equipment cannot be economically organised for one country in the RCD. This kind of production usually requires a larger market. From this point of view, the production of rotating electrical machinery should be considered as a RCD project. None of the RCD countries has a large demand for setting up a minimum economic capacity. Thus, as far as market is concerned we can conclude that the RCD Region as a whole could be a good market for establishing a production unit for rotating electrical equipment and other necessary equipment for generating electricity.

As for the supply of the main raw material such as steel, casting, copper, aluminium, etc., we conclude that there is, or will be, scope for this kind of production in the RCD Region in the future. The most serious problem in setting up this kind of production in the RCD Region is to provide the know-how, the technical, economic and managerial aspects of establishing an efficient and competitive production of turbines, generators, large motors or transformers. There are several world firms with experience in setting up this kind of production in developing countries. We believe that only with close co-operation with one of the world firms in a special arrangement or a joint venture, can the production of rotating and other electrical equipment be technically and economically feasible in this Region.

Such production requires a large investment. We estimate that setting up the production of hydro and steam turbines for a total of 12 turbines yearly, with complimentary equipment will require an investment of 25 million dollars (without a foundry).

Establishing production of hydro-electrical and steam generators with a capacity of 10 - 12 generators and some large electrical motor and necessary equipment will require an investment of 25 to 30 million dollars. The total output of such a factory could be 15 - 20 million. Details about the investment and the cost could be worked out after a more thorough study and an agreement with foreign firms. Taking into account an existing capacity in some other countries which are already successfully operating, we conclude that from the economical point of view, such capacity would be suitable and profitable to the RCD countries, particularly in saving foreign exchange.

The UNIDO experts subscribed to the above idea and pointed out the necessity of preparing a feasibility report on the production of heavy electrical equipment and co-operation of the RCD countries. This study should be finalized as soon as possible. UNIDO could, if necessary, supply the RCD with technical assistance in preparing this feasibility report. However, we should like to stress that, for the sake of a better elaboration of the feasibility report, the RCD countries should clarify some critical questions regarding their standpoint on the establishment of, and the co-operation in such production. A further analysis, some conclusions and recommendations regarding rotating electrical equipment are included in the joint conclusions for heavy electrical equipment at the end of this Chapter.

6.6. Oil Drilling and Extraction Equipment

The Regional Planning Council, at its 6th Session held in Ankara in January 1967, while reviewing the progress of the studies which were undertaken on a regional basis by member countries, noted that Iran should circulate a study on oil drilling, extracting and refining equipment by the end of April 1967, if Pakistan and Turkey send in the filled questionnaires by February 1967 (p. 2 of RPC 6th Session report). At the following RPC meeting it was recommended that Iran should circulate the studies at the next meeting.

At its 11th Session in December 1969, the RPC recalled the earlier decision of the Council and recommended that this should be considered when the UNIDO study on RCD Heavy Engineering Corporation was discussed.

Iran has not distributed the project report through the RCD Secretariat. According to information from reliable sources this report has not yet been prepared.

It was a difficult task for the UNIDO experts to obtain reliable data on the demand, import and production of oil drilling equipment in the RCD region. In the foreign trade statistics no particular equipment for oil drilling purposes appear and there is no factory specialized in the production of such equipment. From our point of view oil drilling equipment falls into two groups.

(a) specific equipment and tools used mainly for oil drilling purposes,
(b) other common equipment used in oil drilling, but also used in many other economic sectors.

Rigs, drilling tools such as bits, drilling pipes, casings, joint tools, etc., belong to the first group. Pumps, diesel engines, electric motors, air compressors and sometimes tanks and boilers, electrical equipment like wires, cables fittings, etc., belong to the second group.

After contacting research centres of the Ministry of Economy in Iran and the NIOC, we obtained some data which indicate a demand for specific and common equipment for oil drilling in Iran which is as follows.

Name of equipment	Specification	Measurement	Annual Demand 1970	1975	1980
Bits	4½" - 26"	Units/yr.	4300	5160	6000
Drilling pipes	2 7/8" - 8"	Miles	36	43	516
Casings	5" - 20"	Miles	165	200	240

For drilling purposes 40 - 50 special centrifugal pumps with 350 HP are required per year and 100 - 110 special diesel engines with 450 HP per year. The requirements for common equipment such as pipes, pumps, etc., are as follows.

Name of equipment	Unit of Measures	Annual Demand 1970	1975	1980
Pipes	metric ton	60,000	86,000	120,000
Slush pumps, average 400 HP	number	7	10	15
Centrifugal pumps	"	380	450	600
Diesel engines range from 5-1.200 HP	"	103	135	170
Electrical Motors	"	300	370	440

The requirements of such products for drilling purposes in Turkey and Pakistan would be about 20 per cent of the above figures.

It is clear that we should seperate in our study the equipment for oil drilling (specific equipment) from the common equipment used in other industries. It is well known that specific equipment of good quality for oil drilling is produced only by a few firms in the world. Oil drilling equipment is very specific with extremely high requirements as far as quality and other character stics are concerned. This is an indication that the setting up of this kind of production would be a serious and difficult undertaking. Finding real consumers for such equipment would be quite a problem as the oil drilling work and exploitation of oil in Iran, as everywhere else in the world, is done by foreign firms who prefer to use equipment produced by well-known firms. As they work all over the world, the exploitation groups bring their equipment with them. Thus, the specific type of import comes into the country with the firms engaged in oil drilling activities. The consumption of this equipment by Iranian, Turkish or Pakistani firms is negligable.

We are therefore facing a specific situation in respect to oil drilling equipment not only with regard to quality and technical requirements but also with regard to import, consumption and demand of this equipment in the RCD Region. It is very unlikely that oil exploitation firms would use domestically produced oil drilling equipment if it were available.

Thus, without going into a detailed analysis, we can logically conclude that for the time being there is no need for a more thorough study on setting up production of oil drilling equipment in the RCD Region. Neither would there be any technical or economic justification for setting up such production.

As for the mechanical and electrical equipment used in oil drilling, production and transportation, there are many firms within the RCD Region which produce or could produce many items of this equipment. Some data on the production of pumps, diesel engines, boilers, compressors and tanks, can be found under the appropriate headings of this report. The problem could be that of quality, price and range of capacity. So far, the oil drilling industry mainly imported these goods. The use of domestically produced pipes is a recent practice with these firms. We believe that there are many possibilities in the RCD Region for co-operational and supply arrangements between producers of such equipment and companies dealing in oil fields.

It may be assumed that oil firms, domestic or foreign, operating in the RCD Region would be prepared to buy some mechanical equipment such as pipes, valves, pumps, compressors, wires, diesel engines, electrical motors and equipment should these products be competitive in quality and price to the world market. We propose that the RCD should indicate where contacts could be made between producers and consumers in the field of oil for long-term programmes of co-operation in equipment. There should be measures in the State economic policy to support such an agreement and help carry out the co-operational arrangement. Large consumers of pipes, valves and pumps should support the development of such an industry in the RCD Region.

On the basis of this short analysis, we conclude that for the time being there is no real need to establish a new production of specific oil drilling equipment. On the other hand there is great scope for the extention of the domestic production and co-operation in common equipment used in the oil industry between producers of this equipment and oil firms.

Refining Equipment

The production of refining equipment, from the point of view of mechanical engineering technology, is the same as the production of other chemical equipment (technological steel structures, plate work, light and heavy plate work combined with tubes, plate work with mechanisms, etc.), it could therefore be solved in one plant for production of heavy chemical equipment.

It is recommended that the equipment for chemical and food industries, up to a plate thickness of 40 mm, could be produced in each RCD country. (There are plants in Turkey, Pakistan and Iran already equipped with technological machinery with these parameters). Heavy technological steel structures, medium and heavy plate work, medium and heavy plate work combined with tubes or with mechanisms should be built in a RCD joint venture plant.

6.7. Boilers, Pressure Vessels and Steam Heating Appliances

A. Background Information

The 6th Session of the Regional Planning Council, held in Ankara in January 1967, while establishing a time schedule for the regional study, recommended that Turkey should circulate the study on boilers, pressure vessels and steam heating appliances by the end of April 1967. At the following RPC meeting the time schedule for the preparation of the RCD report was extended. At the 10th Session of the RPC it was noted that Turkey had circulated the study recently.

The RCD study on boilers, pressure vessels and steam heating appliances was prepared by Cevdet Kossman Consultant in 1969. This study contains data on boilers for industry, the existing capacity in the RCD countries and for the current and future demand. There are no data on investments, prices, costs or profitability of production. The study is a work of 112 pages.

B. General Description of the Project

In the introduction of this study it is mentioned that its purpose is the investigation of capacity for all the three countries, estimation of the demand up to 1978 and indication of co-operation possibilities among the three RCD countries. The study includes:

(a) the production of boilers for heating,
(b) industrial boilers,
(c) radiators;
(d) heat exchangers,
(e) pressure vessels.

While looking for data, the consultants stressed that the information on the above goods should be included in the metal sector and machine production as they formed an integral part of the overall statistics of these sectors. The consultants contacted some producers and public institutions directly. In Turkey about 40 firms were contacted, 6 in Iran and 8 in Pakistan. The report contains data on the boiler industry, radiators, heat exchangers and pressure vessels of each country. There are 27 firms in Turkey manufacturing various types of boilers (cast iron boilers, water tube boilers and only a few radiation boilers). Some of these firms have a licensing agreement with foreign firms. The used capacity of these firms averages about 50 per cent. The main companies producing boilers in Turkey are.

Turk Dokum Fabrikalari A.S. employing 2,000 workers and 25 engineers; Serki Isitma, employing 10 engineers, Ideal Standard (Surgurlar) with 18 engineers; Fenni Gama, etc. In Iran the main companies are. Sigma Company, General Industrial Company, Machine Building Plant, Arak (as future producers of boilers), Cyrus Arjomand Bros., Tahacosh Company. In Pakistan. Herman Murhatta Kohinoor Engineering Company, F.V. Fabrication, Lahore, Heavy Mechanical Complex, Taxilla, etc.

Many of the firms producing boilers are well equipped, some of these with X-ray welding control. Although this industry is developed in the RCD Region, a great number of components and material is imported such as drums, burners, safety valves, control equipment, etc. In the report data can be found on the present capacity and future demand.

1. Boilers for Heating

The following data were collected for each country.

(Unit, m^2/year)

	Turkey		Iran		Pakistan	
Year	Production Capacity	Demand	Production Capacity	Demand	Production Capacity	Demand
1969	93,000	104,974	5,000	11,043	nil	2,700

Future demand is estimated on the basis of the trend of consumption in previous years, on import data, data for area of heating, etc. The forecast for the demand in 1978 is as follows. (m^2/year). Turkey - 456,980; Iran - 94,912; Pakistan - 13,500 (in 1980).

This represents an increase of about 12 per cent in Turkey, 20 per cent in Iran and about 15 per cent in Pakistan. If we take into consideration the rapid increase in central heating construction, the increase in the demand for heating boilers may be very high.

2. Industrial boilers up to recent times were produced in Turkey and to a limited extent in Pakistan. However, the new capacities in Arak, Iran and in Taxilla, Pakistan, will produce industrial boilers as well.

The future demand for industrial boilers in Turkey is calculated in value terms and is estimated at 38,941,000 Turkish Lira in 1978. The future demand for industrial boilers in Iran is estimated for 1978 to be about 5,000 m^2 per year and 4,500 m^2 in Pakistan. Statistical data on the importation of boilers for 1968 indicate a larger import in Iran and Pakistan compared with the figures mentioned under demand in the report.

3. Radiators: the largest market for radiators exists in Iran and Turkey. The installed capacity and the real demand in the three RCD countries were the following in 1969.

(Unit m^2/year)

Turkey (1969)		Iran (1970)		Pakistan (1970)	
Capacity	Demand	Capacity	Demand	Capacity	Demand
2,160,000	2,040,000	250,000	280,483	nil	46,956

The demand for radiators in 1978 in the RCD countries is foreseen as follows:

Country	Unit of measurement m^2
Turkey	8,900,000
Iran	1,898,236
Pakistan	234,783

The increase in the consumption of radiators in Turkey is foreseen to be between 15 - 18 per cent and in Iran about 20 per cent.

4. The production of heat exchangers is greatly developed in Turkey and to a lesser extent in Iran and Pakistan. In the project report the following figures are given for heat exchangers in the RCD countries:

Turkey (ton/year)		Iran (ton/year)		Pakistan (ton/year)	
Capacity	Demand	Capacity	Demand	Capacity	Demand
1,700	1,550	600 (1970)	1,700	600 (1970)	2,850
		1,140 (1973)		2,900 (1972)	

The Iranian heat exchanger industry in Arak will produce heat exchangers for the sugar and food industries as well as for the chemical industry. The other capacity for heat exchangers in Ahwaz, (Stork Workshop Factory) stopped its production and closed down. The future demand for heat exchangers will be about 3,000 tons in Turkey to 1978 (capacity should reach 5,000), 2,000 tons by 1978 in Iran and about 2,850 tons in Pakistan yearly.

5. Pressure vessels are produced in all the RCD countries and the present capacity and demand are as follows.

(Tons per year)

Turkey		Iran		Pakistan	
Installed Capacity	Demand	Installed Capacity	Demand	Installed Capacity	Demand
7,540 (1969)	3,570	5,000	5,700	5,150	5,440

The future demand of pressure vessels as it appears in the study ie as follows.

Turkey	-	8,980 in 1978
Iran	-	5,070 in 1978
Pakistan	-	5,440 in 1978

The consultant estimated that the future demand in Iran and Pakistan would not increase in the next eight years, which does not seem possible. In our estimation the demand will be from 15,000 tons to 20,000 in both countries together. Pressure vessels with low pressure (up to 3 atmospheres) are used mainly for storage tanks (water, oil, gasoline and other liquids) and could be produced in any shop which manufactures boilers. Very often it is a secondary product.

In addition to the above data on the study of boilers, pressure vessels and steam heating appliances, we find some observations and conclusions of the Cevdet Kosman consultant on the capacity and on how to meet the demand in the RCD Region for all types of the analysed products. Regarding boilers for heating and industrial boilers, the conclusion is that Turkey will be self-sufficient up to 1978 at least, that Iran should continue importing boilers and that Pakistan may do the same. Regarding radiators, the study concludes that Turkey has enough capacity and that Iran and Pakistan will have a small import of radiators. As for heat exchangers, Turkey and Iran will be self-sufficient while Pakistan may continue to import a small quantity. All RCD countries are self-sufficient as far as pressure vessels are concerned.

Some Remarks and Conclusions

This study is mainly a market analysis for boilers, pressure vessels and steam heating appliances. Although the efforts of the consultant are to bring as far as feasible complete data regarding the capacity, consumption, import and future demand, he did not quite succeed in his efforts. The main reason is the lack of statistical data and the fact that much of this production is secondary for some factories which may produce various types depending on the order and on market demand.

Foreign firms import a number of these products together with machinery and equipment for related production units in the processing industry.

We should also like to point out that for some data regarding capacity and demand, the forecast for a period of five to ten years is the same. This cannot be approved as it indicates a static market. Neither is there any certainty that all the demand is included in the figures. In a few places it is mentioned that demand for the sugar industry is not included in the figures. We believe that the future demand will be slightly higher than stated in the report for some of the products mentioned.

Looking at production from the RCD point of view, we conclude that with a few exceptions regarding high pressure vessels and large boilers, the other products are mostly local or national market products. This means that production and marketing could be successfully organised on a national market basis. The investment needed for such a production or the expansion of existing capacity is not much. The supply of material depends mainly on the domestic market with the necessary inputs either imported or locally produced. This may be the main reason, in addition to existing capacity, for which the consultant recommends that there is no necessity for a joint investment for the three countries in this field of production.

We are in agreement with this recommendation but would like to give much more importance to the possibility of exchanging these goods on the basis of excess capacity and excess demand among the RCD countries. Moreover, we would like to emphasise the need for specialisation in the production of high-pressure vessels or boilers. It could be considered together with the production of large sized boilers discussed in project No. 11. For the sake of regional trade and specialisation, the cost and selling prices are important. Looking at the statistical data, we observe that there is still a large import of these products in the RCD countries.

For example, the import of boilers, economisers, superheaters and parts for these items in Iran was US$ 9 million in 1969, (official foreign trade statistics). On the other hand, the use of existing capacity is not high. This indicates that the imported goods are cheaper and of better quality. The UNIDO experts are not in a position to check the cost of these products in existing plants but in proposing trade arrangements and co-operation in this field among the RCD countries we would like to stress that this could take place only if one of the selling countries export the goods at the world market price and standard. We believe that some firms in Turkey and a new capacity in Arak and Taxilla can fulfill this condition.

6 8. Pumps and Compressors

A. Background Information

At its sixth Session held in Ankara in January 1967, the Regional Planning Council, while discussing the deadline for the preparation of the regional study, concluded that Turkey would circulate the study on Pumps and Compressors by the end of April 1967.

In the following meeting the Regional Planning Council extended the deadline for the circulation of the report to the next meeting.

At its eleventh Session in December 1969 the RPC noted that Turkey had prepared the project report but recommended that submission of the report for consideration should be deferred until completion of the UNIDO study.

Turkey has not sent the project report to the RCD Secretariat in spite of being urged to distribute the report, and thus the report was not available to the UNIDO Experts.

In Turkey there are a few pump producing firms and in the last two years, two firms have made licensing agreements with firms from USA and West Germany. Pumps are produced in Ankara, Izmir and Istanbul. On the basis of information received from officials concerned, Turkey is self-sufficient in pumps. However, looking at the production programme and the imports of pumps in Turkey, we do not believe that it is self-sufficient in all types of pumps.

Turkey produces compressors by Atlas and Copco. The other firm producing compressors in Turkey is the Makna firm, Lupamat Compressors in Izmir. We learned from our contacts with the representatives of the Atlas Copco firm that they intend to produce large size compressors within 2-3 years.

The Turkish public enterprises, particularly the engineering section of sugar mills, are producing pumps for the food industry. In the import statistics for 1969 we find that Turkish importation of various pumps was about $ 4 million and the import of compressors was about $ 3 million (source: Turkish Monthly Foreign Trade Statistics p. 60).

In Iran there are presently many small shops producing hand-operated water pumps. The total quantity of hand pumps produced in Iran in the last year is not

known, but it is estimated that it is in the range of 5,000 pcs/year. Some hand pumps are also being imported.

Motor water pumps used in Iran are mostly one or multi-stage centrifuge pumps. They are used not only for agricultural irrigation but also in factories, homes, etc. There are no data given on the total number of water pumps used in factories and homes, only the number of pumps for agricultural irrigation is known. According to the "Water Requirements for Agricultural Irrigation in Iran" by Stanford Research Institute the number of wells for agricultural irrigation in 1969/70 was: River pumps - 1,580 pcs., Shallow wells - 6,050 pcs. and semi-deep wells - 25,760 pcs. In 1968/69 the production of motor pumps in Iran was 6,393 pcs. and in 1969/70, 5,751 pcs.

In 1971 the metallurgical and engineering plant in Tabriz will start the production of centrifugal water pumps, suction dia. 2" up to 10"; the total capacity will be 10,000 pcs/year. With the existing capacity in shops already producing centrifuge pumps, the production in Iran will cover the needs up to approximately 1976/77. After this year either the metallurgical and engineering plant in Tabriz will be enlarged, or there will be new capacities in existing workshops.

Deep-well pumps are very often used in Iran for irrigation purposes, in factories as well as in homes. The production reached 4,000 deep-wells in 1968 in Iran.

Forecast for Deep Wells for Agricultural Irrigation*

	1,346 (1967/68)	1,351 (1972/73)	1,356 (1977/78)	1,361 (1982/83)
Deep Wells pcs.	7,030	11,590	14,790	18,880

* According to "Water Requirements for Agricultural Irrigation in Iran 1967-1982 by Stanford Research Institute.

So far there is no production of compressors in Iran. Metallurgical and engineering plants in Tabriz will start production in 1972 of the smallest mobile and stationary air compressors (up to approx. 10 cu.m/hour), capacity: 1,000 pcs./yr. A plant in Ghazvin is also under construction for the production of small compressors for refrigerators in co-operation with Westinghouse.

Import of Pumps and Compressors in Iran

Tariff No.	Types of Pumps		Year 1968/69	1969/70
827 A1	Petrol pumps and other	tons	244	459
		000$	1.070	1.170
827 A2	Parts of petrol pumps and other liquid pumps	tons	413	579
		000$	1.800	2.500
827 B1-1	Fire fighting, non-self-propelled pumps	tons	110	163
		000$	172	140
827 B1-2	Parts of non-propelled fire fighting pumps	tons	54	78
		000$	123	200
827 B2-1	Deep well pumps	tons	1.960	850
		000$	2.350	840
827 B2-2	Motor pumps (deep well pumps excluded) with a suction pipe dia. above 3", pumps motor 3/5 HP and above	tons	3.116	1.108
		000$	4.720	2.050
827 B2-3	Parts of deep well pumps and motor pumps, suction pipe dia. over 3"	tons	2.511	1.157
		000$	2.570	1.400
827 B3-1	Hand pumps	tons	104	51
		000$	100	46
827 B3-2	Pumps for liquids not listed elsewhere	tons	576	411
		000$	1.560	1.340
827 B3-3	Parts of hand pumps not listed elsewhere	tons	70	25
		000$	280	80
827 B-9	All types of Compressors and parts for them	tons		
		000$	14.000	14.600

Source : Iran Statistics for Foreign Trade.

The production of pumps in Pakistan started long ago. There are about 50 firms producing various types of pumps, mainly hand pumps. The production of centrifuge and deep-well pumps was 11.000 in 1967. Import of pumps is still high, although the domestic capacity is not fully used. During 1970 the import of pumps was about $ 4 million and import for parts for pumps was about $ 3 million. The production of compressors, except small air compressors, is not as developed as the production of pumps. The total import of compressors in 1970 was about $ 5 million. (Source : Foreign Trade Statistics of Pakistan). The import of pumps and comprssors before 1970 was almost the same.

From this short survey of production and import figures we can conclude that the market for pumps and compressors is very large in all the RCD countries. Although some domestic capacity exists and is being expanded, the import of pumps remains very large, mainly because domestic production cannot meet the demand. It is also due partly to the shortage of raw material and credit facilities for buying such products abroad.

The production of pumps from the technical and economic point of view is not complicated. With a few exceptions, it is necessary to have capacity or facilities for some common equipment like lathes, drilling, boring and milling machines, grinding machines, etc.

On the basis of data from industrial profiles for manufacturing establishments from France, Japan, Israel and Yugoslavia, we can see that the total capacity of independant establishments for the production of pumps ranges between 2.000 and 12.000 pieces of various pumps. The total value of production depends on the type of pumps. The minimum economic scale is about 2.000-3.000 tons yearly production. In a factory in Japan, with a capacity of 12.000 pumps, most of the production consists of pumps between 2 and 50 HP. The total investment in the mentioned capacity of pumps is about $5 million and the total output ranges from $6-8 million. The average employment in this factory is about 500 people.

Usually, the input requirements are met domestically with importation of components of less than 10%. Some of these factories have iron or steel casting facilities, others buy these parts from other firms in the country. We also noticed that sub-contracting is largely practiced in all countries in the production of pumps. In the above mentioned countries there are small capacities in the production of pumps employing up to 50 persons. Some factories are specialized in the production of pumps only like those in Japan and some of them also produce compressors (in

France, for example). The selected economic coefficient indicates adequate profitability of the above mentioned factories in the said countries. Thus, in Japan, the gross profit to gross production ratio is 16%. In France during full capacity it is 15.6%. In Israel it is about 28% and in Yugoslavia it is 14.2%.

On the basis of the above data and other technical information we can conclude that from the technical point of view and more particularly from the economic and social points of view, the establishment of production of pumps and compressors can be profitable in the RCD region and can be suitable for RCD joint action. We should like to propose that the project on pumps for the chemical industry be considered together with this project (see project No. 10). On the basis of this approach we should like to propose the following:

(a) It is recommended that all the RCD countries produce small hand operated water pumps, small and medium size motor driven centrifuge water pumps up to a diameter of suction tubing of approx. 10" (250 mm), deep well pumps including submersible pumps, small diaphragm pumps, small piston pumps and small pumps for the chemical and food industries.

Other types of pumps could be produced on the basis of joint purpose enterprises for the RCD region.

(b) An RCD joint plant should be designed for the following production programme:

1. Large size motor driven centrifugal water pumps of a dia. of suction tubing 10" (250 mm) for low, medium and high pressure.
2. Centrifuge feeding pumps for medium and high pressure boilers.
3. Diagonal propeller pumps for water.
4. Horizontal and vertical centrifuge pumps for transportation of chemicals, medium and large size.
5. Centrifuge pumps for the food industry, medium and large size, for use in sugar factories, dairy plants, breweries, etc.
6. Slurry pumps of medium and large size.
7. Medium and large size piston and diaphragm pumps.

(c) Production of axial propeller pumps and reversible axial propeller pumps (pump-turbins) should be excluded from this project and should be included in the project for the production of water turbines.

(d) There is a wide range of different types of compressors from the smallest air-compressor and compressors for refrigerators up to the largest turbo-compressors for transportation of natural gas or other gases. It is recommended that all RCD countries should produce small and medium size air-compressors up to approx. 250 cu.m/hour, for low and medium pressure, stationary or mobile design and small compressors for refrigerators.

(e) Other compressors could be included in the production programme of the RCD joint plant for pumps and compressors. This programme could include the production of:

1. Large size air-compressors (above 250 cu.m/hour) for low and medium pressure, stationary or mobile design.
2. All sizes of air-compressors with higher pressures.
3. Piston compressors for transportation of chemicals incl. balanced-opposed compressors.
4. Compressors for big cooling and refrigerating units.
5. Compressors for large air-conditioning equipment (complete units).
6. Screw compressors.

It is possible to adjust the production of pumps and compressors in accordance with the demand of the RCD market.

The production of turbo compressors should be included in the project for the production of steam turbines. From the point of view of input and technical know-how, skilled workers and even investment, the RCD countries are suited for developing this kind of production. The establishmen of a modern and well equipped production unit in the RCD area will bring many opportunities for sub-contracting and co-operational arrangements within each country, and within the RCD area as a whole. The wide range of types of pumps gives an opportunity for specialisation and co-operational arrangements which could be reached only if national companies are well established and profitable. The present problem of large import in such countries can significantly be solved through further increase of domestic production by specialisation within the RCD, and through an increase of efficiency and competitiveness on the market. Moreover, there is a great possibility for trade arrangement on the basis of excess demand for some kinds of pumps and compressors in the RCD area.

6.9. Special Valves

A. Background information

The Regional Planning Council, at its eighth Session held in Teheran in April 1968, noted a proposal for the manufacture of special valves as a joint purpose enterprise to be located in Iran. At its ninth Session in December 1968, while making a review of the progress of the studies relating to the joint purpose enterprise, the RPC recommended that Iran should circulate the study in early 1969. At each of the subsequent meetings of the RPC the decision for the submission of the report was put off to the next RPC meeting.

Iran has not yet finalised the report and the UNIDO Team did not receive any paper or project report on valves.

On examining the market situation in the RCD region we found that there is no industrial production of valves in any of the RCD countries although some shops are producing a limited number of valves mainly on a specific order basis. These shops lack the potential to produce a larger number of good quality valves and we found that there is a large import of valves, particularly in Iran. This import, in the past two years was about 8-9.000 tons for a total value of $ 16 to 20 million. The production of industrial valves does not require any complicated technology but it requires special quality material and a high standard of work. There are over 3.000 various types of valves used in the oil and gas industry, the chemical and petro-chemical industry, thermo-power plants, sugar factories and other food industry, all irrigation projects, water supply projects, etc.

In view of the wide utilisation of the various types of valves in the different sectors of industry and in view of the future development plan of Iran and the other RCD countries the annual demand in Iran, during the next few years, will be about 10.000 tons and 5.000 tons in the other RCD countries. An annual demand of 15.000 tons of industrial valves indicates that there is a need for establishing a production unit of industrial valves in the RCD region. From this point of view, the recommendation of the RPC for setting up a joint purpose enterprise or any kind of co-operation between the RCD countries can be approved. In the absence of any technical and economic documents regarding industrial valves the UNIDO Experts have

to explain what the possibilities are for establishing such production and the real prospects for such an undertaking. As far as market is concerned there is no doubt that a large market exists mainly in Iran. As for the input we believe that there will be no problem, particularly in Iran or Turkey, with the supply of steel (carbon and low-alloy steel). The building required is a normal industrial hall. The machines necessary for production depend mainly on the type of valves to be produced but usually the following machinery in the production of valves and fittings is in use: universal lathes (including large ones), grinding machines, thread cutting machines, horizontal, vertical and radial drills, universal milling machines, welding equipment, lap machines, testing equipment and facilities, and some equipment for auxiliary shops.

The production of valves also requires a very good foundary and a supply of casting. Some of the valve factories have their own foundary and some are using the services of other factories in the vicinity of their factory. As mentioned before, there is a wide assortment of valves and the production of these goods in the RCD countries cannot cover the whole assortment. In the beginning, only those types and assortments should be chosen which are in large demand in the RCD region and for which there are suitable technical conditions. More market surveys are necessary to determine the real assortment. It is advisable to start with a serial production of a limited type of valves with a few hundred assortments (and some capacity for special orders) rather than with many types on non-serial production. A special agreement should be reached with the main consumers in the RCD region, especially with the oil and gas industries.

It is recommended that all RCD countries should produce small non-ferrous metal valves with the exception of special valves for the chemical industry, small and medium size valves for water and gas mains, low and medium pressure valves up to the size of 200 mm (8") (cast iron body).

The RCD joint venture should be designed to include the following production programme:

1. Slide valves, gate valves, swing check valves, regulating gate valves with electric power cylinder, etc., maximum working pressure of 10 kg/cm^2, inner diameter 200 to 1.200 mm for non-agressive water and for other non-agressive liquides and gases, etc.; suitable for mains, for plants such as sugar factories, for cooling system in thermal power stations, etc.

2. Slide valves, gate valves, swing check valves, regulating gate valves with electric power cylinder, etc., maximum working pressure of approx. 80 kg/cm^2, inner diameter 100 to 1.100 mm for crude oil and natural gas; suitable for crude oil pipelines, natural gas pipelines.

3. Slide valves, gate valves, swing check valves, governor valves, safety valves, globe valves, controlled by hand or by electric power cylinders, etc., made of grey iron castings, steel castings and stainless steel castings, working pressure 6-10 kg/cm^2, inner diameter 25 to 300 mm; for hot water, steam, chemical liquids, gases, etc.

4. Slide valves, gate valves, swing check valves, governor valves, safety valves controlled by hand or by electric power cylinder made of steel castings and stainless steel castings, working pressure 16-40 kg/cm^2, maximum inner diameter 400 mm; for steam, chemical liquids and gases, for crude oil products, etc.

5. Slide valves, gate valves, globe valves, governor valves, safety valves, plug valves controlled by hand or by electric power cylinder, working pressure 40 to 250 kg/cm^2, inner diameter up to 250 mm; suitable for steam in power plants, for chemical liquids and gases, for crude oil products, etc.

Capacity of the Plant

According to import statistics, Iran's import of all kinds of valves from 1966/67 until 1969/70 was as follows:

Year	Weight	Value
1966/67	4.887.957 kg	9.0 mill.
1967/68	5.165.930 kg	11.0 mill.
1968/69	8.776.198 kg	16.0 mill.
1969/70	8.871.717 kg	20.0 mill.

The current production is limited to non-ferrous metal taps only.

It is expected that the total need of special valves in the range of parameters given for the above production programme of new plants will be approx. 10.000 up to 12.000 tons/year in 1975. In the case of the 50% coverage of the different types and sizes from the point of view of weight, the capacity of the new plant could be from 5.000 up to 6.000 tons/year in the first stage and approx. 9.000 upt to 10.000 tons/year in the second stage.

The plant to be built should have its own foundry for grey iron castings, maximum weight of casted piece 2.000 kg, a foundry for stainless steel and stainless steel castings, maximum weight of casted piece 2.000 kg and non-ferrous metal foundry, maximum weight of casted piece 100 kg. Forgings and pressings (approx. 150 tons/year) could be purchased outside the factory.

Parameters of New Plant

Main shops:

- Central Store of Raw Materials and Sub-deliveries
- Preparation Shop for Material
- Mechanical Shop for Heavy and Medium-Heavy Valves
- Mechanical Shop for Small Valves
- Mechanical Shop for Small Components and Parts
- Intermediate Store
- Mounting Shop of Heavy and Medium-Heavy Valves
- Mounting Shop of Small Valves
- Cold Pressure Testing Shop
- Hot Pressure Testing Shop
- Hardening Shop
- Store and Finished Products and Dispatch Room

Metallurgical Shops:

- Foundry - grey iron castings, capacity approx. 5.000 tons/year
- Foundry - non-ferrous castings, capacity approx. 400 tons/year

The capacity of the foundry is already given for the second stage of production. Free capacity in the first stage will be utilized for commercial castings.

Auxiliary Departments:

- Tool Room
- Tool Issue and Sharpening Shop
- Joiners Shop
- Maintenance and Repair Shop
- Electrical Shop
- Laboratories
- Store and Treatment of Scrap
- Transport Department

Personnel:

Without foundries:

- Workers	800
- Technicians	90
- Administrative clerks	60
	950

Land:

Total area of building site with reserve for the expansion 150.000 sq.m.

Buildings:

Without foundries:

- Main Hall	15.000 sq.m.
- Other buildings	8.000 sq.m.
- Sheds	4.000 sq.m.

Fixed Capital Investment (without foundries):	US$
- Advance expenditures (geological survey of the site collecting of date for DPR, detailed Project Report)	400.000
- Land and land improvements	120.000
- Buildings	2.450.000
- Fencing, roads, electrical and water mains inside the fenced area	110.000
- Machinery and equipment incl. tools and spare parts	6.600.000
- Erection Works	520.000
Physical cost in total :	10.200.000
- Consulting, engineering services, training cost	1.000.000
- Interest during construction, contingency for unforeseen cost	900.000
Total fixed capital investment	12.100.000

The total output of such a factory based on a 6.000-ton production of valves will be about $12 million. We calculate that the total cost will be about $ 1 million yearly, then the total profit will be over $ 3 million. The rate of profit (ratio between net income and investment) will be about 25% and the return of capital about four years.

The above rough estimates suggest that this project can be very profitable and could bring great benefit to the RCD region, particularly through the savings of foreign exchange. As Iran is the largest consumer of valves and as other requirements for setting up such production can be met in Iran, it is an indication that this factory should be located in Iran.

The locational problem is dealt with in the first part of this report.

As far as RCD co-operation is concerned we believe that this project could be a joint purpose enterprise with a special agreement on purchase guarantee and supply of this product on the RCD market. If the RCD countries agree to take a joint action for some market facilities in order to sell the product within the region, then it should not be difficult to obtain foreign technical assistance, the know-how and financial participation in setting up the production of industrial valves.

6.10. Pumps for the Chemical Industry

A. Background Information

The Regional Planning Council at its 8th Session held in Teheran, in April 1968 noted that Pakistan had sanctioned a project for the manufacture of chemical pumps. The RPC recommended that a study be made by Pakistan on the manufacture of chemical pumps as a RCD joint purpose enterprise.

At the 9th Session in December 1968, while making a review of the progress of the preparation of the study relating to the joint purpose enterprise, the RPC recommended that Pakistan circulate the study in early 1969. At the following meeting a decision was passed to extend the deadline for the circulation of the study to the next RPC meeting.

So far Pakistan has not distributed the project report and the UNIDO experts had no available technical and economic documents regarding this project, to enable a rough assessment the UNIDO experts used some data regarding the existing industry in the RCD countries in the production of pumps, a study prepared by Pakistani chemical consultants on the development of the chemical industry in the RCD, and the available statistics and data from the National Planning Organization of the RCD countries.

The chemical industry requires, in addition to the specific equipment of machinery, various other machinery which is used in other industrial branches, such as pumps, valves, compressors, boilers, heat exchangers, filters and centrifuges, etc. Consequently pumps are only to be used in the chemical industry to some specific requirements in material (corrosion). Most of the pumps produced are used in other economic branches. In view of the above, we may ask ourselves why the production of pumps for the chemical industry is a separate project among the twelve projects.

On the basis of technical data published in England, in large project of chemical industries in the U.K., the average share of investment in the chemical industry is as follows:

Heat exchangers	6.5%
Pumps	2.0%
Piping, valves and fittings	8.2%
Air and gas compressors	5.0%
Filters and centrifuges	0.5%

The conclusion based on the above data is that the study of pumps for the chemical industry should be included in a joint project for pumps and compressors and be considered jointly as is the case with boilers and valves.

In addition to the above explanation, we find difficulties in identifying the production of pumps, particularly for the chemical industry because there are no factories for the production of pumps for this industry. The import statistics of the RCD countries as well as the customs statistics do not specify the import of pumps for the chemical industry. Thus, it is impossible to use the practiced method for evaluating the present consumption, import and future demand for pumps for the chemical industry. The chemical consultants of Pakistan, in the aforementioned study prepared at the beginning of 1967, had made a pump estimate based on the total future investment in the chemical industry and on the share of the expenditure and of future demand. This method could be approved if the investment programme set up in the development plan were to be carried out and details on the structure of the chemical industry known. However, since this project is included in the twelve projects, we should like to make some comments and offer some explanations which should be considered as additional comments to projects No. 8 (Pumps and Compressors) regarding the specific requirements of the chemical industry.

Centrifugal pumps are used in chemical industries and their advantages are: simplicity, low cost and adaptability to various uses. Centrifugal pumps for the chemical industry require special corrosion resistant materials or other technical requirements for some specific liquids. In certain cases it is cast iron but very often it is stenoil steel, and in the last period particularly, alloyed steel containing chromium, nickel, molybedum. Rotary pumps are used for viscous liquids.

As in many other goods, there are various types and assortments of pumps and one factory usually does not produce all of them. Having reviewed the total demand of pumps used in the chemical industry, we are not able to find any adequate data.

By using the chemical consultants' method and data on the development of the chemical industry in the RCD Region, we could conclude that the total pump requirement for the chemical industry in the RCD Region will be $6 to $7 million per annum for the period 1972 - 1977. The estimate of the chemical consultants for 1967 is $4.4 million per annum, and our study brings us to the conclusion that this is an under estimation, particularly for Iran. On the basis of this demand, we conclude that the demand should be larger if a factory is to set up production of pumps only for the chemical industry. However, we should stress that about 65 per cent of the above demand could be met by factories producing pumps for common uses, that is, without the special technical requirements for the chemical industry. Consequently, only about 35 per cent of the demand is closely linked to specific pumps for the chemical industry with specific technical requirements. On the basis of our estimation, the total demand for specific pumps for the chemical industry is assumed to be about $2.3 million yearly for the period 1972 - 1977.

By using the usual parameters and the average price of pumps, an amount of $1.70 per kg. of imported pumps into Iran in 1968 and 1969, we can conclude that the demand for specific pumps for the chemical industry will be about 1.5 tons per year. If we add to this number the chemical pumps used outside the chemical industry, the total demand of pumps for the chemical industry will be about 1,6 to 1.8 tons per year in the future. As we have pointed out earlier, it is impossible to produce all types of pumps in one factory. The maximum demand regarding the type which can be met by one factory is estimated by us at one third or one half of the total demand. Thus the capacity of the factory only producing pumps for the chemical industry could be below 1,000 tons and the minimum economical capacity is 2,000 to 3,000 tons yearly. With these figures and the estimation of the future demand we could discuss the capacity and establishment of the factory for pumps for the chemical industry in the RCD Region. As far as the know-how and the technical sides are concerned, contact has already been made with a foreign firm concerning the production of pumps. The main machine requirements are not large or expensive. A pump factory normally requires lathes, radial drills and milling machines, hydraulic presses, welding and cutting equipment, testing equipment, etc., as well as foundry facilities. We estimate that the total investment for a factory which could produce about 2,000 tons of pumps per year for use by the chemical industry, including working capital, could be up to $1.5 million.

However, we prefer to suggest some other approach to solve the problem of supply of pumps to the chemical industry As we have explained in project No. 8 (Pumps and Compressors), in all the RCD countries, many factories are producing pumps. Some factories are in the process of expanding their activities and other have been newly established. Pakistan has long experience in the production of pumps. We believe that in this situation there is a possibility for RCD co-operation in the production of pumps for the chemical industry. We should also like to suggest a further study to identify suitable firms producing pumps which could increase their capacity to meet the demand of the chemical sector, with an additional investment if necessary. Further steps should be in the specialisation of the production of pumps which could contribute not only towards meeting the demand but to cutting down imports and saving foreign exchange. It would also increase the efficiency and competitiveness of firms producing pumps. The trade arrangement with special facilities which could be given through the export/import regulations could also contribute to co-operational arrangements among the many firms which already operate in the production of the various types of pumps. Consequently, we do not propose that a special factory for the production of pumps for the chemical industry be established in the RCD Region. We propose that the RCD joint project producing pumps and compressors include, in its production programme, the demand for pumps for the chemical industry.

6.11. Boilers (large size for grid power stations)

A. Background Information

The Regional Planning Council at its 9th Session held in January 1967 reccommended that a feasibility report for boilers (large size for grid) should be prepared by Turkey.

At its 7th Session held in August 1967 the RPC recommended that Turkey should circulate the report by the end of January 1968.

At the 10th Session held in June 1968 the RPC noted that Turkey had circulated the Study on Boilers, Pressure Vessels and Steam Heating Appliances which also covers the study on boilers for grid power stations.

The study on boilers makes up the last chapter in the RCD Study on Boilers, Pressure Vessels and Steam Heating Appliances. This report was prepared by Cevdet Kosemen Consultants in April 1969 and distributed by the Turkish Government. The part of this study concerning large size boilers consists of 16 pages with a short explanation on the demand for steam boilers, the production of boilers in the RCD and conclusions regarding high capacity boilers. In the explanation on demand in the RCD, the report states that the requirements of steam boilers will be as follows:

Turkey	Number	Total Capacity
1969-72	Two steam boilers	2 x 150 MW
1979	Four steam boilers	600 MW
Iran		
1969-72	Eight boilers	670 MW
1972-77	Nine boilers	450 MW
1977-87	Three boilers	300 MW
Pakistan		
1969-72	Nine boilers	635 MW
1973-78	Twelve boilers	1,335 MW

In the explanation on production in the RCD, it is stressed that the thermic power plant boilers in Turkey were manufactured by foreign firms. Only Fenni Gama, a Turkish factory, is qualified to produce boilers in co-operation with foreign firms,

Drums, tubing and piping, valves and fittings, water regulators, soot blowers, burners, economisers, control equipment, etc. should be imported. Some Turkish firms can produce boilers up to 115 tons per year on a foreign licence. In Iran and Pakistan there is no production of such goods and the total demand is met by imports.

In the conclusion regarding demand, the following demand is reported.

1969-75	Turkey[1/]	Iran[2/]	Pakistan[2/]
Power	825 MW	1,424 MW	1,225 MW
Steam ton/hr	2,685 MW	5,040 MW	3,150 MW

1/ All committed

2/ Construction necessary

The conclusions also state that.

> "If the sources for raw materials, qualified personnel and experience of the three countries are taken into consideration, it is impossible to meet the total demand in short-run by a joint investment. Today, establishments working with a foreign firm's licence, only exist in Turkey out of the three countries". (Source. The Study, pp 6.7 - 1).

In discussing the investment opportunities for setting up new production units and particularly from the point of view of foreign exchange, the consultants came to the conclusion that "this crude calculation shows that an investment to meet this demand will not be economical".

Referring to the content and subject of this small study, it could be considered as a pre-feasibility study as well Looking for other sources on the future demand for steam boilers for Turkey, we found that they indicate a larger capacity of steam resources for energy and consequently a larger number of steam boilers compared with those mentioned in the said study. For instance, Turkey will need two steam sets yearly (110-200 MW) from 1972 to 1978, Iran and Pakistan will also need approximately two sets yearly during the same period (RPC IX Annex 17). Our additional study confirms that the yearly requirement for Turkey in thermo power production for the present decade should be 300 MW of newly installed capacity, 400 MW in Iran and 180 MW in Pakistan yearly.

In the study on the manufacturing industry for hydraulic turbines of the Turkish consulting firm ENSA, we find data on the total electric energy production and share of hydro-electric and thermal electric production and we can see that the ratio of hydro-electric production to the total electric production will decrease from 76 per cent estimated for 1983 - 1983 to 48 per cent in 1987. Taking into account a high total increase in energy production in Turkey and some technical factors related to the sharing of hydro-electric and thermal resources of energy, we cannot accept the estimation of the consultants of the demand for large size boilers for Turkey.

As far as the production problem is concerned, we agree with the main conclusion that the establishment of production of high pressure steam boilers for electric power stations will not be economical. The main reasons for this are serious technical problems and the large investment needed for setting up the production of large heavy pressure steam boilers. Only a few firms all over the world are equipped to produce the largest unit (from 200 MW and over) of boilers. The problems of establishing a factory to produce equipment for thermic power stations should be divided into two groups. one is the production of large, high pressure boilers and the other is the production of many other types of equipment necessary for power stations. Co-operation in establishing power plants is practiced in many countries. Co-operation in the RCD countries for the establishment of such capacity is possible and adviseable. Some Turkish firms are also interested in it. Thus, although our answer to establishing production of boilers for power stations is negative, our answer to the question of establishing capacity for the production of some equipment and co-operating with foreign firms in building up a steam power station is in the affirmative. This problem should be connected to the larger problem of establishing the production of heavy electrical and other equipment for power generating units, that is, with the production of turbines and generators. We shall return to this project while analysing the next project on the manufacture of hydraulic turbines and coupling systems. In this connexion we shall include some recommendations regarding this project.

As a consequence of the main conclusion that such capacity should not be established in the RCD Region, this study does not contain data regarding investment costs or locational factors. It contains only an analysis regarding savings in foreign exchange.

6.12. Mechanical Equipment (Hydraulic Turbines and Coupling Systems)

A. Background Information

The Regional Planning Council, at its 6th Session in January 1967, recommended that a Feasibility Report on Mechanical Equipment (Hydraulic Turbines and Coupling Systems) should be prepared by Turkey.

At its 7th Session held in August 1967 the RPC recommended that Turkey should circulate the study by the end of January 1968.

The RPC, at the 13th Session held in Dacca in January 1971, noted that Turkey had recently circulated the study and that Iran and Pakistan should shortly submit their views.

The feasibility study on the manufacturing industry for hydraulic turbines and coupling systems in the RCD countries was prepared by the Turkish consultant firm from Ankara, TUSA (Energy, Industrial and Engineering Consultants) in 1970. This study is a good feasibility report which includes nearly all economic and technical elements which are usually required for a feasibility report. The report was distributed by the Turkish State Plan Organization through the RCD Secretariat in early 1971.

B. Description of the Report

In the beginning the report deals with the purpose and scope of the study.

The consultants carried out this study by collecting data and information through specially prepared questionnaires, by visiting the RCD countries and through an analysis of all available information.

In the following chapter we shall find the definition and classification of hydraulic turbines, which include some technical data and production characteristics for the main type of hydraulic turbines.

Then follows detailed information about electrical requirements and sources of electric energy. Requirements of hydraulic turbines are extensively discussed.

Turkey

In the chapter describing the situation in Turkey we find the total electricity production and per capita consumption in Turkey from 1950 to 1967. The total production in 1967 was 6,116.7 million KWh. The consumption per capita was 187 KWh. The average annual increase of total production was about 12 per cent. The total future production is foreseen as follows:

The Estimated Total and Per Capita Consumption of Electric Energy in Turkey During the Next Thirty Years

	Electric Energy		Per Capita Energy		
Year	10^6 KWh	Increase %	Plant MW	KWh/capita	Increase %
1967	6167		2150	187	
1972	11400	13.0	2950	306	10.4
1977	20700	12.7	6950	492	10.0
1982	36800	12.2	11900	776	9.5
1987	62900	11.3	18700	1185	8.8
1992	100000	9.2	33600	1689	7.4
2000	180000	7.6		2580	

It is important to note that the average increase for the next fifteen years is 12.3 per cent. This means that the consultant estimated the future trend of production nearly as it was in the past fifteen years. Turkey uses coal, petroleum and water energy for the production of electric energy. In 1967 the share of the hydro-electric production in total energy production was 28.4 per cent. The share of petroleum was 24.4 per cent and that of coal (including ignite) was 34.7 per cent and other resources were 2.5 per cent.

The report emphasizes a large potential in Turkey for useful hydro-electric energy. It is estimated around 65 billion KWh. An extensive explanation is given on the existing hydro-electric stations, on those under construction and those which should be under construction up to 1982. It is important to note

that [illegible], [illegible] tration [illegible] [illegible] [illegible] resources [illegible], [illegible], [illegible], [illegible] [illegible].

[illegible] such [illegible] significant, [illegible]. In [illegible]. [illegible] such [illegible]. [illegible]. [illegible] hydraulic [illegible] hydraulic resources [illegible] construction [illegible]. [illegible] requirements [illegible].

Pakistan

In [illegible] production [illegible]. [illegible] is [illegible].

[illegible] Production

[illegible]

[illegible]ar	[illegible]st [illegible]istan	[illegible]istan	[illegible]	[illegible]
1[illegible]	[illegible]	[illegible]	[illegible]	
1961	[illegible]	[illegible]	[illegible]	
196[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1963	[illegible]	[illegible]	[illegible]	[illegible]
196[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
196[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1[illegible]	[illegible]	1[illegible]	[illegible]	[illegible]
1[illegible]	[illegible]	1[illegible]	[illegible]	[illegible]

West Pakistan is [illegible] hydro-electric [illegible] and hydro-resources share over 50% of the total installed capacity. The share of hydro-energy resources in 1975 is forecasted to be 50% and for 1985. In West Pakistan the share of hydro-electric resources in 1975 was 35%, which is forecast to decrease to 20% by 1985. The USBR consultant forecasted total economic hydro-potential to be about 16,000 MW in Pakistan. In detailed study for Pakistan, no trend is for East Pakistan, is made. It is mentioned in the report that, although West Pakistan has very rich hydro-electric potential in the northern area, there are many economic and technical problems such as how to use this resource properly, taken into account the topographic situation. In account, West Pakistan is only one of hydro potential

In Pakistan the [illegible] installed capacity was about of over 900 MW of thermal power plant of about 1000 MW. In the future programme extended by after the final [illegible] and Total hydro-electric plants the total installed capacity in West Pakistan will be 5000 MW in 1985. In East Pakistan the total hydro installed capacity will be 250 MW with the Brahmaputra Barrage 1550 MW in 1990. With such development Pakistan will utilize nearly 40% of its full hydro electric potential.

Italy

The present and future installed capacity and electricity production is estimated as follows:

Estimates for Installed Power [illegible] Production for the next 10 years

Year	Installed Output		Total	Electricity Production
	Thermal	Hydraulic		10^3 KWh
1968	599.7	388.5	1000	3500
1969	750	388.5	1138.5	4900
1970	900	650	1550	5500
1971	1200	900	2100	8120
1972	1400	1050	2450	10500
1973	1600	1300	2900	12500
1974	1950	1450	3400	14520
1975	2250	1550	39000	15500
1976	2550	1850	4400	16[illegible]
1977	2950	2050	5000	20[illegible]0
1978	4320	2220	6540	25600

(It seems to us that the total production of electricity does not cover the internal production of electricity in some industries for 1968 and 1969).

The resources and structure of energy production in Iran in 1968 and the estimation for the future are as follows.

Distribution of Electricity Production According to different Sources

Types of Power Generation	1968(Actual)	Period of 1972-1987 (estimated)
Hydraulic	35.5	30
Steam	45.2	30
Gas	3.2	32
Small diesel	16.1	17

Iran does not have any detailed study on hydro-potential of the country as yet. The most viable work is an analysis of Heasra Engineering Company. On the basis of the feasibility report prepared by this company, the river Karoon is the greatest hydraulic potential in Iran. The Heasra Engineering Company gave priority to investment in electricity production in Iran.

In the conclusions of market analysis, the feasibility report stresses that the number of turbines listed in the tables, by countries, is only the minimum number which is necessary to meet the energy demand. Although the RCD countries have great hydro potential, they only use a small part of it.

In the feasibility report it is envisaged that in the future programme only the demand after 1975 should be considered taking into account the necessary time to make a decision on the construction period and to produce hydro turbines; from this point of view the total number of turbines in the RCD countries starting from 1976 will be as follows.

Hydraulic Turbine Requirements on the Region where the Capacity of the Manufacturing Industry is Based, Commencing from 1975 onwards

Years	Number of Turbines	Total Output (HP)
1976	7	1,433,000
1977	9	2,472,000
1978	7	1,902,000
1979	3	811,000
1980	15	2,822,000
1981	3	689,000
1982	-	1,420,000
1983	7	
Total	51	11,599,000
Yearly Capacity	6.37	1,450,000

Starting with such an extensive analysis of the future plant, they propose that the annual production should be six hydraulic turbines with an installed capacity of 250,000 to 300,000 HP each. In addition, they propose that the corresponding six alternators should be produced with a capacity of 180 to 250 MW. This proposal is made on the basis of connexions between turbines and generators in the production and with this combination it will only require 30 per cent of extra factory space and only 25 per cent increase in overall investment. It is also proposed that the factory should start production some time in 1974, producing Francis Hydraulic Turbines and hydraulic alternators with the following characteristics.

Francis Hydraulic Turbine

Installed capacity	277,000 HP (-200 MW)
Head	112 m
Speed	166 rpm
Diameter of the runner	5.6 m
Weight of spiral case	270 tons
Weight of suction pipe	65 tons
Weight of turbine	195 tons
Total weight including all equipment	1,000 tons

Hydro-Electric Alternators

Installed capacity	200 MW
Speed	166 rpm
Motor diameter	8.8 m
Motor length	3.5 m
Weight of rotor (including shaft)	9[illegible] tons
Weight of [illegible]rter	285 tons
Total weight (including all equipment)	1,200 tons

The production programme of the factory as it is proposed in the feasibility report will be.

Capacity of the Proposed Plant

Type of Product	Number of Units	Annual Capacity		
		Total Power (HP or MW)	Total Weight (ton)	Total Sales
Hydraulic turbine and its governer	6	1,620,000 HP	6,000	6,000,000
2-valves and Gates	15-20	-	1,500	1,200,000
3 Penstock and steel lining for tunnels	Various	-	2,000	1,300,000
Total I	-	-	9,500	8,500,000
4 - Alternator	6	1,200 MW	7,200	7,200,000
Total II	-	-	16.700	15,700,000

The feasibility report includes also the necessary number of workers, technical personnel and clerks as well as data on building proposals.

In the programme of production and investment, the facilities for casting and forging are not included. We believe that since such facilities for turbines and generators must be of high quality work, the main forging and casting parts should be imported. The report does not explain much about technological processes except

for the machinery layout in a typical hydraulic turbine. It also explains briefly the requirements of the factory for energy, water, compressed air and other auxiliary requirements. Under the heading of plant location choice, the report estimates that the most important factors are.

(a) the demand for products,
(b) the cost and availability of raw materials,
(c) the geographical condition of countries and cif cost,
(d) the side industries to support installations,
(e) hydro-energy resources to be used in the country.

The suggestion is that Turkey is the most suitable location for this plant.

The last chapter deals with investment, cost analysis, profitability of the project and the economic and social aspects of the project. The following summary of the total investment and profitability is foreseen hereunder.

Yearly capacity - 6 hydraulic turbines
6 alternators and the
necessary hydraulic equipment

	Local 000$	Foreign 000$	Total 000$
Fixed investment	11,830	5,929	17,755
Working capital	4,650	1,950	6,600
Total investment	16,480	7,875	24,355
Annual sales income	-	-	15,700
Annual operating cost	-	-	11,835
Gross profit	-	-	3,865

Profitability -

$$\frac{\text{Gross profit} = 3,865,000}{\text{total investment } 24,355,000} = 15.9\% \text{ (with customs duty)}$$

$$\frac{\text{Gross profit} = 3,865,000}{\text{total investment } 21,755,000} = 17.8\% \text{ (without customs duty)}$$

Pay-out time - 6.3 years (with customs duty)
5.6 years (without customs duty)

The total foreign currency requirements are $7,875 million and the consultants estimate that the total foreign currency saving will be about $13 million.

The feasibility report emphasizes the necessary incentive and subvention regarding exemption from customs duty and similar measures. In the cost analysis we find that the share of material in the total costs is 46 per cent for turbines and alternators (together), the share of labour is 30 per cent and other belonging to depreciation, license and other expenditure. The main input of material is casting and forging steel and other metals. An annual sales income of $15.7 million is foreseen. The annual operation cost will be about $11.8 million. All financial data are given separately for the production of turbines only and for the complete production of turbines and alternators.

The recommendations of this feasibility report are as follows.

"1. It is recommended that a plant which should meet the requirements of the RCD countries for hydraulic turbines as well as hydro-alternators be set up.

2. The annual capacity of the proposed plant should be six hydraulic turbines and the corresponding number of alternators along with the necessary equipment. Each of these turbines being to cover the power range from 250,000 - 30,000 HP.

3. The working capital of the installed factory should be on a higher scale as the annual capacity is low in terms of number of units, but very high in terms of production cost.

Therefore, during the time of production, a considerable amount will be devoted to manufacture.

4. Profitability alone could not be regarded as the main criterium for these types of projects. However, foreign exchange savings and the indirect benefits of the project to the region appear to be more important factors in any final decision.

5. In view of the size of the demand, the hydraulic power potentials, availability of the raw material and labour, cif costs and the status of the basic and auxilliary industries, it is recommended that the project should be located in Turkey.

6. The installation and the bringing into operation of the factory at full capacity will take four years. Therefore, the partners should come together and decide upon the installation as soon as possible.

7. Lastly, we would like to mention some of the advantages that could be available to the entrepreneur for the production of hydraulic turbines and alternators in the RCD countries.

(a) at least ten years sales guarantee,

(b) the possibility of purchasing modern machinery at a reasonably low price from certain European turbine manufacturers which are in the process of closing down,

(c) the possibility of manufacturing in the same plant the gates, valves, pressure pipes, etc., required for the hydro-electric power stations, as well as pumps, pressure vessels and other similar products for which there is a substantial demand in the RCD countries."

B. Evaluation of the Project

This project is among those which are best prepared. As it is explained in the market survey of the project, none of the RCD countries by itself has a sufficiently large demand for heavy electrical equipment, hydraulic turbines and generators but taken together, there is a large market for one capacity, on a minimum economic scale, to be established

The national policy of rapid economic development, particularly in the capital goods industry, indicates that this project is in line with overall economic development in the RCD countries. It should however be noted that the task which was entrusted to the Turkish consultants was related to hydraulic-turbines. The feasibility report includes a study and proposed production of hydro-turbines and generators.

Referring to the market study in the feasibility report, we can approve the method used and the main conclusions with a few remarks. First of all, the consultants use the available material in the three countries and take out the main data. However in planning electricity demand, some additional method is normally used to justify the future demand for electricity, as for example, the planning of trends of increasing consumption by sectors, based on earlier trends. There is insufficient data in this report to justify the share of hydro and thermo resources in the total production. There are no data regarding the main characteristics of the quantity of accumulation in any river basin. There are no data on the annual working hours of hydro and thermo plants. Therefore, we cannot

approve the structure of hydro-thermo power production, although we agree with the total production.

We should like to make a few remarks on the capacity of turbines and generators.

1. The role of small-scale hydro potentials and requirements of small hydraulic turbines in the region is over estimated. It is true that such small-scale hydro potentials played a considerable role in urban areas in Europe in the 19th and the beginning of the 20th century, but these potentials were developed over a period of a hundred years (the building of earth dams, wiers, dykes, etc.). Now these small-scale hydro potentials have lost their importance and most of these hydro-electric power plants are closed down. Only in multi-purpose projects, where production of electrical and mechanical power will be a secondary task, will the utilisation of these small-scale hydro potentials be profitable in the RCD region.

2. The same applies to the medium-scale units of hydraulic turbines. The cost of energy produced by large thermo units is now already so low that it is impossible to utilise small hydro potentials. The same will happen in all the RCD countries, mainly in Iran, where utilisation of natural gas resources is only 12 per cent at present. This, combined with inadequate financial means, will affect the total production in the RCD joint venture plant.

3. On the other hand, the study is not supplying any data on the replacement of existing hydraulic turbines; this will have a positive effect on the production programme of this RCD joint venture plant.

4. The plant should produce gates, valves, penstock and steel lining for tunnels, etc., as given in the feasibility report.

5. There is no good suggestion on how to produce hydraulic alternators in this plant; the production of hydraulic turbines with alternators in one plant is exceptional.

It is true that the turbine manufacturers cannot depend only on the orders received for turbines, but alternators will not solve this problem. Other kinds of products for the RCD joint venture plant could be axial propeller pumps, reversible axial propellor pumps (or other large pumps), large valves and fittings, some heavy welded and turned components and parts for other kinds of industries, etc. (To get the best utilization of the biggest machine tools).

The data about the Skodaexport are wrong. Skodaexport is only an export organisation; the plant for hydraulic turbines is the CKD Blansko which is now only producing turbines with accessories (gates, valves, steel structures), but also heavy machine tools (vertical turning and boring mills).

Regarding personnel requirements, we observed that the produc ion of hydro-turbines and generators is not the standard type. Each power plant - due to specific topographic conditions, water supply, etc., - requires individual drawing. For this reason we propose that a special drawing bureau should be established, this requires a larger number of technicians and engineers than stipulated in the report.

As far as the total investment is concerned, it seems to us that the space proposed for the production of generators is too small. The space foreseen for turbines is 30,000 m^2 and 10,000 m^2 for generators. Although the space for generators could be lower and some facilities in other constructions could be used, we believe that a minimum of 15,000 m^2 would be necessary for production of generators. Nothing is clear from the programme about the testing room for turbines and generators. It seems that the testing room on vibration of generators is not foreseen. Taking into account the above and some other observations regarding machinery, we are of the opinion that the total investment of 24.3 million for this project is an under estimation. We believe that the minimum investment should be about $30 million for establishing such production capacity. We would also like to remark on exploring the possibility of reaching an economic scale and a higher profitability in the production of generators only. The expansion of the production of steam turbines should have been analysed. We believe that it would bring some profitable results.

The operational expenses are given in rough figures and we are unable to make a more thorough analysis. We believe that the total value of sales is also under

estimated. The sale of turbines and generators cannot be approved because there are no data on what additional equipment is delivered along with turbines and generators. Our remarks regarding the total investment and sales will consequently affect the data on profitability, nevertheless, this factory could still be profitable and we could approve the main conclusions regarding the profitability in this feasibility report.

C. General Observations regarding Projects on Heavy Electrical Equipment

Under project No. 4 (Rotating Electrical Machinery), No. 5 (Turbo-Generators), No. 11 (Boilers large sized), and No. 12 (Hydro-turbines), we discussed the situation in the RCD countries relating to demand and future requirements of such equipment. As all these projects deal with the production of equipment for generating electricity, we are of the opinion that one summary and some additional analysis on the demand and production of such equipment in the RCD countries will be useful. To complete the production of heavy electrical equipment, transformers and some hydro-mechanical equipment should be added.

We believe that such an approach could contribute towards RCD co-operation. We would like to point out some of the figures and important facts in the discussions and decision making of the RCD countries for undertaking a detailed feasibility report for the production of heavy engineering equipment in the RCD Region.

The requirements of heavy engineering equipment depend on the production and consumption of electricity. It is not necessary to explain the importance of electricity for any country. However, it is necessary to emphasise that the production of electricity and per capita consumption in all the RCD countries is very low. It is also necessary to emphasise that there is no possibility of getting electricity outside the RCD Region. Observing the production trend in the RCD countries, we see that it was relatively high and constant in the past few years. in Pakistan 15 per cent, in Turkey about 12 per cent, and in Iran 20 per cent. As for the determination of requirements of equipment it is necessary to know the total production and share in the production of hydro and thermo resources. We estimate the following total production for each of the RCD countries.

Estimation of the Total Electricity Production in Turkey

Year	Total 10^6 KWh	Total MW	Hydro 10^6 KWh	Hydro %	Hydro MW	Thermo 10^6 KWh	Thermo %	Thermo MW	Nuclear 10^6 KWh	Nuclear %	Nuclear MW
1967	6167	2150	2370	38.4	730	3797	61.6	1420			
1972	11400	3950	8000	70	1800	3400	30	2150			
1977	20700	6900	14100	68	3200	6600	32	3700			
1982	36800	11900	24300	66	5800	9400	26	5300	3100	8	800
1987	62900	18700	30500	48.5	7400	23700	38.5	9500	8700	13	1800

Our estimation on the above table differs slightly from that proposed in the feasibility study on the manufacturing industry of hydraulic turbines due mainly to two factors.

1. We are of the opinion that the production of the thermo power station cannot be decreased as rapidly as stipulated in the feasibility report, instead of the 20 per cent share in the total production we should assume a share of 30 per cent up to 1982. Although Turkey has considerable hydro resources, the investment in hydro resources is very high; therefore the use of coal for the production of electricity will be higher.

2. The second chance is in connexion with the nuclear resources, because we believe that a country like Turkey (rich in classical energy resources) should not install a nuclear power station until 1977 (as proposed in the study). We assume that it could be established by 1982.

Regarding the real annual demand for the installation of the MW, we have prepared, on the basis of the above table, the following analysis for a period of five years:

Total increase of production and installed MW for a 5-year period and annually

Period	Total increase		Hydro			Thermo			Total MW Annually
	10^6 KWh	MW	KWh	MW	Annual	KWh	MW	Annual	
1972-77	9.300	3000	6100	1400	280	3200	1550	315	595
1977-82	16.100*	5000	10200	2600	520	2800	1600	320	840
1982-87	26.100*	6800	6200	1600	320	14300	4200	850	1170

* The balance belongs to nuclear energy

Pakistan

Estimated Total Production of Electricity in Pakistan

Year	Total 10^6 KWh	Installed MW	Installed MW		
			Hydro	Thermo	Nuclear
1970	7280	2260	748	1512	-
1972	9780	2787	1028	1760	-
1975	13820	3657	1477	2180	-
1980	22483	6936	3850	3086	-
1985	35674	9600	4840	4280	480

Total increase in Pakistan of production of electricity and installed MW

Year	Total increase in 10^6 KWh	Average increase per year %	Increase		Annually		
			Hydro MW	Thermo MW	Hydro	Thermo	Total
1970-75	6540	13	730	668	146	134	280
1975-80	8363	10	2370	906	474	180	654
1980-85	13490	10.5	1000	1200	200	240	440

Iran

Estimated total production of energy in Iran

Year	Total in 10^6 KWh	Installed MW	Hydro MW	Thermo MW	Nuclear
1970	6600	1550	650	900	
1972	10500	2450	1050	1400	
1975	16600	3900	1650	2250	
1980	32000	7600	2800	4800	
1985	53200	12600	4800	7300	500

Total increase of production of electricity and installed MW in Iran

Year	Total 10^6 KWh	Average increase	New Hydro MW Total	New Hydro MW Annual	New Thermo MW Total	New Thermo MW Annual	Annual average increase MW
1970-75	10000	20	1000	200	1350	270	470
1975-80	15000	12	1150	230	2550	517	740
1980-85	21200	11	2000	400	2500	500	900 and 500N

Summary of total annual increase of installed MW by hydro-thermo power stations for RCD countries

Period	Hydro Turkey	Hydro Pakistan	Hydro Iran	Hydro Annual total	Thermo Turkey	Thermo Pakistan	Thermo Iran	Thermo Annual total
1970-75	280	146	200	626	315	134	270	720
1975-80	520	474	230	1224	320	180	510	1010
1980-85	370	200	400	920	850	240	500	1590

On the basis of the aforegoing total requirements of the installed MW, separated by hydro and thermo resources, we can make a rough estimate of the need for the next 15 years of the number of generators and turbines for the RCD Region. It will only be necessary to establish the standard type of turbine and generators regarding power which will be in our forecast. We agree with the proposal that the standard steam turbines and generator units should be of 100 and 200 MW. For the hydro power station we believe that various generators ranging up to MW would be required, and for determining the number of hydro-turbines and generators we shall calculate with an average of 100 MW.

On the basis of the above we could determine that the average requirements of turbines and generators would be.

Period	Annual requirements Number of hydro sets	Number of thermo sets	Total number
1970-75	6	5	11
1975-80	12	5	17
1980-85	9	8	17

We could use some other method to arrive at the total requirements. The simplest method is through the planning of the future demand based on the most recent average increase of production of electricity, assuming the proportion of hydro-thermo resources. Moreover, it is necessary to agree on the annual working hours of the total installed capacity in hydro and thermo plants.

On the basis of the last reliable data we could calculate the total production of energy in all the RCD countries, for 1971, as being 24.6 billion KWh. We have already discussed the average increase of production in Pakistan and Turkey which will be 10 - 11 per cent and 20 per cent in Iran during the next few years and 12 per cent later. Supposing that the average increase in all the RCD countries until 1975 is only 12 per cent yearly and later 10 per cent yearly, the RCD Region will have the following increase of KWh yearly.

Period	KWh 10^6
1974-76	3.7 to 4.0
1977-80	4.5 to 5.5
1980-85	6.0 to 8.0

On the basis of our calculation we can forecast that the structure of resources will not be stable over this period, but it can reach the relation of 45 Hydro and 55 Thermo resources in the next 15 years. Using the same parameters and standards for hydro and thermo sets (110-200 MW for thermo and an average 100 MW for hydro) we come to the same number of requirements of turbines and generators in the RCD Region as already stated earlier.

Requirements for transformers are usually twice as high as the installed Mega Watts. This means that if a total annual increase of about 1500 - 2000 of installed MW is in the RCD countries, there will be a need for about 3600 - 4000 MVAmp transformers, which justifies a larger production unit for transformers. In all the calculations of total requirements, high quality production such as measuring instruments and large forging and casting parts were omitted as they can always be ordered from abroad.

We could conclude that there is a large market for electrical power equipment in the RCD Region. From the technological point of view we should like to suggest that this production unit be as follows.

1. The production of steam and hydro-turbines and other related equipment including the production of hydro-mechanical equipment.

2. The production of steam and hydro-generators and large electrical motors.

3. The production of large transformers.

4. The production of boilers and related equipment for steam power stations.

The production of other electro-installed equipment is not included as this item could be supplied from any existing factory with production of electrical installation equipment.

We may ask ourselves if the establishment of a production of heavy electrical equipment in the RCD Region would be technically and economically feasible. As far as demand is concerned, as already discussed above, there is no doubt that there will be a demand for 10 - 12 turbines and generator sets yearly and that this production unit can be approved from the economic scale point of view. From the technical point of view, all the RCD countries are already in the second stage of

industrialisation and such production with technical assistance, license or a joint venture with foreign firms, can be established. Some capacity already exists in the RCD Region on almost the same technical level. Some other developing countries such as Brasil, Argentina, Mexico, Egypt, India are producing, or are about to produce, equipment for electrical power stations.

If we take into consideration the saving of foreign exchange contributing to the national income, employment, etc., then there is no doubt that establishing production of heavy electrical equipment will be very profitable to the economic development of all the RCD Region.

We believe that, although roughly explained, the above data favour establishing, as soon as possible, a joint production of heavy electrical equipment in the RCD Region.

In conclusion we should like to propose.

(a) as a first step that the RCD countries, with the technical assistance of UNIDO and consultancy firms, prepare a detailed and bankable feasibility report. All economic, technical and locational aspects should be analysed in this report. All elements necessary for decision by the RCD countries should be included;

(b) as there already exists (or is under construction) in the RCD countries some capacity suitable for production or co-operation in this field, we propose that these capacities be analysed for their suitability for co-operation in the production of heavy electrical equipment.

(c) Moreover, the RCD countries should agree in principle to participate in such an undertaking within the framework of the RCD and to establish close contact with various production units, provided the production units are established in all RCD countries. Some other measures from the economic policy point of view should be taken by all the RCD countries. Other principles of RCD trade should be respected, particularly where price and quality are concerned. Furthermore, the RCD countries and future producers of this equipment should solve the problem of competitiveness regarding

credit facilities. It is known that world firms sell large amounts of equipment under medium-term credit facilities. Some credit facilities should be provided in selling equipment within the RCD Region.

(d) The Turkish feasibility study on the manufacturing industry for hydraulic turbines is a good study and we should like to suggest that this study be a starting point and a basis for a future feasibility report on establishing the production of heavy electrical equipment in the RCD Region as proposed above.

CHAPTER VII

IDENTIFICATION OF OTHER ENGINEERING FIELDS SUITABLE FOR CO-OPERATIONAL ARRANGEMENTS

The 12 projects which analysed in the previous Chapters cover only part of the engineering industry in the RCD region. Some of the aforementioned projects are related to the existing plants, others to the new projects under construction. The existing capacity in engineering fields gives much scope for co-operational arrangements and for an agreement between the RCD countries. Unused capacity in the engineering sector (explained in Chapter I, item 3), and the question of efficiency and competitiveness on the market in many of the engineering fields indicate larger possibilities for co-operation. The implementation of a national policy and further development in some of the engineering fields also depend on greater co-operation.

Bearing these factors in mind the UNIDO experts submit herewith a short summary on the identification of some new fields for co-operation among the RCD countries. The approach is based: -

(a) on the existing capacity of the engineering industry, the use of this capacity, excess capacity, etc.;

(b) on the technical connexions, suitability and inter-relations among the plants;

(c) on the possibility of economic advantages of a larger market, co-operation and specialisation,

(d) on an improved supply of intermediate goods, spare parts in the RCD market, on newly set-up specialisation, cutting down a wide range of products in many engineering plants and increasing efficiency and competitiveness in the market, etc.

It is not our intention to make a study of each factory and of each product. We would prefer to identify new fields in relation to those groups of products which are most numerous in a given field of production. A further study will be based on a product-by-product or factory-by-factory approach to co-operation. As far as the available data and time permit, we should like to identify the

following new fields as being most suitable for co-operation in the Heavy Engineering and Electrical Equipment Industries, although we are fully aware that there are other fields suitable in the RCD region.

7.1. Agricultural Machinery and Equipment

The agricultural sector is one of the largest in the economy of all three RCD countries. The national policy, as stated in the Five Year Plan, stresses the need for faster development, modernization and expansion of mechanization in this sector. On the other hand, each of the RCD countries has a tradition in the production of agricultural tools, implements and equipment. During the last few years, many new capacities for production of agricultural machinery and equipment have been developed. These include the production of tractors and to a lesser extent, combine harvesters. In the Preliminary Report we referred to the situation regarding the production of agricultural equipment in each RCD country. Additionally, within the RCD region there are approximately 100.000 tractors of various types. The annual demand for tractors during 1971 was approx. 25.000 to 28.000 with domestic production slightly below this demand. Non of the RCD countries has definitely solved the production of diesel engines for tractors. There is a similar situation concerning other agricultural machinery such as cultivators, harvesters and other tractor accessories. We are of the opinion that the present stage of development and the real situation in the production of agricultural machinery in each country, urgently requires joint co-operation based on a division of work, production of components and uses of excess capacity. It is normal that the production of some agricultural tools, animal-drawn implements, tractors and tractor accessories should be organised in each of the RCD countries. Agricultural machinery contain many components and parts which are not completely produced in any of the RCD countries. We have already mentioned diesel engines and this subject is discussed under Project No. 3 "Diesel Engines", in previous Chapters. There are also some components for diesel engines such as pistons and rings, crank shafts, connecting rods, electrical equipment, forged parts, which can be organised under agreement between the countries. Usually the production of such components all over the world is done by specialised firms and delivered to main producers on a sub-contracting basis. As a production capacity for diesel engines components already exists in the RCD region, sub-contracting arrangements would be suitable.

Furthermore, there are other major tractor machine parts such as gear boxes, transmission cases, rear axle cases, gears, clutches, pumps, dynamos, filters, etc.

for which a capacity also exists in the RCD countries. Each RCD country should have its own assembling and production plant for tractors. Co-operational arrangements mutually agreed upon on sub-contracting basis between the main producers of tractors and specialized firms for production of pistons etc., would be suitable and advantageous to the contractors and the three countries as a whole.

It is necessary to emphasize that some of these components require a high standard of technology, highly qualified personnel, and machinery. These components can be produced economically in large quantities. At the moment most of these components are imported into the RCD countries.

Co-operation in the production of agrioultural machinery requires some regional standardisation. From time to time contact between the main consumers and producers, joint research and marketing, etc., is advisable. Co-operation on a regional basis in this field is carried out in other regions and we are convinced that there is a bright future for oo-operation within the RCD region. Co-operation will contribute towards solving many problems on the production of agricultural equipment in each RCD country. A further study by specialists in the produotion of agricultural machinery is strongly recommended.

7. 2. Machine tool production

As explained earlier, each RCD country has a production of machine tools of various types. The production is organised by several private firms in all RCD countries, yet each of these countries has a large modern plant for the production of machine tools: the HKEK firm in Turkey, the Machine Tool Factory in Karachi, Pakistan and the Machine Tool Factory in Tabriz, Iran. Within the RCD region a wide range of machines are produced, such as lathes, milling and drilling machines, grinding machines and others.

Even so, the domestic production of machine-tools cannot meet the domestic demand. On the basis of an estimation made by WPIDC Pakistan, the import of machine-tools in 1970 was as follows: -

Lathes	- 1.100
Milling Machinery	- 600
Grinding Machinery	- 1.500
Drilling Machinery	- 1.750

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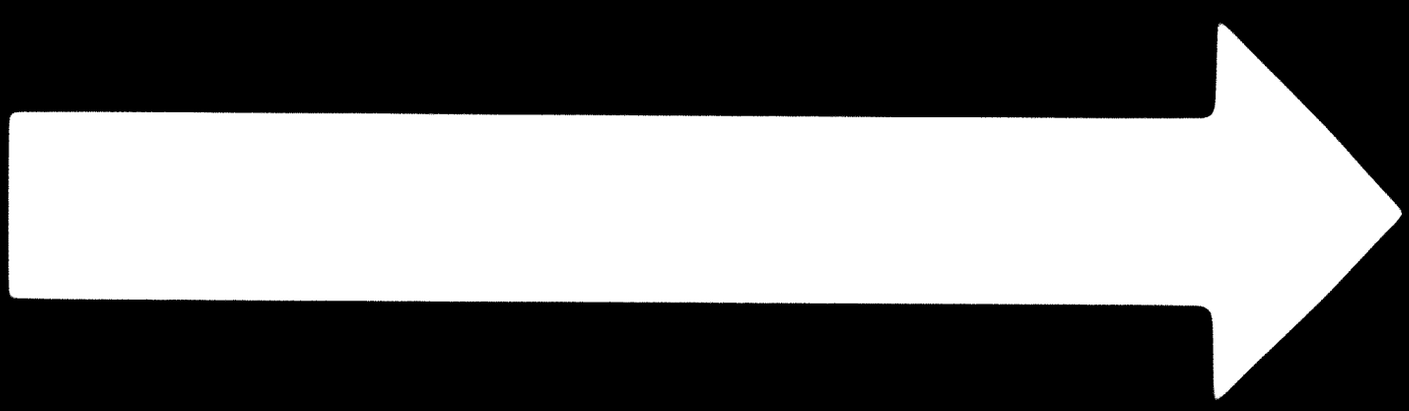

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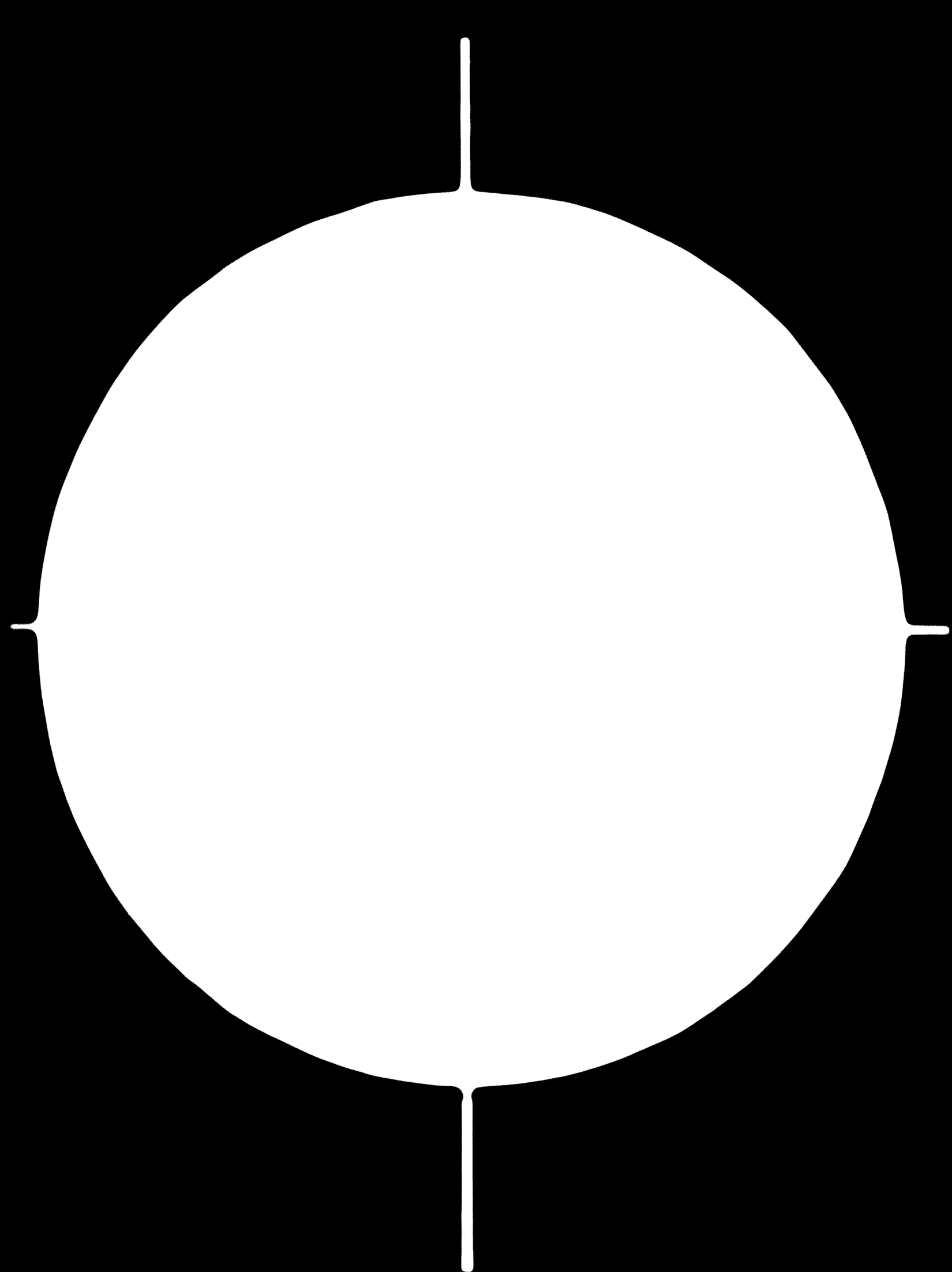


In discussion with foreign representatives and on examining stocks at present on the market, we discovered that in spite of the increase in domestic production there is a large stock and supply of imported machine-tools, especially into Iran. It seems that the domestic price is not competitive to the imported price.

On examining the production programme of large factories in the RCD countries we observed that the range of various machine-tools is very wide. Thus, for instance, MKEF in Turkey produces 8 different types of lathes. The Machine-Tool Factory in Tabriz, Iran produces 4 types of grinders, 3 types of central lathes etc. The private firm Bantigalla Engineering Company Pakistan produces about 10 types of lathes and several types of drilling machines. The Landhy Machine-Tool Factory near Karachi produces several types of lathes, milling machines, etc.

The production of machine-tools is considered as the most complicated and serious undertaking in any country. In developing countries its production is usually organized under license and with the assistance of foreign firms. This is, also the case with the RCD countries where we can observe a very large co-operation with the developed countries in this particular field. Specialization in the production of machine-tools over the world is far too advanced and many of the factories are only producing a few types of machine-tools. The available date from some European firms confirm the good results of specialization, of improved quality, of the better use of capacity, efficiency of production and competitiveness on the market. These are the most serious problems facing the machine-tool factories in the RCD countries, particularly those newly established ones.

There is no doubt that co-operational arrangements between the RCD countries should include trade facilities, standardization of machine-tools division of work, specialization, joint research and market analysis. Furthermore, a joint venture, licensing arrangements, and contracts with foreign firms will contribute to a faster solution of the existing problems of machine-tool producers in the RCD countries. Problems such as overlapping of programmes between old producers, mainly private firms and the newly established State-owned factories can also be solved through co-operation and specialization. Competitiveness with imported machine-tools, particularly future programmes of development of production in each RCD country can also find solutions through these arrangements.

In our contacts with the managers of large plants, we found that they fully agreed with us that a wide range of production of various types of machine-tools and lack of co-operation are two factors responsible for the low use of capacity

high costs and low competitiveness with foreign firms. We should like to stress the importance in this field by paying special attention to joint ventures and joint ventures with foreign firms. First of all, co-operation in this sector with foreign firms is on a long-term basis and should help the domestic firm to keep pace with modern technology and design. We believe that within the RCD region arrangements between large producers like the Tahrir Machine Building, Landhey Machine-Tool Factory, IKCL and MTCO and foreign firms would be very advantageous for the RCD producers. Agreement by the main RCD producers regarding market, specialisation, etc. would bring large benefits to the domestic and foreign partners in such a joint venture. It is not necessary to emphasise the necessity and the ensuing benefits of such arrangements in this sector, except that, in this field the arrangements should have some specific characteristics and be organised within each country within the RCD region as a whole, and with domestic and foreign firms at large. A detailed study by specialists in machine-tools should include main producers as a necessity for practical co-operation.

7.3. Automotive industry

According to world experience, the automotive industry is the most suitable for various co-operational and sub-contracting arrangements within a country and between a group of countries on a regional basis. All RCD countries have large production and assembling units for various types of automobiles, trucks, buses and their components. Most of these productions are organised on special arrangements with foreign firms on the basis of licensing joint ventures or co-operational arrangements. It is difficult to understand why there is only a limited number of sub-contracting arrangements within each RCD country and none among the RCD countries in this field.

The large number of components which belong to various types of industries (from metalurgic to textils products) are very suitably for joint ventures in the automotive field of production. On the other hand there are many production units in each RCD country which already produce various components and parts for the automotive industry, some of which are suitable for specialisation, high quality production and mass production of certain parts and components for the automotive industry. Unfortunately, efforts made by the Machine-Tool Factory in Karachi for gear boxes and producers of wheels for cars from Turkey were not very successful.

We can understand the reasons why each country wishes to have its own production of private cars, trucks, buses etc. which are economic and non-economic.

Presently, each country of the RCD region is already developing the automotive industry but the domestic content in the value of production is still low. It is the intention of each country however to increase the domestic value added.

The forecast for future production of various motor cars in Iran is as follows:-

Years	[illegible]	[illegible]	[illegible]
Passenger cars	nos.	[illegible]	[illegible]
Buses and mini-buses	"	[illegible]	[illegible]
Trucks	"	[illegible]	[illegible]
Vanettes	"	[illegible]	[illegible]

It is pointless to try and explain the figures for the demand of passenger cars, light trucks, dumper trucks, vans, buses and mini-buses. The demand is steadily growing. On account of the large territory of each RCD country, a fast economic development, which includes a higher standard of living and modern transport facilities, we can foresee a high demand and a prosperous market for vehicle transport equipment. The trends of demand of transport equipment in the RCD countries is high all over the world and will continue to increase. There is no doubt about the prosperous development of automotive industry in the RCD countries. The question is how will these industries be efficient with the increase of domestic value added and meet competition on the market. There is not the slightest doubt that the large framework of RCD co-operation and sub-contracting arrangements in the automotive industry is one of the possibilities for solving this question. We recommend that this co-operation starts in the production of diesel engines for trucks and buses and extend to other parts. The main components like motors (diesel and gasoline engines) are imported (as an end product or as parts for assembly) but the production of the frame and other construction and mechanical parts can be executed locally. The production of gears, transmissions, rear axles, clutches and other machine components has started. The capacity for production of wheels, tyres, filters and similar parts also exists in the RCD region. Some capacity for production of pistons, and piston rings, spark plugs, electrical equipment and fuel injectors and vehicle instruments are also under construction.

As a first step, the RCD Secretariat and the member countries should initiate a special meeting of representatives of main producers to discuss the possibility of mutual co-operation. Special expert groups should prepare a detailed

in the production in the automotive field, can be included in this analysis. Through the proposed co-operational arrangement problems such as supply of material, foreign exchange shortage, use of capacity, market limitation can certainly be improved.

4. Earth-moving equipment

In the RCD region many activities have developed using various types of earth-moving equipment: agricultural and irrigation works in each country, road constructions and other constructions which require bulldozers, loaders, escalators, etc. (rubber tyred or crawler type) and also dumpers, steamrollers, concrete mixers etc. There is no industrial production of the most important types of this equipment (except steamrollers, concrete mixers and dumpers).

The total import of earth-moving machinery and equipment in 1967 was about $ 100 mill. and is estimated to be about $ 150 mill. in 1970 in RCD countries. Some of the new factories, like the Arak Machine Building in Iran, expects to produce some earth-moving equipment such as bulldogers, loaders, parts for greders and other equipment, also vibratory rollers, asphalt laying plants, concrete mixers, etc. Turkey is also producing some of the rubber-tyred earth-moving equipment (IKEK firms). Factories in Pakistan (Taxilla and Karachi), in addition to the capacity in Arak, can produce some of the earth-moving equipment, particularly components of earth-moving equipment. In Iran there exists a capacity for dumpers, in Turkey for concrete mixers, etc.

A large demand and a huge import of earth-moving equipment can be foreseen for the future.

We should like to suggest that the production of earth-moving equipment should be organised in the RCD region on a co-operational basis with the existing firms involved in assembling or production of these items. As the production of such goods and particularly the market are specific, we should like to suggest that this production be organised on the co-operation or joint venture basis with foreign firms. Furthermore, we propose that domestic producers should make more detailed study of their own possibilities and feasibility for co-operational arrangements for the production of some of this equipment, especially some components in order to cut down the high foreign content in this field.

The firms in this field of production should request licenses and joint venture arrangements with foreign firms who would pay due regard to their present situation and would accept the maximum use of domestic capacity, material and other resources. It is advisable, that the domestic production should be limited at first to some type of rubber-tyre equipment and crawler type earth-moving equipment, while other types could be imported for the time being. Contact among main producers interested in production and co-operation of earth-moving equipment should be established immediately.

5. Machinery for Processing Industry

In all the RCD countries many industrial branches such as the food industry, sugar, textile, cement, printing and chemical industries have been developing. The common name for this industry is the processing industry. The large import of machinery and equipment for this industry can be observed from statistics. On the other hand domestic firms do not use their capacity. Once, metal workshops used to produce some spare parts and simple machinery for various branches of industry. The sugar industries started to produce machinery for their use. Some of the firms, after first attempts to produce such equipment and positive results, bought foreign licenses and established a co-operational agreement with foreign firms for the production of such equipment. The demand for machinery for the processing industry, specially in some branches, is constant.

All these facts make up for a successful development of machinery equipment, particularly for the textile, sugar, cement, chemical plants and mining. The large heavy mechanical factories like the MKEK in Turkey, the new plants in Arak in Iran and Taxilla in Pakistan also started production of some equipment for the processing industry.

Looking at the present and the future position of these industrial branches we can predict a large demand for machinery for the processing industry. Thus, by an estimation of the present and future production of sugar we can foresee that an average of 4-5 sugar plants will be established yearly in the RCD region (1 in Turkey, 1,5 in Iran and 2 in Pakistan). A similar situation exists for cement, where 6-7 factories are expected to be established yearly in the next 5-10 years (approx. 2 factories in each RCD country). The requirements in the textile sector are more considerable. According to an estimation for 1970-75 the RCD region will require about 1,5 mill. new spindles and 40,000 new looms. However, due to the large number of textile plants and the replacement of old and obsolete machinery, the

requirements are expected to be much larger. Import of equipment in the chemical sector is very large. The national development plan for each RCD country expects large investments in the chemical sector, ($ 1.200 Mill. in a five year period for all RCD countries out of which $ 700 Mill. will be for equipment and machinery). Some domestic factories could participate in the supply of market demand of chemical machinery such as heat exchangers, pumps, filters and centrifuges, compressors, some processing equipment of carbon or alloyed steel, etc. Production of equipment for the processing industry is advanced in some RCD countries or advancing as for instance the production of machinery for a sugar factory in Turkey, textile machinery in Pakistan, cement equipment in Turkey, chemical equipment in Iran, etc. There is also a production and demand in wood machinery: machines for the shoe industry, tea processing industry, food industry, printing, etc. In spite of domestic production, the import of machinery for the processing industry in all the RCD countries is still very large.

Although the conditions for mutual trade and co-operation in the processing industry machinery or components already exist among the RCD countries, there is no co-operation or business arrangement. It is clear that further development in each RCD country depends on future markets, and on a co-operational arrangement within the country and among the RCD countries with foreign firms. In our opinion, the development of firms with an advanced production of sugar, textile or chemical machinery, etc. depends on these arrangements. We should therefore like to recommend that co-operation in the engineering industry should receive special attention and specialisation for the production of machinery and equipment for the processing industry. On the basis of the present situation it would not be difficult to identify industrial branches or firms suitable for co-operational arrangements (Sugar Corporations in Turkey for sugar plant machinery, textile machinery in Pakistan, chemical machinery in Iran, cement plant equipment in Turkey, etc.), and we should like to propose that this field be included for co-operation among RCD countries.

7.6. <u>Co-operational possibilities for selected equipment</u>

In addition to the above group of production units for machinery and equipment suitable for co-operation, we should like to mention a few other sectors where, according to our study, co-operation would thrive. These are: -

(a) telecommunication equipment. All RCD countries have production units for telephone and other telecommunication equipment. The oldest factory is in Pakistan. It was established in partnership with Siemens A.G. and is

producing long distance telephone equipment such as trunk exchangers, carrier telephone systems, subscriber trunk dialling. They also produce teleprinter exchangers and railway signalling equipment. The factory has some free spare capacity and exports of some equipment has already started. Iran has a factory in Shiraz on a joint venture with Siemens A.G. A similar capacity exists in Turkey. We should like to suggest that some co-operation and specialisation be introduced including further contact and co-operation with foreign firms. There are good prospects for this particular industry in this region.

(b) Many industries coming under the common denominator of Electronic Industry have started developing in this region. Co-operation in the production of components for this industry has a wide experience all over the world. On account of the cheap labour, co-operation in this sector among domestic firms of the RCD region and foreign firms looks quite promising.

(c) The production of durable consumer goods is well advanced in the RCD region, particularly in Iran and Turkey. In our estimation, the present stage of development of this industry makes it suitable for co-operation and specialisation and to further development by cutting down costs and market limitations.

(d) The RCD countries already co-operate on maritime transportation facilities and we should like to point out that there are possibilities for co-operation in shipbuilding. The requirements of the merchant fleet are large in all the RCD countries, and the domestic production cannot meet the total demand. Larger co-operation in this field could increase the capacity of the existing ship-building industry and attract new capital for its expansion. Moreover, the RCD countries could co-operate on the supply of various materials and inputs of the engineering industry particularly in castings and forging facilities

On the basis of our study, the above listed fields are suitable for co-operational arrangements. We should like to conclude by stressing that without co-operational arrangements and specialisation within each country and the RCD region, and in many cases with foreign firms, the existing problems in the above fields will persist and cannot be easily solved. In the following Chapters we shall refer to some other necessary measures, which are primarily of an organisational aspect, which are important to start and maintain co-operation in the engineering industry.

CHAPTER VIII

THE MAIN CONCLUSIONS AND RECOMMENDATIONS REGARDING THE 12 PROJECTS

1. The RCD countries have achieved considerable success in their economic development, particularly in the industrial sector. The level of industrialisation reached and the structural changes engendered, are causing a new set of problems in the fields of production costs, competitiveness, investments efficiency, co-operation and sub-contracting among firms, export earnings and import needs etc. Many of the above problems are directly related to the Heavy Engineering Industry, to the establishment of larger markets and regional industrial co-operation.

The engineering industries in the RCD countries are nearly at the same phase of development, although their historical development was different, causing specific characteristics in some branches. Small firms prevail and production techniques are not as advanced as is desirable (with some exceptions). The growth rate of the engineering industry in all RCD countries has been very high, especially during the last few years, due to a correspondingly high allocation of the national financial resources to the industry and due to commencing production in a few new plants. However, imports of engineering goods are correspondingly very high, and on the increase.

The economic policies of each of the RCD countries not only give priority to the various branches of the engineering industry for fuller utilisation of capacity, but also emphasise the needs for increasing efficiency, obtaining economies of scale and introducing standardisation. All these are directly linked to the need for larger market co-operation and specialisation. In world-wide heavy engineering industry the advances in technology, organisation and management methods, efficiency and competitiveness are closely related to co-operation among the various countries and firms.

Since the engineering industry, and particularly the production of capital-goods, is in the first stage of development in all RCD countries, it gives a unique opportunity to Governments and entrepreneurs to profit from the experience of other countries and areas.

2. The co-operation in the engineering industry has a direct impact on the use of the existing capacity, on the increase of efficiency of the firms and its competitiveness on the market. The co-operation among the 12 projects are co-operatively linked in the RCD region with many other firms, including some foreign ones. This indicates that the suitability of such arrangements among the 12 projects should be considered with its suitability for co-operation with other firms within RCD region, and in connexion with the greater utilization of existing capacity. Our main conclusion for 12 projects are as follows:

3. The production of diesel electrical locomitives in Hakesheir, Turkey, can be approved as an RCD Joint Project. This project is suitable for RCD co-operation and can be profitable if this co-operation is established. In the beginning it could include the setting up of a joint design bureau and co-operation arrangements among several firms in Pakistan and Turkey in the production of components for locomotives. In addition, arrangements may be extended towards production of wagons, shooting locomotives and other railway components. Later on, the three RCD countries can study the electrification of their railways and the production of relevant equipment.

4. The requirements for centrifuges and filters for the chemical sector is only part of the total market demand of these products. We do not see any need for building new factories for the manufacture of these products. It would not be justified from the economic and technical points of view. Some already established capacity for the production of centrifuges and filters, particularly in Turkey, can meet the bulk of the market demand. It is advisable that some specialisation among firms producing these products should be established and the RCD countries should agree on trade arrangements in supplying the market demand of these articles for the chemical industry.

5. The project for manufacturing Sulser Marine Diesel Engines in Pendick, Turkey, can in principle be approved as an RCD Joint Purpose Enterprise. No single RCD country has a sufficient market for these products. It is necessary therefore, to prepare a new feasibility report for this product with a larger contact among RCD countries in its preparation. Co-operation can only be foreseen in the future.

The production of other diesel engines, like automotive diesel engines, tractor diesel engines and various stationary diesel engines already exist in many factories within RCD region. The main future demand for these diesel engines should be met by increased production and extension of existing factories. To meet these

demands regarding various types of diesel engines, it is advisable that there should be some standardisation, division of work and specialisation among the factories within the RCD region. The production of heavy diesel engines for trucks is concentrated in Iran and can meet this country's demand and partly the demand of other RCD countries. The production of light diesel engines is mainly carried out in Pakistan and can partly meet the demand of other RCD countries. The same holds for marine diesel engines and some stationary diesel engines in Turkey.

In addition, we recommend close co-operation among firms producing diesel engines within the RCD region. Those co-operational arrangements can be established by producing many components such as gearboxes, pistons, piston rings, electrical equipment, injection pumps, governors, nossels etc.

Sub-contracting is advisable among the producers of diesel engines and specialised firms which already exist in RCD region in producing of some components. Furthermore, there is a large possibility for trade arrangements using excess capacity and excess demand in the various types of diesel engines within the RCD region, i.e. the use of excess capacity for small stationary diesel engines in Pakistan or Leyland diesel engines in Iran to supply the RCD market.

6. The production of rotating electrical machinery and other equipment for electrical power stations such as: turbines (project No. 12), large boilers for grid power stations, (project No. 11), and transformers are non existent in RCD countries at the moment. Due to a large consumption of equipment based on long term forecast of demand it is advisable that the production of this equipment should be established in the RCD region. There is an insufficient market in any one of the RCD countries for heavy electrical equipment, but the demand of the RCD countries together indicates that the establishment of an economical capacity for this production would be beneficial. We propose that a detailed feasibility study be prepared for the establishment of generator production, production of turbines, (hydro-steam and gas), for the production of large transformers and other necessary equipment for power stations. It is necessary that the three RCD Governments declare a joint interest in such a study and agree on the preparation of a joint feasibility study. Existing feasibility studies and documentation will be useful for easier preparation of a joint feasibility study. There is a genuine chance on an RCD agreement in setting up the production of turbines, etc. in Turkey, Iran and Pakistan. UNIDO can give technical assistance in the preparation of such feasibility report.

7. Regarding the project of oil drilling and refinery equipment, it is not advisable to set up a RCD joint project or co-operation in this field due to the limited market and specific technical requirements. Regarding refinery equipment, it is recommended that plates of 40 mm thickness be produced in each RCD country together with equipment for the chemical and food industry. For heavy technological steel structure, medium and heavy plate work, combine with tubes or mechanisms can be built as RCD joint projects. Consequently, co-operational arrangements in the production of various refinery equipment among the RCD countries is possible and recommendable.

8. The production of boilers, excluding high pressure, low and medium pressure vessels and steam heating appliances is suitable for the domestic market in each RCD country and an adequate capacity already exists or is under construction. We do not propose consequently the establishment of a joint RCD project in this field. However, we would like to propose that some co-operation be established by trade agreements in the production of boilers, pressure vessels and steam heating appliances within the RCD area, based on excess capacity and excess demand which may exist at various periods for various types of the above products.

9. The production of pumps and compressors already exists in all three RCD countries, some of which are still under construction. The capacities are mainly for hand and other smaller pumps and compressors. There is large demand and import of pumps for the chemical industry and large compressors (over 250 m^3/hr.). We propose that the RCD capacity for the production of large pumps, special pumps for the chemical industry and compressors be established on a joint basis among the RCD countries. Furthermore, it is necessary that co-operational arrangements and specialisation among the various producers of pumps and compressors be established within the RCD region.

10. The plant for the production of industrial valves can be established as an RCD project from the economic and technical point of view. It is recommendable that all RCD countries produce small non-ferrous valves, small and medium size low pressure water valves from cast-iron. Other valves can be economically produced only in Iran (due to a large market) or under an RCD framework agreement, so we propose that this project be very suitable for a joint RCD enterprise.

11. We find that special projects for the production of pumps for the chemical industry will not be acceptable from an economic point of view, but we propose that this production be included in the RCD joint project for pump and compressor production. Together it may become a profitable venture.

12. The production of large size boilers for grid power station is a specialised production utilising specific equipment and technical characteristics. We propose that other equipment for grid power station be produced in [illegible] joint venture. It can be done in co-operation with foreign firms who will supply the domestic producers with large sized boilers. This project should be considered together with projects for heavy electrical equipment.

13. The feasibility report on the manufacturing of hydraulic turbines in [illegible] entities is well prepared. It could be the basis for an [illegible] study in the production of electrical equipment. We propose that the production of turbines for the [illegible] region be considered together with the production of other equipment for electrical power stations. We do believe that more suitable solutions would be found for the [illegible] countries and the main proposal of this project could be realised. We proposed under point 6 of this conclusion that, with [illegible] technical assistance, a joint detailed feasibility study be prepared for the production of generators, turbines and large transformers in the [illegible] regions.

14. In addition to the above 12 projects there is a large possibility of co-operation among the existing engineering industry capacity based on technical and economic suitability and inter-relations. There are many economic advantages in using larger market, improving the supply of intermediate goods and components etc. This co-operation is particularly advisable among the large newly established plants like Lendhi Machine Tool Factory, Tetila, Heavy Mechanical Plant, Tekstil and Arsh Machine Factories, ETK and others. We have indicated the most suitable fields for co-operational arrangement and specialisation in the production of:

- agricultural machinery
- machine-tool production
- automotive industry
- earth moving equipment
- various machinery for the processing industry (machines for the food and sugar industry, textile, chemical, cement industry, etc.)

Furthermore, there is a possibility for co-operation in the production of telecommunication equipment, steel pipes, ship-building, home appliances, electronic products and office equipment etc.

1[illegible]. The realisation of the production programme for many of the 1[illegible] mentioned projects, is closely linked with existing capacities and with the increase use of capacity in newly established factories. The realisation of the national policy of each [illegible] country regarding heavy engineering industry, the use of capacity and increase of efficiency and competitiveness in the market, largely depend on co-operational arrangements within the [illegible] region among the 1[illegible] projects mentioned and other factories in the [illegible] region, and with foreign firms. In our study we pointed out a many technical and economic factors which could be sufficient for the three Governments to choose firm and decide on adequate steps for the setting up of co-operational arrangements for the various projects, factories and production. In some cases the arrangements between two of the [illegible] countries would be suitable.

The co-operational arrangements are large and of a long-term nature with specific characteristics if they were based on a regional basis. In order to follow a more comprehensive study of the various projects and production for co-operation in the [illegible] region including detailed technical arrangements), it is necessary that the three Governments should decide and decide where a further study by specialists should be undertaken. On the basis of a decision and the request of the [illegible], [illegible]IDO could give technical assistance for the next phase of the studies on co-operational arrangements regarding the heavy engineering industry among the [illegible] countries.

PART III

ORGANIZATIONAL APPROACH TOWARDS CO-OPERATION IN THE ENGINEERING INDUSTRY IN THE ECD COUNTRIES

PART III

ORGANIZATIONAL APPROACH TOWARDS CO-OPERATION IN THE ENGINEERING INDUSTRY IN THE RCD COUNTRIES

CHAPTER IX

INTRODUCTION: FACTORS AFFECTING THE ORGANIZATIONAL STRUCTURE

One of the tasks of the UNIDO Team was to study the mechanism and to find a suitable organisational structure for co-operation. In this part of our report we shall discuss the organisational aspect of the RCD co-operation and propose a structure and mechanism for immediate co-operation in the Heavy Engineering Industry in the RCD countries.

The organizational structure of economy, the organization of industrial firms and various the business activities have become components of the economic development of every country. The general organisational framework within which firms and economy operate, the legal aspects of the organisation, the financial aspects of business arrangements, mutual obligations between firms, internal organisations of firms, etc., are of vital importance to business. The role of governments in establishing regulations and a general organizational framework is increasing all over the world. The selection of a suitable form of organisation and the devising of an internal organisation is a compound as well as an important subject for economic practice and theory within such a framework. A new approach towards organisation among firms began with the development of technology and regional co-operation as well as with the building up of several economic regions all over the world. The synchronisation of national policies and interests, of legislations and organisational forms and the creation of international principles and practices in economy is already well advanced.

However, international co-operation and the establishing of new forms of co-operation still faces various problems and specific requirements of national

economies and economic interests of the various regions. This is due to the fact that the organizational structure is a susceptible and complex subject, with many other technical and legal factors of an internal and external nature which affect the organizational structure and forms. The complexity is particularly pronounced in the RCD countries due to the specific characteristics of each country, such as the RCD as a specific organization, its stage of development and its very dynamic development of the engineering industry.

Basically, the organizational structure should allow and secure the optimal operation of the industry and each industrial sector, and should stimulate further development. The organization of co-operation should be stable on the one hand but should nevertheless have enough flexibility to respond to the dynamic development and requirements of each sector of economy.

We should like to point out some of the main factors likely to affect the organizational structure, method and form in industry which are very important to the organizational structure of the RCD as far as co-operation in industry is concerned. These factors are: -

(a) The development stage of industry, the technical characteristics of industry, the number and capacity of the firms, their internal organization and contacts, the structure of production, domestic market, etc. In brief, we could call these the technical-economic factors. We have already pointed out that the RCD countries either are, or soon will be, on a nearly equal level of industrial development and that the structure of production and market is similar. They each have a large number of firms with a traditional technique but lack mutual contacts.

(b) The RCD countries have many similarities in their economic system, legislation and regulations. However, they also have many special regulations. Some of them should be synchronized and simplified for the sake of wider regional co-operation and free movement in goods, capital and labour between these countries.

(c) Each organisational structure in industry or its improvement and changes should be made with a proper regard to existing conditions, practices, and established organizational forms in industry. Thus if we wish that an organization should be acceptable or should be implemented we should give due regard to the existing organization, economic practices and the already

established contacts and arrangements between the firms in the RCD countries and with other foreign firms. Besides, in a sound organizational approach the free choice of entrepreneurs, their interests and individuality should be respected.

(d) In addition to the above factors which are so important for the organisational structure in the RCD countries, the specific characteristics of each country should not be disregarded in setting up an organizational structure. The RCD is neither a common market nor a customs union. It is an agreement between sovereign countries to co-operate in economic and other fields, on the basis of each country's interests. Therefore, in any arrangement, these facts should be taken into account. The RCD Secretariat is neither a super-national nor a decision making body.

On the basis of the specific characteristics of the RCD countries, the new inter-regional institutions cannot have any super or intergovernmental fuuctions nor any authority to make decisions on matters which are the exclusive right of each Government. The organizational structure, which is to establish contacts between the firms of the RCD countries, should do it on a business-like basis, by carrying out economic, technical, financial and administrative functions in accordance with the jointly made decisions and suggestions of the three countries and their inter-regional bodies.

(e) Finally, we should like to stress that one of the factors in the organizational approach to RCD co-operation is the structure of economy regarding State and Private ownership, the existing traditions and experience in the organization of Chambers of Commerce and Industry as well as in the various associations. Furthermore, the practice and experience with foreign firms and business partners should be fully utilized in building up co-operational arrangements between the RCD countries. The present achievements, which are due to the use of modern organization in business, and available technical facilities and principles of rationalization should be included.

Having analyzed the existing situation regarding the structure and the organisational forms in each RCD country, the established contacts and business arrangements between industrial firms and their level of internal organization, we could conclude that the study on the approach to the organizational structure should start with preliminary functions and initial forms of organization in co-operational arrangements. It is necessary to build up a regional organization by means of which

large firms and individual entrepreneurs could establish contacts, have discussions on mutual problems and interests and make business arrangements in line with the present economic policy and existing level of production development in the various fields of engineering industry in the RCD. However, any advanced organizational forms which do not correspond to the existing situation in the RCD or else are not suitable from the technical or judicial point of view would only bring confusion, endless difficulties and uncertainty in the co-operation of the Heavy Engineering Industry. An organizational structure should be so conceived as to stimulate and speed up co-operation in the RCD countries.

Finally, we should like to state that co-operation in the Heavy Engineering Industry in the RCD region is a long-term process which is in its first stages of development, and this should be taken into account when making a basis for the establishment of contacts and business arrangements between firms and entrepreneurs.

CHAPTER V

PRESENT ORGANIZATIONAL STRUCTURE OF RCD AND ITS EXPERIENCE

It is not our aim to describe either the RCD agreement or its organizational structure. It is sufficient to mention the main bodies responsible for industry and economic co-operation in industry. The highest body is the RCD Ministerial Council composed of the Ministers for Foreign Affairs of the three countries. There is a Regional Planning Council composed of representatives of the State Planning Organisation. These two Councils usually have meetings twice a year. Then comes the RCD Secretariat as a permanent institution of the RCD headed by the Secretary General. In the RCD Secretariat each country is represented with an adequate number of deputies of Secretary General and Directors. The RCD Secretariat does not have any technical staff for any branches of industry. To deal with the subject of industrial development there is the Committee of Industry which usually meets 2-3 times a year. Each country delegates members to the meetings of the Committee of Industry. To analyze some substantial and technical questions the Committee has established the practice of ad-hoc groups of experts to prepare recommendations for the Committee of Industry. Moreover, there is the RCD Chamber of Commerce and Industry with a limited number of members, limited financial resources and limited activities. The most important achievements in the organizational structure of the RCD co-operation are the joint purpose enterprises. The RCD Ministerial Council has adopted, from the very beginning, the joint purpose enterprise scheme to co-operate in the development of industry. There are already several industrial sectors and plants where joint purpose enterprises are established and are partly in operation. The joint purpose enterprise scheme will be dealt with later on in this report.

As we emphasized earlier, the RCD is not a typical regional organization with the characteristics of an economic union, nor economic aims or a customs union or any other form of super national economic regional organization. The RCD is based on a large co-operation and the realization of the interests of each country in various fields of economic and social activities on a mutual agreement basis

and on contracts between the RCD countries. These main characteristics and functions of the RCD affect its organization and activities.

The RCD has been developing wide activities in various fields. It took many necessary steps to initiate and start co-operation in many fields of the social and economic sector. Many industrial projects have been identified as suitable for co-operation; for some have reached an agreement and others are already in operation. A large and ambitious programme of joint purpose enterprises cannot be carried out in such a short period without adequate preparation in and between each of the RCD countries, including the devising of an organizational structure.

First of all, the RCD Secretariat has not been adequately equipped for such a large and complex function as is the co-operation in industry, especially with technical staff. Secondly, there is a gap between the present RCD organization and activities within the Government framework and those organizations and activities dealing directly with business arrangements and co-operation in practice. Within the RCD administrative structure (Council, Committee, RCD Secretariat) except for the joint purpose enterprise scheme, there is no adequate institution, regional business organization, association of producers or any kind of contacting organisational structure for entrepreneurs in the RCD, which could implement decisions and recommendations of the RCD bodies. This lacking organization should be the one to initiate and work out the new co-operational arrangements.

To illustrate the existing gap between the government inter-regional institutions and the non-governmental business organizations in the RCD, we should like to use the data of growing governmental and non-governmental institutions in France and Germany during the period of 1950 to 1965.

Trends in Franco-German International (Regional), Government and non-Government organizations.

Year	International governmental Institutions		Regional non-governmental Organization	
	Newly created	Existing Total	Newly created	Total
1950	4	13	35	269
1951	1	14	46	309
1952	1	15	43	352
1953	1	16	32	388
1954	2	18	25	420
1955	2	20	28	445
1956	0	20	30	473
1957	5	25	51	524
1958	5	30	65	589
1959	3	33	89	678
1960	1	34	62	740
1961	2	36	53	793
1962	2	38	32	825
1963	2	40	34	859
1964	0	40	18	877
1965	0	40	13	890

(Sources: Journal of Common Market Studies, Vol. IX, No. 2, Dec. 1970)

It is observed that non-governmental (business) organizations, established across national frontiers in these two countries, have been growing in number at a higher rate than inter-governmental organizations, and that the ratio in 1965 was 890 non-governmental to 40 governmental regional organizations.

Thus, we can conclude that the lack of inter-regional business organizations maintaining contact between firms and the lack of institutions to bring together the entrepreneurs, has affected the realization of many useful recommendations of the RCD and has had an adverse effect on the efficiency of the work of the numerous meetings of the various RCD bodies during the last 7 years. We can also observe that there is insufficient contact between the various RCD bodies and industrial institutions, industrial firms and especially with private entrepreneurs in the RCD region. In the various RCD meetings representatives of firms did not participate and the RCD was unsuccessful in mobilising the private sector for co-operation. Moreover, there is not enough preparation for a more considerable co-operation in plan harmonization, trade policy and current measures of economic policy.

In analysing the experience of the RCD we can obeerve that the organizational structure is not adequate for its complex functions or to carry out regional co-operation. In addition many new requirements of industry and some large new firms urgently need a regional market, and co-opsration in this field is bringing about fast ohanges in the prsent situation of industry in RCD. New subjects and a new approach to oo-operation are a result of the teohnical and economic characteristios of the engineering industry, based on the need of these firms to use capacity and to increase production and efficiency. This is fully in accordance with the national policy of each country.

Theee firms oannot develop euccessfully without co-operation and specialisation within a national, regional or world framework. Consequsntly, the question of a new organisational struoture in the RCD is dictated by ths economy of the large industrial firms as a preoondition for a more efficient operation. It doss not depend on the wishes of individuals or institutions.

A further development of the engineering industry in the RCD countries and the eetablishment of new firms or expansion of existing firms, calls for a permanent oo-operation. Technical, economic and organizational questions will beoome more and more important compared with administrative functions. In this eituation the RCD should be ready to meet this ohallenge and the RCD Secretariat equiped with a tsam of experts and representativee of business firms.

The present organisational structure of the engineering industry in each oountry, particularly the position of ths firms in the economic syetem, thsir mergers, domestio legislations, internal organizations of the firms and their mutual oontacts in oo-operation, would be advantageous for an advanced organizational struoture of oo-operation in the RCD. Although the thres oountries are mainly practising a free sconomio eystem, the rols of the Government and its institutions in some of the activities of the firms is considerable. For instanoe, the oo-operational arrangement with foreign firms, decisions for investments, some export/ import arrangements of the firme, are subjeot to the approval of the State administration or banks under State oontrol. Thus, we should not underestimate the role of Governments and their administration in each of the RCD oountries dealing with the new RCD organisational struoture. For instance, a less protective Government polioy of domestio firms will enoourage merging and oo-operation between firms. Export facilities in the RCD region for some of the produots will also etimulate oo-operation. Some businessmen are waiting for theee measures from the RCD oountries to oome into force.

The internal organizations of the firms and their mutual relations, with a few exceptions, are traditional, old fashioned and with many autocratic characteristics. The co-operation between firms in the countries, their specialization, sub-contracting or merging are still in the initial stages of development, and this state of affairs is particularly unfavourable for RCD co-operation. By enforcing domestic regulations and policies each country would thus encourage co-operation, specialization, sub-contracting and merging of firms within the country.

Experience of domestic firms could greatly contribute to RCD co-operation through co-operation with foreign firms. Each CD country has a large number of foreign firms who have been operating in the country for longer periods in the engineering sector. This experience could be useful. However, we should like to emphasize that long term agreements, based on co-operation with domestic firms using domestic capacity would be much more favourable than simply the buying of a license or making short-term arrangements. With the fast development of some of the engineering firms, the RCD countries are able to make arrangements on a greater scale with foreign firms on a joint venture basis. The national regulations of each RCD oountry regarding foreign firms, the capital investment, the operation, payment of interests, financial and credit facilities, labour and judicial regulations, taxation, eto. could be a good basis for drawing up regulations for similar activities among the RCD countries. With a few adjustments these regulations would be suitable for larger co-operation between firms within the RCD region.

Finally, we would like to state that much of the present experience could serve for setting up a future organizational structure for co-operation in RCD.

1. Joint Purpose Enterprise Scheme

One of the most important achievements of the RCD is the agreement on a joint purpose enterprise scheme with general criteria for establishing a joint purpose enterprise. At the same time the RCD agreed, in principle, that some of the projects in the engineering industry should be established as joint purpose enterprises. The 12 projects which are the subject of our study are only part of a large number of projects which are still under consideration in the RCD countries. Thus, in addition to the 12 projects which have been discussed in detail in the first part of our study, we should like to mention that for a few other projects in the engineering industy agreement on a joint purpose enterprise is either reached or under oonsideration.

In the other fields of industry, especially in jute mills, paper mills, various chemical projects, metal sectors, oil fields, etc. there are many RCD joint purpose enterprises under implementation or under consideration.

Since we considered the experience of joint purpose enterprises in our preliminary report (page 109-118) we should like to make a short review on the joint purpose enterprise scheme in the RCD countries.

The RCD Council of Ministers, at its Sixth and Seventh Sessions held in 1967, in Ankara and Islamabad respectively, reiterated the importance of the joint purpose enterprise and expressed the view that the establishment of large, complex and sophisticated industries on a regional basis would have very significant economic benefits.

The RCD Member Governments have agreed that the following criteria should govern the establishment of joint purpose enterprises:

i. Products of such enterprises established in a particular country should be sold to other member countries at internationally competitive c.i.f. prices.

ii. The joint purpose enterprises should take all necessary measures to ensure an acceptable quality and standard for its products.

iii. In determining the projects for regional development, priority should normally be accorded to the establishment of such industries which require a market larger than any one member country can provide to ensure economic production.

iv. As far as possible, the technical know-how and personnel required for developing and running joint purpose enterprises should be secured from within the region.

v. Within the broad concept and spirit of Regional Co-operation for Development attempts should be made to try to secure over a period of time, a reasonable share to each member country of the benefits that would flow from the establishment of joint purpose enterprises.

vi. Attempts should be made over a period of time that the allocation of projects to member countries is made in such a way that the flow of the products of joint purpose enterprises among the RCD countries is approximately equal in value. This principle should apply not only to joint purpose enterprises which had already been approved and/or approved in principle, but also to those for which studies are underway.

vii. Arrangements should be made to incorporate approved joint purpose enterprises in the national development plans of member countries which will be reviewed and modified for the purpose, from time to time.

viii. The RCD countries, while establishing industries, should take full note of the Ministerial Council decisions and/or provisions of the Memorandum of Understanding reached in respect of approved joint purpose enterprises.

The long-term commitment regarding the selling phase of the products is one of the most important features of the scheme. It is meant to make joint purpose enterprises attractive to investors. A secured market can be an important factor in facilitating planning of production and reducing investment risks. The size of the new trade flows may in certain cases provide an impetus to transport industries to streamline their facilities or review their freight rate policy.

Another feature, namely, the condition to make supplies at internationally competitive prices and acceptable standards offer certain definite advantages and some problems. The principal advantage being that it does not force the importing country to contribute towards the cost of industrialization of the partner country to contribute towards the cost of industrialization of the partner country where the enterprise is located, as it is open to the importing country to obtain its requirements from third countries in case the price offered by the partner country is higher than the international price. Since the country where the enterprise is located has to bear the cost of trade diversion (in terms of the difference between its costs and the world market price) it is generally much easier for the importing country to agree on the location of the industry in the partner country. However, the production costs in the RCD countries are frequently higher than in industrialised countries which tends to preclude the prospects of exports at internationally competitive prices. The factory prices index, if the c.i.f. price is 100, will be 130-160 in the RCD region for many engineering products.

The RCD countries so far have not granted any special privileges or concessions to the products of joint purpose enterprises by offering reduced tariffs or relaxing import controls. The exchange of the products of joint purpose enterprises is generally subject to the stringent conditions of internationally competitive prices and acceptable standards. The grant of tariff preferences - in the form of lower duty-free access to the whole regional market - can substantially increase the scope of the scheme and fundamentally improve its potential and prospects. Lower

duty or duty-free access to the regional market would improve the competitiveness of the cost production and make the scheme of joint purpose enterprises extremely attractive to the private sector whose interest in the scheme has not yet been aroused to the desirable extent. The RCD Agreement for the Promotion and Operation of Joint Purpose Enterprises contains provisions envisaging the modification of "import/export rules and regulations". The customs tariffs on which preferences would be granted can be treated as a rule relating to imports. The scheme of tariff preferences - in the form of lower duty or duty-free access to the whole regional market - can therefore be put into effect within the terms of the existing agreement. This has to be accompanied by the removal of quantitative restrictions and other import controls.

The arrangements made so far do not visualise any tariff protection against import from outside the region, though the RCD Agreement for the Promotion and Operation of Joint Purpose Enterprises contains general provisions which can be utilised for amending the national import regulations and introducing protection against imports from third countries.

At the end we can say that the joint purpose enterprises scheme is not exploited enough in the RCD co-operation and there are many possibilities for further implementation. To meet further RCD requirements, the joint purpose enterprises framework should be given more regional characteristics. In specific situations, joint purpose enterprises should take forms which are able to bring greater efficiency on a regional basis. Joint purpose enterprises should deal more with foreign firms than at present and become more attractive to entrepreneurs.

Some of the already approved principles and provisions regarding the joint purpose enterprises should be implemented or stipulated by the RCD Governments. Special attention should be paid to diffusing more information about joint purpose enterprises, especially among private business and potential investors.

One of the reasons why the joint purpose enterprises scheme has not yet spread to the private sector, is because there are no preferences in economic policy measures for co-operation (under joint purpose enterprise framework). Indeed, businessmen want preferences and practical measures for removing barriers to co-operation. It seems to us that faster spreading of co-operation in the private sector depends largely on such preferences and incentives granted by measures of economic policy.

As already mentioned, the joint purpose enterprise scheme was not used sufficiently. This scheme is mainly related to new investments, to the establishment of new enterprises and to purchase warranties for these new enterprises. The development in the engineering industry is well advanced and requires new and larger schemes for co-operation under the EC framework. We should, therefore, like to suggest that the joint purpose enterprise scheme and agreement among the EC countries should be revised and enlarged in the line with the new requirements of economy. First of all the joint purpose enterprise scheme should include all types of co-operation.

It is necessary that some of the principle of joint purpose enterprise scheme should be extended to all co-operations, arrangements in industry, especially to the articles of the Agreement on Promotion and Protection of Joint Purpose Enterprises regarding the modification of current rules and regulations, Article I, item 4 of the EC Agreement on Joint Purpose Enterprises, Article II, item 1 on Employment and Article 3, regarding the duties of the EC countries in connection with import export rules on import of machinery and equipment where the joint purpose enterprise scheme is approved. Furthermore, some new elements should be included in the joint purpose enterprise scheme that would encourage the private sector to join the co-operation. It is also necessary to simplify the foreign exchange regulations in order to facilitate the co-operation as well as the procedure of the joint purpose enterprise scheme and give more practical performance to entrepreneurs. We believe that a more detailed study of the present joint purpose enterprise scheme as well as amendments for its improvement would be beneficial for further EC co-operation.

CHAPTER XI

DISCUSSION ON SUITABLE ORGANIZATIONAL STRUCTURE FOR RCD CO-OPERATION IN ENGINEERING INDUSTRY

Our approach to the organisational structure in the heavy engineering industry in the RCD is based on co-operational arrangements from the technical and economic points of view. We have already indicated in previous Chapters that many large firms could make full use of their capacity and increase efficiency only with wider markets, co-operation, specialisation, sub-contracting, etc. Also, in view of the specific characteristics of the RCD countries, the inter-regional organisation should deal and operate in accordance with the national policy of each country or a joint policy formulated by an appropriate RCD Council. This would mean that the new organization in business would be mainly commercial, technical and financial with additional training and research, etc.

A third point regarding the approach to the discussions for a suitable organisational structure is related to the type and scheme of the organisation. It is known that there are no general schemes for an organisational structure of regional co-operation. The organisational forms of regional co-operation range from ad-hoc bilateral collaboration in one project to complex multinational undertakings. A regional co-operation scheme may embrace a wide spectrum of activities, from joint feasibility studies or services programmes to the long-term development ideal, conformity in national plants, etc. The short history of economic integration in developing countries demonstrates many highly ambitious projects that have only remained at the planning stage. A detailed analysis of these failures will show that the causes were lack of flexibility, insistence on general schemes and neglect of the obstacles which have to be overcome in any potential joint venture. Co-operation in industry covers the successive stages of production and promotes the exchange of a wide range of semi-manufactured and manufactured raw materials. It also promotes the application of similar technological processes in the industrial enterprises of two or more countries and the construction of new division of labour. Between these types of co-operation there are various forms and degrees of joint operation, joint ownership and industrial partnership. By various criteria we can further classify the arrangement for industrial co-operation on production and

technological arrangements, investment arrangements, then bilateral and multinational arrangements with various institutional characteristics. Also marketing arrangements (providing the use of the sale and service facilities of other enterprises, for an enterprise, or for the establishment of a joint marketing network), specialization agreements, technical services arrangements (for joint maintenance and repair services), joint design research or standards activities in specific fields, sub-contracting arrangements, joint ventures, establishing of subsidiaries in partner countries which are more or less independent in relation to parent enterprises, establishing of corporations with equal participation of partners in capital and jointly owned subsidiaries, joint ownership in companies with non-equal participation of partners, mixed companies with agreed or an equal share of partners share-holding companies among several firms, public companies with agreed shares, etc.

We should like to emphasize that each RCD country has a commercial law and other regulations regarding the type of company which could be set up in the countries. Thus, for example, businesses and entities defined by the Iranian national code are: joint stock company, limited liability company, general partnership, partially limited partnership with shares, proportianal liability partnership, co-operative association and joint stock company.

In Turkey there are five types of commercial companies defined by Turkish commercial laws: collective company, commodity company, limited company, anonymous company and cooperative.

We have explained the types of co-operational arrangements in the Preliminary Report (pp. 13) as well as some experiences on regional co-operation in South America and Africa. For the study on the organizational structure of the RCD the types of co-operation which are important will be mainly in national firms or production units or future organisational institutions dealing on regional bases. Under the joint purpose enterprise scheme the RCD countries have agreed that a joint purpose enterprise can be undertaken in various forms such as joint ownership, either in the public or private sector, ownership by one or more countries for providing supplies to the other, establishing production facilities in one country for which raw materials are produced in another, and long-term purchase arrangements based on productive capacity in any of the countries. Also all the RCD countries have special regulations regarding foreign firms, their investments and operation. These regulations are usually well known as they are published in the Investment Guide for each country. Books like "Investors Guide to Iran", "Guide to Investment in

Pakistan" and "Investment Guide to Turkey" contain the laws governing investment policy toward foreign investment, procedure for establishing enterprises, taxation preferences, remittance of profits, labour regulations, banking and infra-structural facilities, etc.

Respecting the national law of each country, the relations between the regional institutions must be based on the independent position of each national enterprise as far as possible. Co-operation and decision making will be based on mutual agreement of the representatives of each country in the inter-regional institutions or on an agreement of each production unit and its representative.

Any co-operation on a regional scale is closely linked to national economic policy and involves some aspects of national sovereignty, inter-regional rules, discipline, techniques, etc. Although RCD is not a supra-national institution, the co-operational arrangement could not avoid synchronizing national interests of the RCD countries and the project bringing benefits to all of them. In the present RCD organizational structure the RCD Planning Council and the RCD Ministerial Council can make the necessary proposals and decisions in the name of the Governments, in the synchronization of co-operation in the area of sovereign rights of each country, in the areas where national policy and development are involved. It includes also the principles under which co-operation should be established, particularly regarding development policy, foreign investment policy, trade policy, protection of regional industries, etc. It will contain some rules and regulations for the necessary discipline in implementing regional co-operation.

In order to carry out the co-operational arrangement, it is necessary to deal with many technical, financial and commercial subjects. This is the area of techno-commercial agreement and operation, mainly concerning practical problems of economy of each RCD country, such as the use of capacity, increased efficiency and competitiveness, standards, specialization, etc. This area needs a new regional organization suitable for dealing with and implementing regional agreement in various engineering sectors for various products, realizing national and firm interests in all aspects of technical and economic matters of regional co-operation

The organizational structure must be in harmony with conditions in the RCD countries and must respect present experience and practice. The present experience in co-operational arrangement with foreign firms is very extensive in each RCD country and should be respectod and used in setting up an organisational structure and venture among the RCD countries. There are many foreign firms operating in the

RCD region, in trade and various commercial arrangement rather than in the technical fields, in joint venture or other production arrangement. We should like to add that the regulations governing foreign investment are stimulating and favourable for the RCD arrangement. We believe that co-operation and partnership among domestic firms of the RCD region could contribute to a larger joint venture with foreign firms.

Finally, the organisational structure of the heavy engineering industry must be appropriate to fit the various groups of this complex sector.

Having explained all general and specific factors affecting the organizational structure and forms and particularly the above-mentioned approach to the organization, we should like to discuss a few possibilities which could be the basis for the RCD organizational structure in the heavy engineering industry. This, will, of course, be an additional proposal to the existing organizational structure including the joint enterprises scheme.

1. The new organisational structure in the heavy engineering industry should foresee some changes in, and improvement of the existing RCD institutions. As this is not the purpose of our study, we should only like to mention that overall successful operations within the RCD structure also depends on the relation between the RCD Secretariat and other RCD bodies, on business firms and the capabilities of the RCD bodies, particularly those of the Secretariat to meet large and complex requirements of co-operation. In connexion with these we should like to propose that it is necessary to change some of the functions of the Committee of Industry. We should like to propose that the planning function of these committees be strengthened or that special sub-committees on plan harmonisation be established. The industrial sector of the RCD Secretariat should be strengthened with technical personnel. In the industrial committees and in some of its bodies, representatives of business firms and business institutions should be included.

We should also like to point out that the RCD Chamber of Commerce and Industry should be more active and should be financially and technically strengthened. It should carry out the task laid down by the establishing of this institution. In addition to the above-mentioned suggestions as preconditions for successful operation of the RCD, we should like to suggest that the State Plan Institution and other departments dealing with industry in its work an alalysis of implementation of national policy and in the analysis of the development of industrial firms, should include the RCD approach on how national problems could be solved and goals reached regarding the RCD market and co-operation.

2. The present RCD arrangements and commitments cannot be carried cut to meet deadlines or demands as there is no commercial institution willing to work on a co-operational arrangement. Although there are many commercial institutions, trade companies, representatives of foreign firms and trade agencies, not one is specialized to carry out work under a co-operational arrangement in industry in the RCD. It could be that the volume of trade is not sufficient to attract the attention of trade capital and businessmen. However, the present agreement under the joint purpose scheme as well as the future co-operational arrangement depend to some extent on trade facilities which should be undertaken by specialized firms in each RCD country. It is not our task to deal with the organization of trade yet we should like to emphasize that in the present stage of development of the heavy engineering firms, these firms are not capable of successful trade-dealing. We are of the opinion that the establishment of one regional trade agency with independent subsidiaries in each RCD country will be very useful for overall trade development in the RCD, particularly in supporting and stimulating RCD co-operation in the engineering industry.

3. In some documents of the RCD and in the Terms of Reference of the UNIDO study it was mentioned that the establishment of the RCD heavy engineering corporation(s) should be analyzed. We should like to discuss this advice more thoroughly. After having studied the heavy engineering industry (particularly some of the larger firms and in view of the already large range of production units, including various types of ownership, various license standards, measurement and contracts with foreign firms), the establishment of a corporation for dealing and solving the existing problems on future development of heavy engineering industry in the RCD countries is premature. If a single RCD body could deal with general subjects of mutual interest to the RCD counties' heavy engineering sector then the setting up of a corporation is not necessary. A corporation is usually a business institution dealing, in practice, with economic, technical, financial and other subjects. In analyzing the establishment of a corporation we come to the conclusion that the very high diversity in the heavy engineering industry cannot be solved in the present stage of development of industry through a RCD corporation for the heavy engineering industry. However, we do agree that there is a common problem related to the heavy engineering industry which should be discussed and solved on an inter-regional basis and which is a precondition for a successful development in this industry. We should like to propose that such problems should be solved through the existing RCD structure, primarily by the committee for industry.

We should also like to suggest that since the RCD countries are particularly interested in the development of the heavy engineering industry that a special permanent sub-committee for heavy industry should be established within the present framework of the Committee of Industry. We believe that such an organizational form could be suited for harmonization of activities in each government. The representatives of heavy industry, particularly the new inter-regional organization should participate in this sub-committee. It could improve its co-operation and solve more easily the many mutual problems related to the national and international level. Consequently, our suggestion is that the setting up of an RCD corporation for the heavy engineering industry is still premature.

If we were to discuss the question of how many and what form of corporation and in which sector of the heavy engineering industry they should be established, we would then like to stress that many factors are involved in the setting up of such corporations. In addition to the fact that the heavy engineering industry is still in the first stages of development, many large firms in this sector have no adequate contacts with the various firms in the engineering industry within the country and the contacts in the RCD region are on a very low level. There is not enough preparation, either on the national level regarding suitable measures of the economic policy, or on the plant level regarding production programmes, standardisation, quality control, etc. Furthermore, some of the large firms which would be suitable for co-operation under the inter-regional corporation are still in the construction stage or on trial production; their financial situation does not make them suitable for inter-regional integration in an RCD corporation. Although our standpoint with regard to the establishment of an RCD corporation is that we are in prinoiple favourable towards it, the matter is too premature for discussion. However, although we are against the establishment of RCD corporation for the present, we would nevertheless recommend that necessary steps be undertaken immediately to ensure that such corporations will be established in the future.

From the above explanation and conclusion, other subjects related to the establishing of an RCD corporation such as management and control, financial and organisational subjects are not for the present in the foreground, but we should nevertheless like to outline some ideas. The establishment of a corporation depends on the subject it is to deal with and on the function it has to discharge. At the moment we can foresee two types of corporations suitable for the RCD region, one which could be established on the basis of the existing industry. The main function

of this corporation would be to deal with present problems and the development of the existing production unit and capacity in the heavy engineering industry. The corporation should mainly deal with the harmonizing of the production programme, specialization and marketing, technical assistance to firms, setting up a joint venture with foreign firms, also with standardization, research and other scientific subjects. For establishing such a corporation large financial resources will not be required.

Management and control should be totally based on equal representation of each RCD country and decisions should be made on the unanimous agreement of the representative of each country.

The second type of RCD corporation could be established for dealing with new investments and establishing new production units within the RCD region. The establishing of such corporations should be made on a formal request from the Government and on their wish to participate in investments and eventually to co-operate on production. This type of co-operation should be more centralized as it will require larger capital, larger international and interregional activities, etc. This type of corporation will be suitable for only a limited number of groups of heavy engineering plants like those setting up production of heavy electrical equipment, refining equipment, nuclear power plant, etc.

Thus, we can conclude that in the establishment of a corporation for heavy engineering the emphasis should be on the preparatory functions so as to create favourable conditions on both the national and plant levels for the successful operation of such an enterprise.

4. Looking at the structure of engineering firms in the RCD we find that there are a large number of small firms, a limited number of medium size firms and a few large firms in each RCD country (see Preliminary Report p. 82). The largest firms are owned by the Government. They have special arrangements with foreign firms or are about to establish new contacts with foreign firms. As explained earlier, these firms are facing serious problems and urgently need a suitable production programme and also need to increase their use of capacity. They have to obtain a market, establish co-operation with foreign firms, etc. All these problems are closely related to RCD co-operation and adequate organizational measures should be taken with regard to these corporations. Since the state-owned sector differs in many aspects to the private sector, we should like to analyse the specific organizational forms of this sector for inter-regional co-operation.

Heavy engineering state-owned firms within the RCD region are mainly organized into large national corporations like the IDRO (Industrial Development and Reconstruction Organization) in Iran, West and East Pakistan Industrial Corporation and the MKEK in Turkey. There are many indications that these industrial firms are suitable for the creation of a heavy mechanical corporation on a regional basis. We are in favour of it, but as explained earlier, without adequate preparation, the setting up of any corporation will be premature and will be like building a house without foundations. We should like to advise that action be taken to start preparations and the process of establishing a corporation bringing together managers and experts of these firms to discuss their problems that are related to production programmes, use of capacities, markets, etc. This will create favourable conditions on the plant level and is the best preparation for establishing a heavy industry corporation. There are many ways in bringing these firms together: A special Committee for heavy engineering industry could be established or a Regional Board for heavy mechanical industry or a preparatory Committee for setting co-operation or corporations in heavy mechanical industry.

Any of the above should include representatives of state-owned firms like IDRO, West and East Pakistan Industrial Corporation and MKEK, also representatives of each Government and representatives of large firms. This body should be advisory, it should meet twice a year and should submit its recommendations to firms, the RCD bodies and to the national Government. Exceptionally, some Decisions regarding technical and economic subjects could be taken by member institutions and firms with the agreement of all members. In our proposal for organisational forms we shall discuss, in detail, adequate forms of organisation for large related Government firms in heavy engineering.

5. Most of the small and medium sized firms in the engineering industry belong to the private sector. Traditionally, they are mainly autocratic and very often organised on a family basis with hardly any contact among themselves. It would not be realistic from any point of view to propose that traditionally independent and individualistic firms form a corporation on a regional or national level. On the other hand, private firms well advanced in technology, with good organisation and contacts with other partners could envisage the possibility of establishing a corporation, or any other type of integration. However, for many private firms a more suitable organisational form would be a joint venture, industrial partnership, joint purpose enterprise scheme and sub-contracting which would involve 2 or more individual firms within the RCD region and with foreign firms outside the RCD region. Bilateral and multilateral forms of organization are unlimited.

The private sector in each RCD country already has the experience of establishing associations and various sub-committees in many branches of industry. We should, therefore, like to propose that the most suitable form for organizing private firms should be by establishing regional associations and groupings of similar producers in branches within the association. The RCD Chamber of Commerce and Industry could play an important role in the establishment of such associations. We believe that these associations would be suitable for bringing together producers of similar goods and attract their interest for an RCD co-operation subject to a favourable and stimulating Government policy, the establishment of an RCD financial institution and other infra-structure facilities. Their contacts through the association could bring about a successful development of many organisational forms under the scheme of joint purpose enterprise as well as some sub-contracting agreement, technological and servicing agreement, etc. An association could carry out, on behalf of its members, special services like providing technical information, market analysis, training activities, research, etc.

There could be many independent associations, and in our further work we shall suggest suitable branches for establishing regional associations for the present. We should like to add that in Latin American countries these associations have proved particularly successful in setting up co-operation in the engineering industry.

6. In the large framework of the possibilities and requirements of an organisational structure in the RCD, some special regional institutions which are necessary and important for the operation of RCD co-operations should be included. Above all, it is necessary to have an inter-regional institution or arrangement for dealing with standardisation. Standardisation is an important technical precondition for successful co-operation and trade between the RCD countries. It is particularly important in this region due to the stage of development, to the various licenses and technical know-how used in the RCD region. In addition, some inter-regional organisation should be established for joint regional research activities, for technical information activities, for quality control, for training activities (such as a regional management school), etc.

We have tried to explain the possibilities of organisational forms which could be suitable for the RCD countries for the present, in addition to those organisational forms which already exist. Our intention was to develop a realistic approach to the RCD organisational structure and to make an introduction to the following Chapter in which we will explain some practical proposals for an organisational structure in the heavy engineering industry and to determine the main scope and approach to the organisational structure as part of an overall RCD co-operation.

CHAPTER XII

RECOMMENDATIONS FOR A NEW ORGANIZATIONAL STRUCTURE FOR CO-OPERATION IN HEAVY ENGINEERING INDUSTRY IN THE RCD

In connexion with our study of the twelve projects mentioned in the terms of reference and their suitability for co-operational arrangements within the RCD framework, we should like to make some proposals concerning organizational structure and forms and other fields suitable for co-operation. Taking into account the complexity of the existing organizational structure of the RCD, our suggestions for its improvement and the specific characteristics of the RCD, we should like to propose the following organizational forms for various groups of Heavy Engineering Industry in the RCD.

1. The project for diesel locomotives should include co-operation among RCD countries, the establishment of a joint design bureau, a purchase guarantee agreement, sub-contracting arrangement, co-operation in the production of wagons and maybe other railway equipment. We should like to propose that a special agreement to co-operate on the above matters should be signed between the State Railways Organizations. We propose that a special Regional Committee or commission be nominated composed mainly of representatives of railways of the RCD countries to supervise the implementation of the main stipulations of the agreement.

RCD co-operation in the production of locomotives and wagons should use the joint purpose enterprise scheme, particularly if this scheme is to be expanded. In this case a Memorandum of Understanding should be signed separately for: -

- production of locomotives in Eskishehir
- establishment of a joint design group or bureau
- co-operational arrangement for the production of components for diesel locomotives including shooting locomotives
- joint study on the future development and electrification of railways.

At the moment Iran is not interested in participating in the production of diesel locomotives but could consider joining the other two countries in the produotion of shooting diesel electrical locomotives, wagons, etc. and in the study on the future electrifioation of railways.

The proposed commission or committee for co-operation in the production of railway locomotives could include representatives of the Governments and could be considered as an inter-governmental organization for carrying out the agreement on co-operation. It is necessary that the expert group consist of experts from railways and factories belonging to railways. This expert group should deal with the practical side of the production and would be responsible for the implementation of the various agreements. Due to the specific regulations related to State Railways this should not be organized jointly with another co-operational arrangement.

2. In the study on diesel engines we propose the Marine Diesel Engines Factory in Pendick, Turkey, as suitable for an RCD project. We should like to recommend this project as a joint purpose enterprise suitable from the organizational point of view. Should Turkey consider our remarks and suggestions regarding this project, it should prepare a revised and detailed feasibility report and the Memorandum of Understanding should be studied by all the RCD countries. The Memorandum of Understanding should include a financial scheme and the participation of other countries including foreign firms, a purchase guarantee, etc. The large shipyards in Pakistan and Turkey should be included in the agreement regarding this project. Also some of the benefits and credit facilities concerning this project should be included in the agreement.

As the joint purpose enterprise scheme is known from the organizational, financial and other points of view, and is already in practice in the RCD Region, there is no necessity for explaining in detail the organizational, management and control functions regarding this project. Organizational forms for co-operation for other diesel engine projects will be proposed later.

3. Production of centrifuges and filters, boilers and pressure vessels, pumps and compressors is included mainly in several existing firms or will be included under construction such as the MKEK in Turkey, the Turkish Sugar Corporation, Taxilla Factory in Pakistan, the Arak Machine Building and Tabris Machine Building Factory in Iran etc. These factories are also the main producers of machine tools and other equipment. We have already pointed out the specific problems facing these factories.

We should like to propose the establishment of a Regional Board for Heavy Mechanical Industry. This Board should first of all include representatives of large State corporations like IDRO in Iran, West and East Pakistan Industrial Corporation, the MKEK of Turkey, the representatives of large factories like the machine tools industry of Karachi and Dacca, the Taxilla Heavy Mechanical complex in Pakistan, Heavy Mechanical Factory Karicals in Turkey, Etimesut Machine Factory in Turkey, the machine factories in Arak and Tabris in Iran, some large private firms like EECO in Pakistan, etc. The Regional Board for Mechanical Industry could include representatives of the government of each country and banks interested in industrial development.

As stated earlier, it is premature to think in terms of establishing a regional industrial corporation and we consider that this regional Board could take steps for preparing the ground for the establishment of a regional corporation for heavy mechanical industry. In the meantime, the Regional Board could help out the abovementioned large industrial firms in making contacts and in co-operating with one another to solve present and future problems. Thus the setting up of a Regional Board is an urgent matter, particularly because the present RCD structure cannot deal successfully with the many technical and economic problems which should be discussed between firms.

The main functions of the Regional Board for mechanical industry would be:

- to discuss and co-ordinate various technical and economic activities and problems of the abovementioned large firms
- to discuss production programmes of factories and better use of capacity
- to deal with co-operation, specialization and exchange of components and intermediate goods between firms
- to make joint analysis regarding domestic, regional and international market
- to synchronize the interests of the firms regarding contract and joint venture with foreign firms
- to discuss future programmes of the firms
- to carry out the necessary joint study and research activities
- to deal with joint training activities

- to discuss and carry out other activities of mutual interest agreed by its members
- to submit to governments and the RCD Secretariat proposals for measures of economic policy related to the development and co-operation in the heavy mechanical industry.

The composition of the Regional Board will, we think, comprise the chief executives and an adequate number of Vice-Chairmen representing each country on a yearly rotation basis. The only fully employed person should be the Secretary of the Regional Board for the Mechanical Industry which could have its seat at the RCD Secretariat. The Regional Board should meet at least twice a year. The Secretary of the Regional Board of Mechanical Industry should deal with all administrative matters, the necessary co-operation in the implementation of recommendations of the Board, the preparation of meetings, the maintaining of contacts between the firms and other RCD and national institutions for carrying out the tasks agreed upon between firms, etc.

The Regional Board for mechanical industry could establish joint commission or a group of experts for dealing with various technical subjects. This group would be composed mainly of experts from factories able to deal with the preparation of some technical subjects and with the execution of the conclusions and recommendations of the Regional Board. This commission or sub-committe could be organised for dealing with marketing, synchronizing the production programs of factories, standardization, training and research activities, etc. The Regional Board for heavy industry would not basically be a decision making body, unless it is on the unanimous agreement of all its members. The main task of this body would be to make recommendations and suggestions to member countries and to related RCD bodies. The recommendations of the Regional Board should be implemented after the approval of the appropriate RCD or government institutions.

We believe that the Regional Board, after gaining more experience, will be strengthened and will gradually enlarge its activities and functions until it becomes a decision making authority for some technical and economic problems of common interest to the firms. This body should cultivate contacts with other domestic as well as foreign firms and institutes.

If this proposal is acceptable to the RCD countries, the RCD Secretariat and the Committee for Industry could take practical steps and responsibility for organising the first meeting of the Board. The RCD Secretariat would closely co-operate with the national institutions like the [illegible], [illegible], and the Industrial Corporations of Pakistan.

With the setting up of the Regional Board for mechanical industry the problem of the organisational forms for co-operation among the main projects in the heavy mechanical sector will be solved; with it the ground will be prepared for setting up of the RCD heavy mechanical corporation in the future.

4. Of the twelve projects under study by the [illegible] team, four of them include production of heavy electrical equipment:

- rotating electrical equipment
- turbo-generators
- large boilers for grid power stations
- mechanical equipment (hydraulic turbines and coupling system).

None of these production units exist, nor are they under construction in the RCD Region. According to some feasibility reports and other studies, the production of the above machinery could economically be organised only on a national market. Therefore, the production could only be feasible if organised on a regional basis. The characteristics of these projects fulfil the requirements of a joint purpose enterprise scheme. However, since all these capital goods (turbines, generators, large boilers and transformers) are part of the equipment necessary for electric power stations and as their technical characteristics and the production schedule are interrelated, we are not in favour of setting up several separate joint purpose enterprises. We would, however, be in favour of setting up one corporation for Heavy Electrical Equipment for all the RCD countries. Since no preparations have been made yet, and there is no complete feasibility report for the production of heavy electrical equipment, we should like to propose that a Preparatory Committee for Heavy Electrical Equipment for the RCD Region be established. This preparatory committee could be organised only if the three governments confirm their interest in joint production of Heavy Electrical Equipment and their willingness to prepare a joint feasibility report on long-term cooperation in this field.

The composition of the Preparatory Committee should include representatives of the three governments, industrial banks of each country and their national institutions responsible for the supply of electricity. The representatives of the RCD Secretariat should also be included in the Preparatory Committee. The RCD Secretariat should provide all administrative and co-ordinational facilities for this Preparatory Committee. The Committee should meet from time to time but not less than twice a year.

The main functions of this Preparatory Committee would be:

- to synchronize various activities of the government relating to production of Heavy Electrical Equipment (power plant equipment)
- to prepare a feasibility report for establishing production of heavy electrical equipment within the RCD region
- to propose agreements to the RCD countries on the main findings of the feasibility report
- to deal with the preparation of a financial scheme for establishing the production
- to propose a suitable mechanism for co-ordination and synchronization between the three governments
- to propose to the government necessary measures for economic policy regarding the establishment of production of heavy engineering goods

The Preparatory Committee should establish close contacts with appropriate national institutions and could apply for technical assistance from UNIDO for the preparation of a feasibility report. The Preparatory Committee should also establish close contacts with national development banks in the RCD countries and with international financial institutions etc.

The Preparatory Committee will be responsible to the Committee of Industry of the RCD and to the Regional Planning Council (RPC) and will submit its report to the RPC at least once a year.

The activities of this Committee in the preparation of the feasibility report should cover the production of large hydro-thermal and gas turbines, the production of large boilers and appropriate therms equipment for therme power stations, the production of hydro and steam generators, the production of large transformers and

other appropriate equipment for power stations.

The Preparatory Committee should make use of all the studies already prepared by the RCD countries regarding this equipment and respect the agreements already made by any of the RCD countries. The establishment of this Preparatory Committee is an urgent matter because of the lengthy preparation for heavy electrical equipment production.

5. For setting up production of industrial valves in the RCD region the most suitable organizational form is the existing joint purpose enterprise scheme. The RCD Region has no production of industrial valves which involves a separate technology with special requirements as far as quality and skill are concerned. There is a large import of industrial valves in all the RCD countries, particularly in Iran. The assortment is so large that any country, with the exception of Iran, can fulfil the requirements of the economic scale in production due to limitation of market. The savings in foreign exchange in all RCD countries would be significant. Therefore, all these factors indicate that to set up a joint purpose enterprise for the production of industrial valves in the RCD would be the best organizational solution.

This production should be organized on a licence with foreign firms. A long-term production agreement would be very suitable for the RCD countries. There are already a few foreign firms interested in setting up such production in Iran. We should like to propose a joint venture. Iran should submit to the other two RCD countries a detailed feasibility report for an RCD project for industrial valves on the basis of co-operation with foreign firms. After the feasibility report is discussed the three countries can sign the Memorandum of Understanding for establishing a Joint Purpose Enterprise. All important subjects could be included in the Memorandum of Understanding under the present scheme of joint purpose enterprise.

6. In the previous chapter we discussed that for many reasons it would be suitable for the RCD region to establish regional associations of producers, particularly for bringing together private dealers and entrepreneurs for closer co-operation. Bearing in mind our earlier explanation regarding the twelve projects and other suitable fields for RCD co-operation in the engineering industry, we

should like to propose that the following associations be established:

(a) regional associations for automotive industry producers.

The production of various cars, trucks, diesel engines, tractors and the various components for the automotive industry belongs to the private sector which comprises many firms in all the RCD countries. The characteristics of these firms regarding production, technology, size, contact with foreign firms, organization, etc., are numerous. The automotive industry is very dynamic from the point of view of development, with a very diversified range of products that makes it highly suitable for co-operation. On account of these factors and the experience of domestic producers in organizing associations, we are of the opinion that a regional association for automotive industry producers would, for the time being, be the most suitable organizational institution for making contacts and starting co-operation in this sector. We should add that similar associations in South American countries have obtained very good results in several fields, associations for the automotive industry are included in these.

The association could be organized in two ways; either with representatives of the existing associations already working within the framework of the Chaber of Commerce and Industry in each country or else through the direct representation of the main producers of those firms interested in RCD co-operation. In In either case the RCD Chamber of Commerce and Industry should play a very important role in the formation of associations for the automotive industry. The experience of other inter-regional associations should be fully used.

On account of the complexity of the automotive industry, we should like to propose that a regional association for the automotive industry be set up, consisting of a committee presided over by a president and an adequate number of vice-presidents and a specialized section for various groups of production such as diesel engines, cars and trucks, tractors and earth moving equipment.

The association could have separate export groups or a sub-committee to deal with subjects of mutual interest to all our producers like: marketing, research, production of gear boxes, production of electrical equipment for motor cars, etc.

The function of this association would be to deal with subjects of mutual interest to its members. The association should make recommendations to national associations, to the RCD governments, to the RCD Secretariat and other RCD bodies.

The association would particularly support co-operational arrangements and sub-contracting and purchase agreements within the RCD Region. Further associations will analyse obstacles to regional co-operation, particularly regarding national policy and regulations and make proposals and suggestions to appropriate RCD and national institutions for the removal of the obstacles.

The association will operate within the framework of the RCD Chamber of Commerce and Industry.

The association could play an important role in organising contacts between producers of the RCD Region, in influencing policies of the three RCD countries for co-operation, and initiating some other organisational forms between the various partners in the production of motor cars. For instance, producers of diesel engines could very soon establish co-operation and achieve some higher forms of interregional organisation.

The establishment of this association and its sections according to specialised branches could cover, from the organisational point of view, some of the twelve projects (like diesel engines) and other new fields related to this industry and identified as suitable for co-operation (like agricultural machinery and earth moving equipment).

(b) The second RCD association we propose is the RCD association of producers of processing equipment.

One of the largest and most complex fields which we identified as suitable for co-operation is the production of machinery and equipment for the various industrial branches such as the food and sugar industry, the chemical industry, the textile industry, the cement industry, the

oil industry, tea processing equipment, etc. This is called processing machinery and equipment.

As explained earlier, the production of some of the above quipment is well advanced in the RCD Region particularly in the chemical industry. The establishment of contacts between producers will be very useful for further development of production in many existing firms. Competition from abroad in this field is considerable and contact among producers in the RCD countries will result in an increase of production and competitiveness on the market. As the processing industry covers many industrial branches we shall be faced with a dillema of should one association be established or should several associations be established on a regional basis and distributed according to branches? For example, the regional association of producers of equipment for the food and sugar industry, the regional association of producers of equipment for the chemical industry, the regional association of producers of textile machinery, of cement machinery, etc.

A detailed analysis shows that very often the same factories produce machinery and equipment for several branches of industry.

There is also some uncertainty as to the reaction of private producers to the establishment of many regional associations. Therefore, we should like to propose for the beginning one association for producers of processing machinery and equipment. This association could have several sub-committees or sections, each concentrated on one branch. This association should be organised on the same pattern as the automotive industry. The RCD Chamber of Commerce and Industry should take the necessary st ps for setting up this association. The association should operate within the framework of the RCD Chamber of Commerce and Industry. Its contacts and activities should also be set on the same pattern as those of the automotive association as far as dealing with members, national institutions and RCD institutions are concerned. In the future the establishment of some other RCD associations are envisaged.

7. There was a statement at one of the RCD conferences that without trade there can be no co-operation. We fully agree with this statement. To start and maintain regional co-operation in the heavy engineering industry, an adequate volume of trade and trade institutions should exist. As already mentioned, at this moment there are no specialised trade agencies operating in this field within the RCD Region. Of course, trade as such does exist and there are firms dealing with foreign trade in all the three RCD countries. However, they do not seem to be much interested in, nor are they suitable for, greater co-operation and trade in the engineering sector. On the assumption that an RCD agreement to the UNCTAD report will be reached very soon, we should like to propose the extension of the existing organisational institutions in the sphere of trade between the RCD countries.

In connexion with this and the specific requirements of the engineering industry as well as some other industries, we should like to propose that trade agencies be organised in each RCD country.

We propose that each RCD country establish a trade company as an independent trade firm or agency in accordance with national regulations. The special function of these companies would be to deal with trade and co-operation within the RCD Region. They would sign a special agreement on the following:

They should first of all agree on close co-operation and each of them will be a representative agent for the two other companies. Then they should agree on establishing a regional consultation board on trade for the engineering industry where the representatives of the three trading companies could discuss and decide on mutual problems and co-operation. These regional consulting boards for trade could also include representatives of other industrial regional institutions such as the joint purpose enterprises, associations, regional boards and committees.

The function of these regional trade institutions would mainly be commercial and co-ordinating, making suggestions and proposals to the RCD institutions, business firms and to each of the RCD governments. The contact between these national trade institutions should be particularly close regarding the market. (Thus, there would be no repetition of the unsuccessful contact between the machine tool factory in Karachi and producers of Jeep-Iran, in selling gear boxes for Jeep).

The initiative for organising such institutions must come from the RCD governments providing capital or getting support from commercial banks. Private capital and entrepreneurs should play the main role in these activities. All operations of such firms should be on a commercial basis, with due respect for domestic regulations and on the assumption of some facilities regarding trade between the RCD countries. The interregional contact of these firms should be based on the common character and practices of regional co-operation in the RCD.

Should the idea of setting up such a trade institution be approved by the RCD Ministerial Council, the RCD Chamber of Commerce and Industry should take the necessary steps to initiate action in each RCD government to organise such trade firms.

We believe that the organization of such a trade institution on the national and interregional level would fill the gap now existing in the RCD organisational structure. It would be very helpful for bringing about many RCD co-operational arrangements in heavy engineering industries and contribute towards the finalisation of many arrangements which we had proposed in connexion with the twelve projects. It would also be beneficial to the future development of the RCD co-operation.

In conclusion, we should like summaries that the existing gap in the RCD organisational structure could be bridged by putting into effect the proposed organisational structure for RCD co-operation in the heavy engineering industry, with a further strengthening of the RCD Secretariat, with the proposal of a revised and expanded Joint Purpose Enterprise scheme, with the proposed RCD association of producers, the RCD Regional Board for mechanical industry, with the Preparatory Committee for establishing a RCD corporation for electrical equipment and with the regional trade agencies. The proposed RCD organisational structure would be able to meet the present requirements for co-operation in the engineering industry. It would be suitable for greater co-operation in the future.

The proposed regional structure has enough flexibility to meet the various needs of the industrial firms and it will provide a firm basis for further development and establishment of new organisational forms for RCD co-operation in the future.

CHAPTER XIII

SOME VIEWS ON THE INSTITUTIONAL FACTORS OF THE RCD CO-OPERATION IN HEAVY ENGINEERING INDUSTRY

In addition to our suggestions regarding governmental and non-governmental institutions in the RCD and the lack of adequate trade institutions, we should like to mention a few institutional factors and important subjects for starting and maintaining RCD co-operation in the heavy manufacturing industry. The RCD was successful in its development of infra-structure facilities, particularly transportation. Financial, research and legal facilities are not adequate. Although this does not come within the scope of our study, we should nevertheless like to mention a few of the more important institutions.

1. One of the serious problems of larger RCD co-operation is the quality of goods and the standardization of engineering products. The RCD region is specific in its use of various measures, technical data and characteristics, quality control, standardization, etc. The region has been using licences and technical assistance from all parts of the world. This brings many difficulties in co-operational arrangements between factories.

There is a National Standards Institute in each RCD country dealing with the problem of standardization. Contact between these Institutes has already been established within the RCD framework and a RCD committee for standardization has been created. We are of the opinion that establishing close contact among the National Standards Institutes is a very urgent task. We should like to propose that the possibility of establishing a RCD Institute for Standardization (to serve several economic sectors particularly in the engineering industry) be studied.

2. Financial institutions are becoming evermore important. It is difficult to establish any large firm, industrial corporation, or even co-operation in industry without the assistance and help of some financial institutions. In each RCD country, besides the private banks, there are public economic corporations or an Industrial Development Bank, which finance and implement various national programmes.

In analyzing the need for regional financial institutions, one must keep in mind that RCD industrial co-operation and development in the field of heavy engineering require the allocation of large investments and consequently, the engagement of many resources, both domestic and foreign. Large investments in heavy engineering, with long-term return rates, require public and foreign investments which are usually above the financial resources of the private firms. If we add to these facts the need for regional harmonization of development policy, the efficiency requirements of the national economies and the implementation of the principles of economies of scale, it is clear that the establishment of a regional financial institution would be very useful and even necessary. In addition, we can remark that there is not enough free capital within the RCD region to finance regional projects, even very profitable ones.

These problems should receive particular attention, especially from the viewpoint of how the regional institutions should be established, what will be the legal procedure for establishing such institutions, what will be their financial resources, and how should they be organized.

To meet the current needs of regional financing and development, some solutions could be found in closer co-operation among the existing industrial development banks of the RCD countries. A regional consortium, agency or financing group, summoned by the Industrial Development Banks of each RCD country could be established, depending on the decision of the authorized bodies of the Industrial Banks of all the three countries. The main function of this agency would be to deal with financial facilities for co-operation in industry and implementation of the development policy along the lines approved by the RCD bodies. This agency, together with the RCD, could also work on the establishment of the RCD Development Bank.

3. As it has already been explained, the development of heavy engineering requires some design centres, research institutes, marketing centres, and similar supporting institutions. Small firms for heavy engineering are not in a position to set up and maintain such institutions, either from the financial, or from the technical point of view. It is advisable for such institutions to be organized within the framework of the RCD, bearing in mind the proposal for establishing regional associations and other organizational structure in the RCD.

4. Some organizational measures in education, training and even in administration should be considered in order to support regional co-operation. For instance, regional centres for management could be established and courses for training in some branches organized. The training of workers from one country by another is advisable when industries are in a more advanced stage in one country compared to another.

5. Under the necessary institutional subjects we could include the various economic policy measures and regulations. It is a fact that without a favourable economic climate, it is difficult to start and maintain co-operation in industry. The economic regulations concerning trade, export, import and financial regulations, such as credit and fiscal policy, are decisive factors in creating the general conditions and climate for co-operation. Under a joint purpose enterprise scheme is foreseen the duty of the countries to adopt the legal and financial regulations in the agreement stipulated in the agreed Memorandum of Understanding between the RCD countries. We should like to propose that such regulations and benefits be extended as long-term regulations among the RCD countries. RCD co-operation will be more attractive for private entrepreneurs when the governments have established permanent legal and financial regulations and institutions to stimulate RCD co-operation instead of a case to case agreement. Without these benefits entrepreneurs will be reluctant to enter broader regional co-operation in the engineering industry.

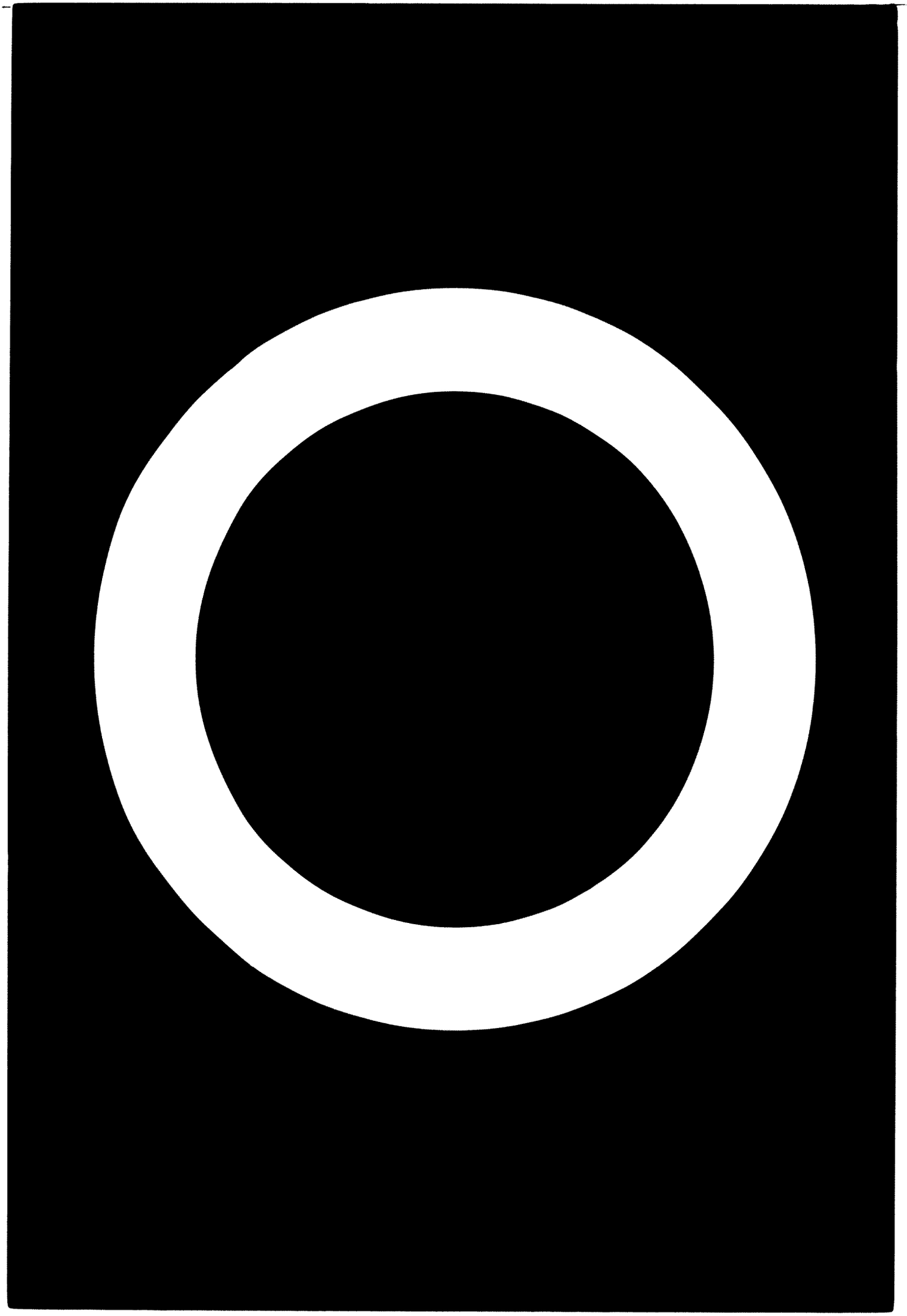
6. Furthermore, we should like to mention the problem of plan harmonization among the RCD countries. This subject is tackled in our preliminary report and in the special report of the RCD expert group meeting regarding plan harmonization. Some institutional agreement regarding plan harmonization in building an infrastructure and in some other sectors of economic development is necessary. As far as the heavy engineering industry is concerned, we should like to point out that in this sector some harmonization of the national policy is necessary. This harmonization is not advisable except in setting up a future programme or in creating national policy. At this stage harmonization is more necessary in the implementation of national policy or National Plan. It is advisable to find means for the realization of a national policy, this makes realization much easier

from the financial point of view and more efficient with regard to production of many goods of the heavy engineering sector. With this approach the harmonization of a national policy should be extended from the national planning organization to other national institutions, to large firms in each country and to various RCD bodies. Implementing this method will prove very useful for co-operation, and the question of plan harmonization will become much more realistic and easier.

7. There are many arrangements between foreign firms and firms of the RCD countries for producing cars, diesel engines, tractors, electronics, transformers, machine tools,etc. The fact that some of these world-wide firms have production arrangements in all three RCD countries, or in two of them indicates the possibility of specific RCD co-operational arrangements involving foreign firms. Since the national market is limited to some engineering products, the co-operational arrangements between these firms on the one hand and the RCD countries jointly on the other have good prospects for the future. From this point of view, the licensing policy of the three RCD countries should be co-ordinated. In the initial phases this work could be carried out by a joint RCD Team negotiating with foreign firms.

With the possible assistance of UNIDO, Vienna, co-operation could be established on these bases with several well-known firms which are already engaged in the RCD area.

To deal in detail with the above-mentioned subjects does not come within the scope of our terms of reference, but we cannot avoid mentioning the above idea within the large framework of the organizational approach to RCD co-operation. This subject cannot be neglected in future co-operation in the engineering sector.



APPENDIX A

Various Documents

Annex I

TERMS OF REFERENCE

[illegible] to [illegible] the three

[illegible] countries

1. Rationalisation of distribution of the following industrial projects [illegible] for cooperation [illegible] to each industry and/or combination of industries, taking into account the relevant economic factors and existing facilities or sanctioned projects [illegible] implementation in similar fields in each country:

   i) Locomotives
   ii) Centrifugal and special filters for chemical industry
   iii) Diesel engines above 500 h.p.
   iv) Rotating electrical machinery
   v) Turbo-generators (steam)
   vi) Oil drilling, production and refining equipment
   vii) Boilers, pressure vessels and steam heating appliances
   viii) Pumps and compressors
   ix) Special valves
   x) Pumps for heavy industry
   xi) Motors (large size for grid power stations)
   xii) Mechanical equipment (hydraulic turbines and coupling system

   The formulation of the related recommendations will have to be based on the technical and economic feasibility of the projects.

2. Identification of further industrial areas for cooperation which are intimately related to the programme of RCD joint purpose enterprises in heavy engineering and electrical industries, that accompanied by rationalisation of their distribution and [illegible] which also should be consulted.

   Finally, the implementation of such projects and the sale of their products among the three countries.

3. Setting up of a suitable organisational structure which could effectively materialise the recommendation in the preceding sub-paragraphs 1 (), 2() and 3. Recommendation concerning this aspect of the problem may be addressed to matters such as:

   i) Establishment of a unified corporation or a number of corporations, to invest in such projects directly and/or indirectly.
   ii) Suitable methods of cooperation with foreign firm or firms.
   iii) Equity participation in such corporation/corporations.
   iv) Management and control
   v) Location of such corporation/corporations
   vi) Coordination of technical know-how which may be secured in connection with the establishment of related projects.

   The study of such organizational arrangements should be in consonance with organizational facts and realities existing in respective countries."

2. The Member Governments are of the view that cooperation amongst them in the field of Heavy Engineering and Electrical Industries could be beneficial and take effect only if all three countries partake in the benefits resulting from such cooperation on an equitable basis, including a reasonably equal flow of products amongst the three countries.

3. In order to give effect to this objective, the UNIDO is requested to assign, as early as possible, a small team of experts to study this matter and recommend, in consultation with the Member Governments, feasible alternative criteria. The interim report to be prepared by the experts is to be considered by the high level representatives of the three Governments and the criteria to be applied in the conduct of the study be decided upon.

4. The Governments of Iran, Pakistan and Turkey also suggested that UNIDO may consider the assignment of undertaking the overall study mentioned to a consulting engineering firm acceptable to three Governments. In the conduct of the study, the consultants should be instructed to apply the agreed terms of reference the objective mentioned in paragraph 2 above, and the decisions to be made by the Member Governments on the interim report of the expert team.

Annex II

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

3 April 1970

Request from the Governments of the
Empire of Iran, Pakistan and the Republic of Turkey
for Special Industrial Services

JOB DESCRIPTION

INT-121-I (SIS)

POST TITLE	Senior Economist/Engineer - team leader
DURATION	One year
DATE REQUIRED	As soon as possible
DUTY STATION	Teheran, with travel to Pakistan and Turkey
PURPOSE OF PROJECT	To prepare studies on the basis of which the three participating countries (Iran, Pakistan, Turkey) can decide on the locational distribution of given projects and on the mechanism for suitable co-operative arrangements. A team, consisting of the team leader, an industrial economist and additional consultants as may be required, is requested to: 1. establish criteria for macro-location of industries in the member countries; 2. evaluate the viability of 12 projects (mentioned in the background information) from the standpoint of establishing co-operational arrangements; 3. study the mechanism and the suitable organizational structure for co-operative arrangements.
DUTIES	The expert will be expected to: 1. design, organize and supervise the work of the team; 2. take active part in the work of the team particularly with regard to suggesting suitable organizational structure for co-operative arrangements; 3. be responsible for maintaining contacts with the Secretariat of R.C.D. and the three Governments.
QUALIFICATIONS	An industrial economist or engineer with extensive experience in industrial development problems and with experience in organizing and guiding team work in this field.

LANGUAGE — English

BACKGROUND INFORMATION — The three interested Governments have agreed to examine the possibilities of co-operation in the establishment of manufacturing units to produce the following: (i) locomotives, (ii) centrifugal and special filters for chemical industry, (iii) diesel engines above 250 h.p., (iv) rotating electrical machinery, (v) turbo-generators (steam/gas), (vi) oil drilling, production and refining equipment, (vii) boilers, pressure vessels and steam heating appliances, (viii) pumps and compressors, (ix) special valves, (x) pumps for chemical industry, (xi) boilers (large size for grid power stations), (xii) mechanical equipment (hydraulic turbines and coupling system). A team consisting of a project manager and an industrial economist will be responsible for designing, organizing and carrying out the respective studies. To this end, additional expert and consultant services will be utilized. In order to secure effective support of the expertise available at UNIDO short-term assignments of UNIDO staff members to participate in the team work are envisaged. The team will be located in Teheran. Travel funds are provided in order to maintain close working contacts with the requesting countries, to collect data in Europe and be in contact with some research institutions abroad and to cover the travel component of UNIDO staff members' assignments.

PRIORITY POST: CANDIDATES REQUESTED BY 15 MAY 1970

Annex II

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

3 April 1970

Request from the Governments of the
Empire of Iran, Pakistan and the Republic of Turkey
for Special Industrial Services

JOB DESCRIPTION

INT-121-J (SIS)

POST TITLE Industrial Economist/Regional Project Evaluator

DURATION One year

DATE REQUIRED As soon as possible

DUTY STATION Teheran, with travel to Pakistan and Turkey

PURPOSE OF PROJECT

To prepare studies on the basis of which the three participating countries (Iran, Pakistan, Turkey) can decide on the locational distribution of given projects and on the mechanism for suitable co-operative arrangements. A team consisting of the team leader, an industrial economist and additional consultants as may be required is requested to:

1. establish criteria for micro-location of industries in the member countries;
2. evaluate the viability of 12 projects (mentioned in the background information) from the standpoint of establishing co-operational arrangements;
3. study the mechanism and the suitable organizational structure for co-operative arrangements.

DUTIES

Under the supervision of the team leader, the expert will be expected to:

1. formulate criteria for deciding on the location of the projects (listed in the background information) in the participating countries;
2. define the data and information requirements for the above and design methods for their collection and analysis;
3. evaluate the 12 projects (mentioned in the background information) availing himself of the services of the consultants wherever necessary and recommend the location of these projects;
4. define requirements for additional expert consultants for the afore-mentioned tasks.

QUALIFICATIONS	Industrial economist with extensive experience in project evaluation and individual planning.
LANGUAGE	English
BACKGROUND INFORMATION	The three interested Governments have agreed to examine the possibilities of co-operation in the establishment of manufacturing units to produce the following: (i) locomotives, (ii) centrifugal and special filters for chemical industry, (iii) diesel engines above 250 h.p., (iv) rotating electrical machinery, (v) turbo-generators (steam/gas), (vi) oil drilling, production and refining equipment, (vii) boilers, pressure vessels and steam heating appliances, (viii) pumps and compressors, (ix) special valves, (x) pumps for chemical industry, (xi) boilers, (large size for grid power stations), (xii) mechanical equipment (hydraulic turbines and coupling system). A team consisting of a project manager and an industrial economist will be responsible for designing, organizing and carrying out the respective studies. To this end, additional expert and consultant services will be utilized. In order to secure effective support of the expertise available at UNIDO, short-term assignments of UNIDO staff members to participate in the team work are envisaged. The team will be located in Teheran. Travel funds are provided in order to maintain close working contacts with the requesting countries, to collect data in Europe and be in contact with some research institutions abroad and to cover the travel component of UNIDO staff members' assignments.

Annex III

REGIONAL COOPERATION FOR DEVELOPMENT

IND/ENGIN/1294
29th April, 1971

SUBJECT: Unido Study on 12 RCD Project

REF: Your letter nos. 1632-33 dated 27th August, 1969 and 3650-33 dated 9th March, 1970

Dear Mr. Batmenglidj,

I have the pleasure to inform you that the UNIDO Experts' study on 12 RCD Industrial projects is under-way. The project reports of seven of these have already been prepared and circulated by the Member Governments and these project reports are duly utilized by the UNIDO Experts in their studies. However, three of these project reports expected to be prepared by Iran, have not yet been received by the Secretariat for circulation. These are mainly, Rotating Electrical Machinery (I would like to acknowledge herewith the receipt of your letter no. 296-33 dated 19th April, 1971, informing us that this project report will be finalized at the beginning of 1972), Oil Drilling, Production and Refining Equipment and Special Valves.

UNIDO Experts are expected to complete their final report until the forthcoming meeting of the Committee on Industry which is scheduled to be held in June 21-24, 1971, or at the latest before the 14th Ministerial Council Meeting. Therefore it is requested that the preparation and circulation of the two project reports, namely, Oil Drilling, Production and Refining Equipment and Special Valves be expedited to facilitate UNIDO Experts' efforts in finalising their views on the 12 RCD project.

With best regards,

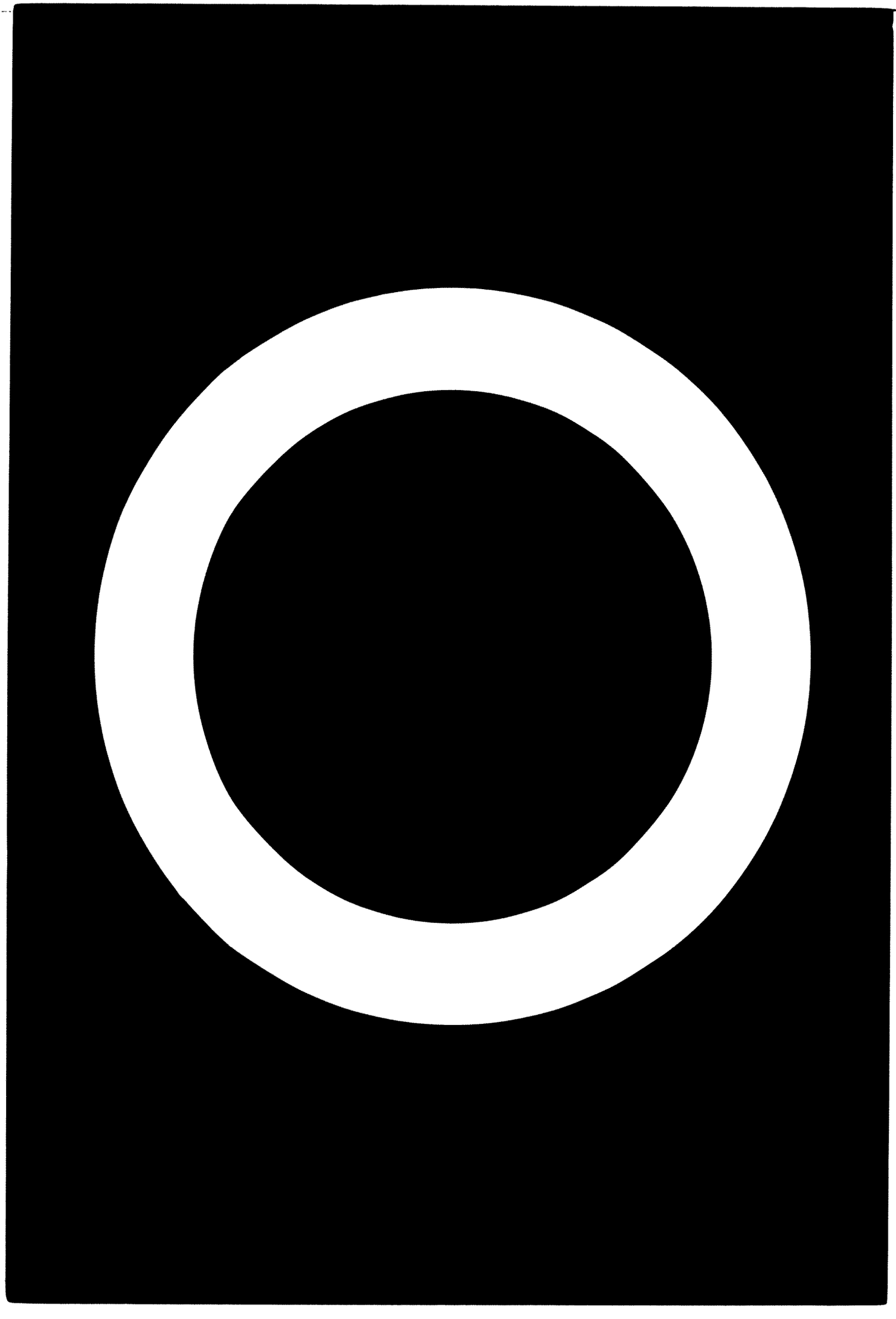
Yours sincerely,

signed
Murat Bilhan
Director, RCD

Mr. H. Batmenglidj,
Ministry of Foreign Affairs

APPENDIX A

The distribution of available ... of



APPENDIX 2

THE CALCULATION OF DISTRIBUTION OF THE AVAILABLE PROJECTS

1. The basic project data on which the distributional analysis is carried out are contained in Table A. The data on output value and on fixed investments are either originally given in the project study or have been directly estimated by the experts. The yearly output level refers to the "normal" operation period. The subdivision of demand for the yearly output of the three member countries for projects II, III and IV has been estimated by the experts on the ground that the relevant products are new; that there is no competitive domestic production and that the intensity of demand by each country is, in principle, equal. Fixed investments for projects V and VI have been obtained through capital output ratios taken from international comparisons, making allowance for the general efficiency conditions in the RCD economies.

As for the range of products included in the production programme of each project, reference is made to Part II of the Final Report.

2. The data on 28 engineering industries and related branches are contained in Tables B, C and D recording respectively the figures for Iran, Pakistan and Turkey. The original magnitudes are indicated by O, o and c.

O is the output value of the relevant branch, referring to the year 1968, i.e. the latest year for which it was possible to collect a common set of statistics or to work out in some cases through extrapolation from similar branches. The data on the output value were originally expressed in the national currencies and were transformed into US dollars by a conventional ratio of each national currency to the dollar, referring to 1968. This ratio is 76:1 for the Iranian rial; 9:1 for the Turkish lira and 7.5:1 for the Pakistani rupia (the so-called tourist rate since the official rate 4.7:1 is clearly overvalued).

o is the domestic content of engineering and related branches in each RCD country. It has been partly obtained from official publications or government sources (especially for Pakistan and Iran) and partly estimated or extrapolated from the data in similar branches (especially for Turkey).

e is the degree of utilized capacity in the relevant branches. These figures are largely estimated, even those received from official publications, because the situation of existing capacity in the engineering industries of the three countries is not yet well known. In some cases the data for capacity utilization are guesses.

C is the full capacity volume of output in the relevant branches ($C = O/e$) and A is the available production capacity in the relevant branches, expressed in terms of output value ($A = C-O$).

For the reasons just now explained, the magnitudes e, C and A are too uncertain for use in a meaningful way in the distributional analysis. Therefore, they are given in the tables only as points of reference for future investigations which will try to improve and update the information on the utilization of engineering capacity.

3. Table E is a matrix of production co-efficients calculating the indirect effects of the projects on the market at large. The inverse production co-efficients for the engineering industries and related branches are not those of the RCD countries. The input-output matrixes for the RCD countries are still too aggregated so that data for those branches do not exist (or, possibly, have not yet been published). In such a situation the experts resorted to the devise of taking as a point of reference the Leontieff-Carr input-output matrix for the USA metalworking and manufacturing activities in 1958, adjusted by re-grouping various activities in order that the matrix fits the composition of engineering and metalworking branches in the RCD countries (the 19 activities of the matrix of inverse co-efficients in Table E correspond to the 19 main branches in Tables B, C and D).

Of course the structure of the American engineering and metal-working industry in 1958 is still very different from the structure of the corresponding RCD industries in 1968. However, there is a presumption that the pattern of engineering industries in developing countries is going to approach in the long run that of developed countries, and ultimately the Leontieff-Carr matrix is the only one in such detail at our disposal. At the same time, the fact that we use inverse production co-efficients different from the actual RCD adds to the reasons for not pushing the calculations of the indirect effects beyond the findings obtainable by operating

(in Tables B, C and D) with the magnitudes $\underline{O}$ and $\underline{o}$.

4. The formula expressing the impact of the separate projects is obtained in the following way:

j $(j = 1, 2, \ldots\ldots 6)$	the six projects to be distributed
i $(i = 1, 2, \ldots\ldots 28)$	the engineering and related branches or products from Tables B, C and D in Appendix 2. The outputs of the projects $j = 1, 2, \ldots\ldots 6$ are also contained in i.
k $(k = 1, 2, 3)$	the three RCD countries
O_i	the level of output in branch i
o_i	the degree of domestic content of output in branch i. The domestic contents of the six projects are also contained in i.
c_i	degree of capacity utilization in branch i
$O_i/c_i = C_i$	output capacity in branch i
$C_i - O_i = A_i$	available capacity in branch i
a_i	$(i \neq j)$ inverse production co-efficients in the branches which are affected by the output of project j
$\overline{B}_j$	the value of yearly output of project j
$\overline{B}_j\, o_i = B_j$	$(i = j)$ value of domestic content of the yearly output of project j
$B_j\, a_i = R_i$	$(i \neq j)$ increase of output in the engineering branch i, affected by the production of project j
$R_i\, o_i = N_i$	$(i \neq j)$ domestic content of the increase of output in the branch i, affected by the production of project j.
$R_i - A_i = M_i$	$(i \neq j)$ requirements for additional production capacity, taking place in engineering branch i after output of project j has occurred. This capacity is expressed in terms of the imports which should be made for meeting the availability of products indirectly required in order to obtain the output of the relevant project in case the present production capacity falls short of these requirements.

The sum of the domestic direct and indirect increases of gross output, engendered by project j in country k, is expressed by the following formula:

$$\bar{E}_{jk} = B_j + \sum_{\substack{i=1 \\ i \neq j}}^{28} N_i - \sum_{\substack{i=1 \\ i \neq j}}^{28} M_i$$

However, since the data on capacity utilization are too uncertain, it is advisable to drop the last terms in the second number and to use the reduced formula:

$$E_{jk} = B_j + \sum_{\substack{i=1 \\ i \neq j}}^{28} N_i$$

5. One may easily realize that the preceding formula is built-up on the output value of one year of "normal" operation and that no mention is made of the present value of effects of the project spread over a certain number of years encompassing either the operation period or both the construction and the operation period. Indeed, there were no data for the projects (except partially for project I) about the patterns of construction and operation period and, within this last, about the "installation" and the "normal" installation period. Under such conditions, the most reasonable solution is to assume for all projects equal construction periods and equal operation periods and to assume moreover uniform construction and operation periods (the amount of fixed investments in each year of the construction period is equal and the value of output in each year of the "normal" operation period is equal). Within such a framework of simplified but unavoidable assumption, it does not make a difference in comparing the benefits accruing to the countries by the different projects whether their present value is calculated over the whole life-time of the projects or whether the benefits are calculated on the first year of normal operation only. We choose here the second alternative and we give up calculating the benefits accruing during the construction period because for the majority of the projects being distributed one cannot know the breakdown of the fixed investments.

6. Even with a small number of projects and with a simplified procedure such as that outlined above, there would be considerable computation work if three alternative micro-locations had to be studied for each project. It is, therefore, advisable to identify in many predetermined micro-locations possible. We shall take into consideration the rules for identification suggested in Table 2, paragraph 4, though no precise quantitative parameters are given in the project sheets.

Project no. 1 of Table A (marine diesel engines) has been suggested for location in Pendik, Turkey, by the drafters of the project study, namely, the Turkish Government and the Sulzer Brothers Co. The locational choice of the Turkish drafters was made on the grounds that the largest demand for this product exists in Turkey and Turkey offers various advantages for the supply of steel materials. It seems to be that some technological links may exist between ship building and marine diesel engine production to be carried out in co-operation with the activities of the shipyard in Pendik. However, there much use is made of steel products, some parts have to be imported at present from advanced countries; there may be certain advantages of location in Turkey due to the vicinity of the project to Europe and the consequent savings in transportation costs of such heavy commodities.

Project no. 6 (special industrial valves) can be located in Iran, due to the fact that the demand is largely concentrated in this country, namely, well above 50% of the total RCD community.

Project no. 2 (steam and hydraulic turbines) entails a large use of steel and casting products for which the largest producer at this moment and for the next years is Turkey. The location in Turkey may also take advantage of the vicinity of Europe for the importation of some heavy steel parts needed in manufacturing the turbines.

Project no. 3 of Table A (hydrogen steam generators) entails large use of copper and aluminium. As for copper, Iran will be the producer for the whole RCD area due to the recent discovery of huge ore deposits. As for aluminium, Iran will start production by the beginning of 1972 in Arak and is becoming the only producer for RCD. Therefore, one may consider the location of this project in Iran as predetermined.

As for project 3 (heavy transformers) we should consider that Pakistan is in the best position for producing heavy transformers because the heavy electrical mechanical plant in Taxila is at the end of the project typical, while in the RCD country is making preparations for producing such goods. One may also add that referring to manpower, production of heavy transformers is a skilled labour intensive field, and as this field Pakistan presents certain advantages.

We have - in the manner just now illustrated - identified the predetermined locations for five projects. Identification has been carried out by means of the general criteria since an evaluation in quantitative terms could be reached only after the location of project is. However, by restricting the identification of predetermined locations, the computations have to be greatly simplified.

Project no. 6 (large purge gas compressor) may be treated as discretionary for this. If, tentatively, we assign it to Pakistan, we have the following initial distribution patterns (see Table A):

Iran	-	Projects 3 and 6
Pakistan	-	Projects 4 and 5
Turkey	-	Projects 1 and 2

We want to ascertain which are the benefits accruing to each country by such distribution of projects.

6. Before applying the formula illustrated in Section 4, one must calculate the share of each country in the total fixed investments required for the project. We assume that the fixed investments of any project coincide with its equity capital and that the country of location contributes 40% to the equity capital and the other two partners 10% each.

For total fixed investments equal to $104 million, Iran should contribute $36.4 million, Pakistan $27.3 million and Turkey $40.4 million. The share of each country is therefore the following:

Iran	34.5%
Pakistan	27.5%
Turkey	38.0%

The benefits accruing to each country, to be ascertained by means of the formula of Section 4, should be close to the same proportion as fixed investments are for each country. If that does not occur, either a different distribution of projects has to be arranged or some mechanism for compensating the unfavoured countries should be devised.

The benefits directly and indirectly created by each project are recorded in the last column of Table F where the magnitudes needed to arrive at this result are calculated. By taking into account the above initial distribution patterns of the six projects, one realizes that the benefits accruing to Iran amount to $23.5 million; to Pakistan, $23.1 million and to Turkey, $21.2 million.

Ultimately, each country's share in total fixed investments and in total benefits is the following:

Country	Share in investments	Share in benefits
Iran	34.5	34.6
Pakistan	27.5	34.2
Turkey	38.0	31.2
	100.0	100.0

This distribution shows an inbalance between Pakistan and Turkey, while it is balanced with respect to Iran. Further comments on this point are contained in Chapter 4, paragraph 4.4.

TABLE A - Data for Distribution of Six Available Projects

Projects	Yearly Output				Fixed Investments (mill. $)	Joining Countries		
	Total (mill. $)	Demanded by Iran %	Pakistan %	Turkey %		Iran	Pakistan	Turkey
1) Marine Diesel Engines	10.5	20	30	50	20.0	X	X	X
2) Steam and Hydraulic Turbines	15.0	33.3	33.3	33.3	20.0	X	X	X
3) Hydro and Steam Generators	17.0	33.3	33.3	33.3	25.0	X	X	X
4) Heavy Transformers	15.0	33.3	33.3	33.3	20.0	X	X	X
5) Large Pumps and Compressors*	7.0	30	40	30	7.0	X	X	X
6) Special Industrial Valves	12.0	60	20	20	13.0	X	X	X

* Including pumps for chemical industry

TABLE B - Engineering Industries and related branches in Iran (1958)

	Industries and Branches	O_i (mill.$)	r_i %	s_i %	C_i (mill.$)	A_i (mill.$)
1)	Communication equipment (telephones, teleprinters, transmitters)	2.80	60	85	3.30	0.45
2.1)	Shipbuilding	-	-	-	-	-
2.2)	Railway equipt. (locomotives, wagons and equipment)	-	-	-	-	-
3)	Special industrial machinery and equipment (processing industries)	1.35	45	90	1.50	0.15
4)	Material handling machinery	1.00	40	90	1.10	0.10
5.1)	Tractors	0.42	40	85	0.49	0.07
5.2)	Other agricultural machinery	2.00	45	90		
6)	Construction (building and road) and mining machinery	0.90	40	90	1.00	0.10
7.1)	Engines	2.23	35	70	3.47	1.05
7.2)	Turbines	-	-	-	-	-
8.1)	Ball and roller bearings	-	-	-	-	-
8.2)	Pumps	4.45	50	70	6.35	1.90
8.3	Compressors (industrial)	-	-	-	-	-
9)	Machine tools and other metal working equipment	2.82	40	90	3.13	0.31
10.1)	Electric motors, generators	4.18	40	53	12.70	8.52
10.2)	Switch gears	1.00	45	50	2.00	1.00
10.3)	Transformers	0.26	0	75	0.34	0.12
11)	Batteries and dry cells, accumulators	6.87	60	45	15.25	8.38
12)	Electric wiring equipment	4.22	45	80	5.24	1.05
13.1)	Stamping, screw machine products	2.51	55	50	5.60	2.80
13.2)	Wire and cable products	5.12	50	55	9.30	4.18
14.1)	Boilers, tanks, etc., drums, containers	9.12	45	55	16.35	2.46
14.2)	Valves	-	-	-	-	-
15)	Structural metal products (bridges, buildings, etc.)	8.87	35	55	9.25	1.38
16)	Primary iron and steel manufacturing	32.50	65	90	40.60	8.10
17)	Primary non-ferrous metal manufacturing	17.20	70	80	21.50	4.30
18)	Plastics	11.00	80	80	13.00	2.00
19)	Cement and refractories	34.37	55	80	43.00	8.63

TABLE C - Engineering Industries and related branches in Pakistan (1960)

	Industries and Branches	O_i (mill.)	c_i %	c_i %	C_i (mill.$)	A_i (mill.$)
1)	Communication equipment (telephones, teleprinters, transmitters)	8.11	50	85	9.50	1.40
2.1)	Shipbuilding	10.00	55	75	13.00	3.00
2.2)	Railway equipment (locomotives, wagons and equipment)	4.66	50	70	2.00	2.00
3)	Special industrial machinery and equipment (processing industries)	7.33	75	20	36.60	29.50
4)	Material handling machinery	-	-	-	-	-
5.1)	Tractors	0.53	50	12	4.00	3.90
5.2)	Other agricultural machinery	2.60	40	52	5.20	2.40
6)	Construction (building and road) and mining machinery	0.66	30	50	1.10	0.45
7.1)	Engines	3.33	50	95	3.50	0.15
7.2)	Turbines	0.50	50	90	0.75	0.10
8.1)	Ball and roller bearings	-	-	-	-	-
8.2)	Pumps	2.66	70	35	0.50	7.80
8.3)	Compressors (industrials)	0.50	70	30	0.50	0.10
9)	Machine tools and other metal working equipment	5.33	70	70	7.50	2.15
10.1)	Electric motors, generators	10.00	40	50	20.00	10.00
10.2)	Switch gears	1.06	40	38	1.20	0.15
10.3)	Transformers	2.13	45	70	3.50	1.40
11)	Batteries and dry cells, accumulators	12.00	40	65	18.00	3.00
12)	Electric wiring equipment	14.66	40	65	22.50	7.80
13.1)	Stamping, screw machine products	0.66	85	55	12.00	0.35
13.2)	Wire and cable products	9.33	65	38	26.55	15.20
14.1)	Boilers, tanks, etc, drums, containers	8.00	85	55	14.50	6.50
14.2)	Valves	-	-	-	-	-
15)	Structural metal products (bridges, buildings, etc.)	4.66	70	32	14.56	10.00
16)	Primary iron and steel manufacturing	53.33	40	55	97.00	13.00
17)	Primary non-ferrous metal manufacturing	30.80	50	45	80.80	30.00
18)	Plastics	5.00	70	55	9.20	3.20
19)	Cement and refractories	53.33	90	88	60.60	7.30

TABLE D - [illegible] Engineering Industries and related branches in Turkey (1968)

	Industries and Branches	O_i (mill.$)	e_i %	c_i %	C_i (mill.$)	A_i (mill.$)
1)	Communication equipment (telephones, teleprinters, transmitters)	3.88	50	85	4.55	0.67
2.1)	Shipbuilding	18.88	55	85	22.20	0.33
2.2)	Railway equipment (locomotives, waggons and equipment)	24.00	50	60	30.00	6.00
3)	Special industrial machinery and equipment (processing industries)	22.22	55	50	44.44	22.22
4)	Material handling machinery	1.65	75	50	2.75	1.10
5.1)	Tractors	55.55	75	55	101.00	45.45
5.2)	Other agricultural machinery	27.00	40	70	38.50	11.50
6)	Construction (building and road) and mining machinery	7.22	40	50	12.00	4.78
7.1)	Engines	3.44	50	55	3.19	3.70
7.2)	Turbines	-	-	-	-	-
8.1)	Ball and roller bearings	-	-	-	-	-
8.2)	Pumps	3.33	70	70	4.75	1.42
8.3)	Compressors (industrial)	1.65	70	70	2.37	0.71
9)	Machine tools and other metal working equipment	4.44	75	70	6.35	1.91
10.1)	Electric motors, generators	16.66	85	50	33.20	16.54
10.2)	Switch gears	4.44	90	70	6.35	1.91
10.3)	Transformers	1.11	85	75	1.50	0.40
11)	Batteries and dry cells, accumulators	21.11	85	65	32.50	11.40
12)	Electric wiring equipment	11.11	90	75	14.80	3.69
13.1)	Stamping, screw machine products	7.77	65	50	15.50	7.77
13.2)	Wire and cable products	36.66	65	50	73.30	36.66
14.1)	Boilers, tanks, etc, drums, containers	11.11	85	55	20.20	9.10
14.2)	Valves	-	-	-	-	-
15)	Structural metal products (bridges, buildings, etc.)	122.22	90	60	204.00	81.80
16)	Primary iron and steel manufacturing	355.55	90	70	508.00	152.45
17)	Primary non-firrous metal manufacturing	111.11	90	55	171.00	59.90
18)	Plastics	64.44	90	55	99.00	34.56
19)	Cement and refractories	116.88	90	85	137.00	20.12

TABLE E

Inverse Production coefficients

(dollars per one dollar of final demand)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
[illegible] Equipment	1	1.070	.000	.003	-	-	-	-	.006	-	.000	.005	.005	-	-	.006	.005	-	-	-
[illegible] railroad equipment	2	-	1.005	.000	.007	.005	.000	.003	.000	-	-	.007	-	-	.010	.007	-	-	-	-
[illegible] Machinery & equipment	3	-	-	1.005	.007	-	-	.006	.010	.001	-	-	-	-	.010	.012	-	-	-	-
Material handling Machinery	4	-	.000	.006	1.040	-	.007	-	.005	-	-	-	-	-	-	-	-	-	-	-
Agricultural machinery	5	-	.007		.007	1.004	.007	.007	-	-	-	-	-	-	-	-	-	-	-	-
Construction mining and oil field machinery	6	-	-	.001	.000	.000	1.000	.006	.002	-	-	-	-	-	.007	.000	.007	.006	-	.006
Engines & turbines	7	-	.006	-	.002	.000	.004	1.006	.000	.000	-	.006	-	-	.006	.000	-	-	-	-
[illegible] Machinery & equipment	8	.000	.002	.060	.000	.002	.002	.050	1.001	.002	.003	.004	.005	.005	.018	.007	.000	.000	-	-
Machine tools	9	.000	.000	.000	.007	.000	.007	.006	.027	1.007	.002	.006	.001	.000	.004	.000	.003	.005	-	-
[illegible] equipment unless	10	-	-	-	.000	.001	-	.003	-	-	1.003	.000	.003	-	-	.006	.005	.000	-	-
[illegible] & [illegible] & equipment	11	.001	.006	.000	.005	.007	.003	.000	.005	.007	.004	1.000	.003	-	.006	.120	.000	.000	-	-
[illegible] & [illegible]	12	.007	.007	-	.006	-	-	-	-	-	.000	.001	1.005	.006	.005	.005	-	.011	-	.005
[illegible] products & tubes	13	.001	.006	.000	.005	.000	.001	.003	.021	.005	.005	.004	.005	1.005	.008	.000	.015	.000	.006	-
[illegible]	-	.006	.006	.000	.000	.002	.006	.001	.000	-	.006	.005	.005	1.004	1.003	.007	-	-	-
[illegible] & [illegible] products	15	.007	.000	-	.003	.005	.002	.001	.001	.003	.006	.006	.002	.002	1.006	.004	.000	.006	-
[illegible] & [illegible]	16	.007	.022	.170	.000	.005	.007	.000	.006	.002	.000	.119	.129	.008	.006	.000	1.010	.000	.000	.005
[illegible]	17	.005	.000	.000	.005	.006	.000	.006	.007	.002	.188	.135	.106	.123	.000	.183	.050	1.007	.014	.012
Manufacturing [illegible] & Plastics [illegible]		.000	.000	.000	.021	.006	.023	.004	.011	.011	.006	.004	.004	.014	.009	.028	.009	.008	.041	.019
Stone & Clay [illegible]	19	.000	.000	.013	.004	.006	.004	.007	.01	.016	.000	.006	.005	.002	.006	.000	.007	.004	.007	1.167

(-) = less than 0.0005.

TABLE F - Direct and Indirect Benefits of Projects

Project	Domestic Content %	[illegible] million	All	[illegible] million	All
1	50	10.00	[illegible]	[illegible]	[illegible]
2	60	15.00	3.00	[illegible]	[illegible]
3	60	10.00	10.00	[illegible]	15.00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	.90	[illegible]	[illegible]
[illegible]	60	10.00	.20	[illegible]	[illegible]

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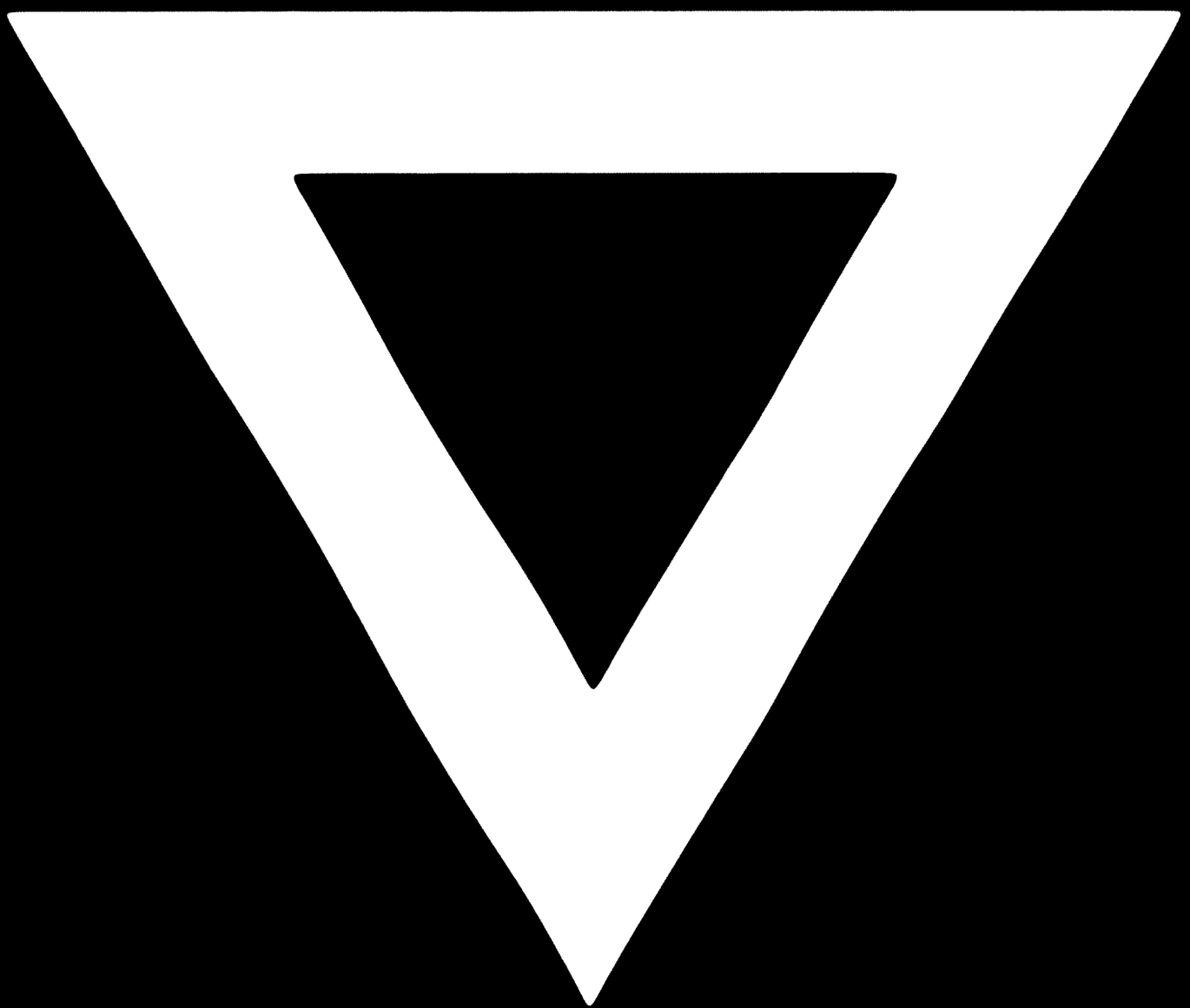

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