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ASSISTANCE TO THE INDUSTRIAL RESEARCH CENTRE

TRIPOLI, LIBYA

DP/LIB/82/003 SF/LIB/87/001

Technical Report *

**Prepared for the Authorities of The
Great Socialist People's Libyan Arab Jamahiriya
by the United Nations Industrial Development Organization**

Based on the Work of

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United Nations Industrial Development Organization

Vienna

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EXPLANATORY NOTES

References to "Dollars" (\$) indicates United States Dollars

The following abbreviations, other than those commonly used, are contained in this report:

GSPLAJ	:	Great Socialist People's Libyan Arab Jamahiriya
IRC	:	Industrial Research Centre
IRSI	:	Industrial Research and Services Institute (in general refers to a foreign well-recognized institute)
M/M	:	man-month
CTA	:	Chief Technical Adviser

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Draft Project Document

(independent numbering)

THE CURRENT STATUS OF THE INDUSTRIAL RESEARCH CENTRE (IRC)

The Industrial Research Centre permanently moves towards the general aim defined in Law 25 of 1970 where the statement was made that the IRC must take responsibility for formulating the national industrial strategy and to take care of the different problems originating from the complicated process of industrial development. Following the construction and occupation of the new, large and well-designed complex of buildings that houses the IRC, one of the main obstacles that hindered the growth and progress of the IRC was removed.

Recently the structure of the IRC was reorganized in order to respond more effectively to the new conditions and demands being made on the IRC. The IRC now consists of five Departments: Administration and Finance; Technical Economic Studies; Laboratories and Research; Geological Research and Mining; Standardization; Specifications and Industrial Properties. These Departments are sub-divided into Sections following the main directions of their activities. These in turn reflect the main targets and priorities of the Libyan industry.

Thus the Department of Technical Economic Studies consists of the following sections: Technical Studies; Economic Studies; and Planning and Industrial Strategies. The Department of Laboratories and Research has the following sections: Textile Products; Food Products; Building Materials; General and Applied Chemistry; Metallurgy and Corrosion; Electrical and Electronic Workshop. The Department of Geological Research and Mining consists of four sections: Geological Mapping; Exploration; Geophysics and Geological Laboratories. The Department of Standardization, Specification and Industries Properties includes sections for: Standards and Specifications and Industrial Property.

The IRC is headed by Director-General, Mr. M. Aburkas. The activities and financing of the IRC are monitored by a Board of Directors which include top representatives of the most well-developed branches of Libyan industry. The Board is presided over by the Secretary of the Public Committee of Industry of the CSPLAI.

It is now planned to diversify from the previous mode of financing the IRC when all the IRC budget was paid for by the State. In the near future it is planned to develop the following financing for the IRC: a) State budget; b) funds provided by contracts with industrial enterprises and c) fees for urgent testing and other activities. It is believed that after a certain period of time the IRC will be self-supportive, and that State funds will only be used for extraordinary purposes.

THE MAIN TARGETS IN THE IRC DEVELOPMENT AND THE ASSISTANCE OF UNIDO IN THIS PROCESS.

Having overcome the initial period of industrial development, a new phase starts for the economic and industrial development of the country which may be characterized by the high degree of responsibility caused by each decision made in all areas connected with industry and economics. The future offers many options, it is difficult without having the appropriate competence and experience to make the correct decision for the benefit of the country. Due to the complexity of the new situation and the increased responsibility on each decision maker, their qualifications need to be increased to cope efficiently with this situation - the price of failure is too high.

Advantages and Disadvantages of long- and short-term UNIDO experts

Although the IRC has seemingly recovered its previous capabilities after its transfer into the newly built premises in 1964, and several sections are now approaching the previously designed "self-supportive" way of existence, the problem of experts still remains among the most important problems when the manner of the proper implementation of the ongoing UNIDO project is concerned. The practice of the UNIDO expert proper recruitment, of their appropriate use in the particular conditions within the different sections of the IRC, of the effective application of experts' reports and recommendations as substantial feedback information, and other similar problems were discussed with most of the leading and experienced representatives of the IRC (see Annex II). It is a well recognized fact now that the main emphasis should be made on the fielding of short-term experts (with not more than 4-6 months stay at the IRC), and consultants (with about one month duration).

The following are the pro and contra reasons which the author derived from numerous viewpoints emphasized during his discussions with IRC officials:

Long-Term Experts: Due to the style of the previous project document, there were many experts who worked on different problems encountered by the IRC, with different rates of efficiency. Each expert being a normal human being, although with substantial experience and knowledge, nevertheless remain a specialist of high grade only in a comparatively narrow field of science, technology, management etc. All the adjacent areas of knowledge are presumably also known to him, but normally far from the "deep well of knowledge" which was required. It may happen, especially when the expert during his previous professional life abruptly changed the area of his interests and succeeded in certain new initiatives from scratch, that such a person chosen as an expert will contain several such well of deep knowledge. However, it is hard to

imagine that all of them coincide with the troublesome problems of the IRC. Summing up this reasoning, we, together with the people from the IRC, concluded that a critical time of the optimal use of an ordinary expert exists, which hardly exceeds 6 months, which was established by practical observation. It does not mean of course that after this period that an expert completely loses his usefulness, but it takes much more time and effort for him to solve a problem which is not so closely familiar to him as the previous one. This is the time when UNIDO and the IRC should find a proper substitution for him.

Moreover, the author supports the viewpoint of Mr. R. Westergaard, who noticed that after some time the personal problems of a different nature overweigh those terms of reference which are mentioned in the relevant job description (see In-Depth Evaluation Report LIB/82/003, R.N. Westergaard, L. Poes, Vienna, June 1986 and also Mission Report, R.N. Westergaard, LIB/82/003, June 1983). It may also be added that sometimes it is much more profitable to invite even a good expert for several short-term missions (split missions) rather than to retain him for all the period contained in the project budget - the expert would be "fresher".

Short-Term Experts: This type of expertise should be divided into two groups. The first of them, which is intended for Ad-Hoc technical assistance does not require any discussion. The number of problems concerning maintenance and repair grows with the increase in the number of sophisticated equipment. This problem at the IRC is now a weak point and will remain so until maintenance and repair become a prerogative of properly trained local personnel. As can be seen from the Terminal Report of DP/LIB/82/003 by Z.L. Halmos, Vienna 1986, the number of units not properly installed because of missing or broken parts is four times larger than that of the equipment installed and put into proper operation in due time. No doubt such a problem could be solved through the urgent invitation to engineers from the companies which produced the most valuable and costly units from among the non-operating ones. Unfortunately the manner of purchase was not the most effective needing considerable time (all equipment was purchased through the contractors who built the new premises), and in many cases the warranties have expired which would have been the most effective way of solving the problem. Thus detailed specifications for new equipment should be urgently prepared and sent to the manufacturers, via UNIDO, with a subsequent request for experts. The author, as well as several IRC officials, emphasized a reasonable doubt that the "troubleshooters" from the manufacturers would be willing to properly train the local staff so as to improve their knowledge and skill and thus eliminate the further dependence of the IRC upon the suppliers. Here we must conclude that the training aspect should receive considerable, perhaps utmost attention in planning future requirements from experts.

This aspect becomes even more evident when the operation of normal experts is considered as in recent years. For the above-mentioned reasons, the duration of expert mission must be limited to several months, however, it is easy to understand that in all cases, except that of troubleshooters, the first one or two weeks of an experts' assignment are not very productive for natural reasons (acclimatization, accommodation, deeper identification of the problems to be solved etc.). Thus it is estimated that the period of the most effective work of an expert may be between 1 and 4 months, the productivity during this decisive period strongly depending upon certain factors, such as:

- The availability of the local staff. It was admitted that previously several experts did not meet any counterpart at all. The training component thus excluded, the effectiveness of the experts' work became at least twice lower. Nowadays, in at least 70% of the working groups, the counterparts are ready to attend the normal training procedures;
- Organization of training procedures. It was normally taken for granted that a good specialist in a given field can effectively teach and train. This is one of the most dangerous misconceptions. Even having excellent training facilities (programmes, text books, equipment and audiences), the most experienced specialist may perform as a trainer of low value. In many cases it is applicable to experts from industrial firms;
- Close coordination of the training procedure with the current activities in the IRC. The best training is based on solving real and not imagined problems;
- Proper evaluation of an expert's capabilities during the study of his papers provided by UNIDO. It was admitted that the IRC officials were, in some cases, deceived by the most impressive papers submitted by candidates, thus perhaps not so valuable candidates were chosen by means of such "paper judgement".

All of these reasons led the author, as well as his discussion partners from the IRC, to the conclusion that the establishment of close long-term relations with certain IRSIs on a bilateral basis is quite desirable.

Mr. R. Westergaard, in his above-mentioned report, noticed that the cancellation of the subcontracting activity aimed at the establishment of close links with an internationally recognized IRSI was a correct decision because the "IRC was not mature enough". This conclusion is seemingly contradicted by his recommendation in the same report whereby the idea to "let a foreign IRSI run the whole IRC" is considered.

Subcontracting for Bilateral Cooperation

It seems to the author that the optimal way may be to allow several laboratories of the IRC to establish, within the framework of the new Project and with the assistance of UNIDO, bilateral cooperation with certain foreign IRSIs, and maybe with technical universities (one partner for a given laboratory should be selected). Having been reflected in the corresponding subcontract, such cooperation should include training (both on-the-job and fellowships abroad should be involved), technical assistance by personal expertise and by correspondence, cooperation in R+D and an exchange of information. Unlike ordinary training, such cooperation opens a way to high grade personnel qualifications such as Ph.D or D.Sc. The decisive features of such cooperation are that the mutual responsibility may be deployed over the whole period of subcontract which differs from the habitual practice of expertise when the responsibility of the expert for his doings disappears with his departure. Among well-recognized possible partners which are experienced enough in scientific and training contacts with developing countries, it is worth mentioning the following institutions:

**International Institute for Aerial Survey and Earth Sciences (ITC)
Netherlands;**
Bureau of Geological Research and Mining (BRGM), Paris, France;
University of Leeds, UK;
TNO, Netherlands;
Polytechnic Institute of Leningrad, USSR;
Uppsala University, Sweden.

The approximate timetable of the activities to be undertaken for establishing the cooperation with the foreign IRSI is given in Annex III. After this idea of bilateral cooperation of the described type was approved by several IRC officials, the author obtained in principal, support and understanding of the viability of such an approach from the UNDP, Tripoli and UNIDO, Vienna.

Thus, the foregoing steps of the project implementation should include subcontracting or bilateral cooperation with one or two foreign IRSIs. If the suggested concept of obtaining expertise, training and information exchange by means of bilateral cooperation are adopted, it is recommended to send the following letter to possible subcontractors chosen by UNIDO and the IRC at the preparatory stage of the project:

Draft Letter for a Subcontract

The Industrial Research Centre (IRC) is the leading institution in Libya which renders responsible activities concerning the development of the most valuable sectors of Libyan industry. The R+D, technical and economic studies and planning activities carried out in the IRC correspond in their aims to the main sectors of Libyan industry and these include: building materials industrial research, food production and textile industry, applied chemistry and metallographic research and also the interest of those sectors which are to be developed in the near future, such as plastics, leather, painting materials, electronics and electrical products.

Besides this, the IRC renders substantial work in the field of geology, such as mapping, geophysics, paleontology, evaluation of mineral sources etc., and is beginning to organize a system of standards, specifications and the supporting metrology base for this.

The IRC is situated in a modern complex of buildings of 31,000m² of total area at a distance of 20 km from Tripoli. Its personnel includes more than 200 specialists. The Centre has at its disposal a large amount of modern equipment such as scanning electron microscopes, X-ray diffractometers, IR-radiometers, analytical devices and instruments. But the average level of the IRC personnel is not sufficient for the execution of its tasks at the level which is now necessary to provide the decision making for the trends and rates of the Libyan industrial development. For the same reason most of the sophisticated equipment installed in the IRC is not operating, or under-utilized.

The activities of the IRC are supervised by UNIDO which recruits the experts and organizes the training for the personnel. Considering the experience of the last decade, it is now suggested to establish within the framework of the next UNIDO project, bilateral long-term cooperation with a prominent foreign industrial research or polytechnic institute. Due to the subcontract to be signed with such a partner, via UNIDO, the executing institute takes responsibility for the following activities: rendering the technical and scientific expertise for the IRC on the most significant problems, on-the-job training of the IRC personnel, organization of training courses for IRC fellows at the partner's site, high-grade (M.S, Ph.D) qualifications for several representatives of the IRC, sharing with the IRC the elaboration of certain R+D work, technical information exchange. A fund of US\$275,000 is allocated for such a subcontract, for a duration of about 3 years, or more.

Your institute is kindly requested to investigate the possibility of accepting the role of subcontractor on the general topic " _____ " and to urgently communicate with us on the decision reached.

Signature Block

Is a Chief Technical Adviser (CTA) necessary for the future?

It has been emphasized several times in previous reports that a strong GTA has a substantial value for improving the current interruptions in the IRC's activities and in its contacts with UNIDO. The evident opposition among the IRC officials against a GTA to be recruited for the future project is shown by the way in which the previous project coordinators worked, which mainly included the running of a few UNIDO experts, which was generally a desk job and did not demand high qualifications and salary. To the experience and knowledge of the author, a strong GTA may be a solid support for the IRC authorities, not only in solving problems related to UNIDO, but also in everyday activities. If a proper candidate can be urgently found and approved, all expenditures will be effectively paid off.

In order not to be at fault in the GTA selection process, which is mainly based on the indirect paper judgement, it may be worthwhile selecting a proper GTA from among the ordinary short-term experts who may have the substantial experience and background. Bearing this in mind, the GTA budget line has only been foreseen in the budget as from the second year of implementation. If a proper candidate is not found, this budget line should be revised. An alternative way of finding a GTA is to enroll him from among the qualified local staff. Such a concept has a certain attractiveness - the national GTA may provide a better knowledge of local conditions and better links with the authorities, which should not be underestimated, especially in a project of SF financing. Necessary changes in planning and financing may be better foreseen and screened by a local GTA. At the same time, because the objectives of the IRC, and those of the project, do not coincide, the former being more vast and diversified, it seems unreasonable to simply load the functions of GTA on the shoulders of one of the acting IRC officials without the proper motivation.

Reconsidering the role of UNIDO in providing expertise and training

Taking into account the following aspects:

- the substantial changes which took place during previous phases within the IRC in particular, and the whole country and its industry in general;
- the experience of inter-relations between the IRC and UNIDO gained during the past 12 years;
- the significant tasks to be fulfilled at the new stage of the national economic and industrial development;

the role of UNIDO as an executive organization providing the assistance to the IRC should be reconsidered during Phase IV of the project.

It would be useful for both sides (UNIDO and the ITC) if their relations changed from the traditional one-way communication which includes generally providing experts and equipment and also periodically reviewing the situation in the project. A more flexible, diversified relationship should be established requiring efforts from both sides, better feedback about the results of each effort should be organized at the executor's and the client's ends of the line. It evidently coincides with the modern trends within UNIDO itself and answers to the actual demands of many developing countries.

Flexibility in relations is required because of the necessity to find out about the new field of relations optimized to the current, more complicated situation in the world and in UNIDO. No previously obtained experience in this field exists.

Diversification in the possible ways of UNIDO operation and in its relations with developing countries is dictated by the fact that with changing times, the more difficult becomes an economic and industrial situation in a given particular country. Using the phrase of a prominent writer, it may be said that all least developed countries look alike, but each developing country develops in its own way.

A stronger feedback should be organized in order not only to urgently enhance the quality of the experts and their usefulness, but also to attract the whole informative and operational potential accumulated by UNIDO for solving the problems of such a big and multi-branch project like this one.

Among the questions which the author believes need to be answered in the near future in order to help the project to be successfully implemented are the following:

- How to establish the regular information flow from UNIDO on the topics which the ITC is currently working on;
 - How to arrange the contacts and future cooperation with ITC;
 - How to become once more involved in the training programmes of UNIDO in the fields of project interest;
 - How to optimize the procedure of selection of adequate experts in order to exclude faults of so called paper judgment;
 - How to establish the rates at which experts are paid better in relation to the quality of their work;
 - How to arrange regular, not occasional notification about an experts work from the ITC to the recruiting branch;
 - How to organize a waiting list for short-term consultants in order to avoid a peculiar situation when the time required for recruitment is longer than the duration of the mission;
 - How to effectively select partner(s) for bilateral cooperation in the shortest possible time;
 - How to organize the effective assistance from UNIDO in establishing research and services the ITC is going to perform in the field of technology;
 - How to speed up the process of procurement of equipment, spare parts and accessories;
 - How to organize short briefings at the ITC for other UNIDO experts arriving in the country.
- It appears that the elaboration of the ways and means to satisfy the above demands will help to improve the effectiveness of UNIDO efforts.

CONCLUSIONS

4.1 The present activities of the IRC are developing in accordance with the new conditions which are now observed in the economic and industrial life of the CSPIAJ. These conditions are characterized by the diversification of economic relations between different administrative, agricultural and industrial bodies of society.

4.2 Together with solving the current problems of the industrial development of the country, it is now planned to assist particular targets of a given sector of industry (e.g., food production, textile industry, building materials etc.). Nevertheless, the main points which are similar and most decisive to all these industrial sectors are formulated as development targets, such as: growth of productivity; solving of pollution problems; industrial automation; utilization of by-products; proper assembly and packaging and labour safety.

4.3 Particular priorities for each industrial sector are formulated on the basis of optimal achievement of the above-mentioned targets.

4.4 The IRC remains the main institute where the strategies as well as different current problems are formulated and investigated.

4.5 New premises allow the IRC to substantially increase the volume, speed and quality of research, development, design and testing activities carried out for the needs of a fast growing and changing industry.

4.6 A deficiency of properly qualified personnel hinders the successful achievement of an equally high level of work, which is however almost achieved in certain sections of the IRC.

4.7 Same problem as 4.6, together with the lack of proper accessories and spare parts results in the large amount of badly needed sophisticated but not operational equipment installed in the IRC.

4.8 The relations between the IRC and UNIDO during Phase IV of the project should be more flexible in order to meet the demands of the work in principally new conditions and for new targets as described above.

4.9 Several vital branches of Libyan industry, such as plastic goods production, painting materials, electrical and electronic devices etc., are not properly followed at the IRC and need more attention.

4.10 In general, the relations between the IRC and local industry develop rapidly, their productivity confirming the necessity of the existence and further development of the IRC.

RECOMMENDATIONS

1. To stress UNIDO's activity as a consultancy and coordinating agency in providing the qualified expertise for solving the current problems of the IRC, mainly on the basis of short-term experts (or consultants).
2. To formulate clearly and to demand in job descriptions from experts recruited by UNIDO that one of the most important tasks for them is to provide training for the IRC counterparts when doing their immediate job, and besides it as well.
3. To reconsider the procedure of expert recruitment in order to avoid the discontinuities between the "image of the expert" produced by representing papers, and the real value of the expert himself.
4. In order to fulfill 1-3, to elaborate a more detailed questionnaire about the expert's abilities and experience, not only in a general field of speciality, but also in a narrow specialization connected with the job in question.
5. To conclude an agreement between UNIDO and the IRC about joint elaboration of a waiting list for all the experts needed for all stages of the project (excluding troubleshooting matters). Having such a list will make the invitation of the necessary expert more operative and fast.
6. To include into the project framework the possibility of establishing bilateral long-term cooperation with one or two foreign well known IRSIs on the basis of a subcontract.
7. To provide the training facilities, technical and scientific expertise and other significant information exchanges between the IRC and subcontracting IRSI choosing as a field of cooperation one or two most vulnerable problems the IRC is working on.
8. To consider the possibility of a CTA appointment from the viewpoint of real candidates accessible. (It is better not to have any CTA than a weak one.)
9. To include into the scope of future IRC activities several modern trends of technology, but only on the basis of real needs and capabilities.
10. To improve the speed and quality of information exchange between the IRC and UNIDO in order to provide better flexibility and effectiveness for UNIDO assistance.

Terms of Reference

of

project formulation mission

to

Industrial Research Centre

L I B Y A

Purpose of the mission:

To formulate a technical assistance project to the Industrial Research Centres (IRC) to be financed under the Fund-in-Trust Agreement for total value of US \$3.7 million for duration of four years.

Composition of mission:

A highly qualified consultant in R and D management with practical experience in activities of multi or mono branch research institution.

Schedule of mission:

Briefing at UNIDO Headquarters 5 days
Field work three weeks
Debriefing and draft project document clearance at UNIDO Headquarters - 5 days

Scope of work:

The consultant will be assigned to the Industrial Research Centre and in close cooperation with the management and the local staff he will be expected to:

- review and assess the present activities of the Centre including its organizational structure and management system, staffing of the departments and laboratories and equipment available;
- analyse the performance of the Centre with special alternatives paid to its relations with the industries;
- in close cooperation with the management of IRC identify the scope and content of the external technical assistance required and determine priorities in the provision of the assistance;
- work out recommendations with regards to measures to be taken locally to streamline and strengthen IRC activities primarily aimed at solving industrial problems and providing direct assistance to the industrial units;
- in consultations with the Director-General of IRC or persons specially assigned by him formulate a draft project document for the technical assistance project to be financed under Fund in Trust agreement between IRC and UNIDO.

The results of the mission will be summarized by the consultant and prepared for discussion at UNIDO Headquarters during the debriefing session. As the final output of the mission the consultant is expected to produce (1) a draft project document in accordance with the UNIDO format and requirement and (2) technical mission report.

The draft project document should be ready for discussion during the debriefing.

The final mission technical report should be submitted not later than in three weeks after his return from the mission.

List of Officials Met During the Mission

1. Mr. A. Konstantinov, UNIDO, Vienna, Substantive Officer
2. Mr. S. Shaker, UNDP, Tripoli
3. Mr. A. Habbishi, IRC Director of Dept. of Tech. Economic Studies, Deputy, Director-General
4. Mr. A. Elnash, IRC Director of Dept. of Laboratories and Research
5. Mr. M. Wajezai, IRC Director of Dept. of Geological Research and Mining
6. Mr. T. Nishit, IRC Director of Dept. of Standardization and Specification and Industrial Properties.

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**Schedule of Arrangements and Activities for Establishing the
Bilateral Cooperation with a Foreign IRSI or Technical University
on the Basis of a Subcontract within the Framework of
the UNIDO Project**

<u>ACTIVITY</u>	<u>EXECUTOR</u>	<u>STARTING DATE **</u>					
		M/M					
1. Identification of IRSIs working group - laboratory with proper interests and capabilities	IRC		1-2				
2. Formulation of prerequisites and objectives for cooperation within the project framework and in accordance with IRC work plan	IRC UNIDO		2-3				
3. Identification of partner on behalf of UNIDO and preliminary discussions on the topic	UNIDO IRC		2-4				
4. Negotiations with the authorities of partner country (if necessary) and Heads of IRSI on terms of subcontract	UNIDO IRC	1.0	2-5				
5. Arrangement of personal contacts between IRC and IRSI through study tours, clarification of details of subcontract, signature of documents, review of subcontract	UNIDC IRC IRSI	2-3	5-6	12			30
6. Training of IRC specialists at IRSI facilities	IRSI	12-40		8...		18...	..
7. Expert missions from IRSI for on-the-job training, providing expertise, evaluation of cooperation	UNIDO IRSI	8-16		10-12	14-16	20-24	26
8. Planning of postgraduate studies preparation of training programmes selection of candidates for Ph.D. research at the IRSI	IRC IRSI UNIDO	2.0-4.0		12-13		18-19	
9. Reporting on main achievements reviewing, revisions, possible changes in programmes	IRC IRSI UNIDO	1.5-3.0		12		20	30

TOTAL M/M: 70 of which Experts: 20 Fellowships 50

Approximate Cost: US\$ 300,000

Approximate Duration: 2.5 years

** in months after start of project