

# Pakistan Institutional Excellence Project

(Cooperative Agreement No. Pakistan 391-0498-A-00-0802-00)

PD-ABF-077

## Cooperating Institutions:

- University Grants Commission,  
Islamic Republic of Pakistan
- U. S. Agency for International Development  
Midwest Universities Consortium  
for International Activities

# FINAL REPORT

June 1991

## PROJECT PURPOSE

The purpose of the Institutional Excellence Project (IEP) is to improve Pakistan's capabilities to develop, adapt, and utilize advanced scientific and technology innovations in support of economic and social development. This purpose will be achieved by strengthening research, teaching and outreach in selected science and technology departments in cooperating universities. The primary mechanisms to be employed in this effort will be the establishment of formal and informal linkages among Pakistani and U.S. scientists and their institutions, education and training and a small grants research program.

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PD-ABF-077  
12A 80399

**INSTITUTIONAL EXCELLENCE PROJECT (IEP)**

**FINAL REPORT**

**June 1991**

**Prepared by:**

**Midwest Universities Consortium for  
International Activities, Inc. (MUCIA)**

**Supported by:**

**University Grants Commission,  
Islamic Republic of Pakistan**

**and**

**USAID Cooperative Agreement No. 391-0498-A-00-0802-00**

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## 1. INTRODUCTION

The purpose of the Institutional Excellence Project (IEP) was to improve Pakistan's capabilities to develop, adapt, and utilize advanced scientific and technological innovations in support of economic and social development. This goal was to be attained by strengthening research, teaching and outreach in selected science and technology departments in participating universities. The primary mechanisms to be employed in this effort were the establishment of formal and informal exchange and collaborative linkages among Pakistani and U.S. scientists and their institutions; the upgrading of graduate and post-graduate education and faculty training; a small grants program to fund proposals for specific research projects germane to the IEP's objectives; and strengthened linkages between universities and the private sector.

The U.S. Agency for International Development (USAID) entered into a cooperative agreement with the Midwest Universities Consortium for International Activities (MUCIA) on April 12, 1990 for the implementation of the Institutional Excellence Project. The project involved the cooperation of USAID, MUCIA and the Government of Pakistan. On August 6, 1990, Purdue University assumed responsibility for the conduct of the project as "lead university" by entering into a subagreement with MUCIA. The Purdue Project Management Office (PPMO) was established in July, and the Chief-of-Party and Administrative Officer arrived in Pakistan in August and September, respectively, to begin program operations and set up the Islamabad Project Management Office (IPMO).

The initial step in the implementation of the IEP was the preliminary institutional analyses that were conducted by officials of MUCIA and USAID/Islamabad in June. These analyses were conducted at the National Centre of Excellence in Mineralogy and Department of Geology, University of Balochistan at Quetta; Department of Chemistry, Gomal University at Dera Ismail Khan; and the Department of Electrical Engineering, University of Engineering and Technology at Lahore.

Following the preliminary institutional analyses, the individual subject area assessment teams began in-depth site visits in August 1990. The assessment teams prepared reports on their assessments of the education and research programs at the



Officials affiliated with the Institutional Excellence Project (IEP) assembled for the Purdue site visit in January 1990. First row (from left): David Sprague, Chief, Human Resource Development Office, USAID/Pakistan; M. H. Qazi, Special Advisor, Pakistan University Grants Commission; A. Q. Ansari, Chairman, University Grants Commission; Abdul Aziz Khan, Planning Unit, Ministry of Education. Second Row (from left): George R. McCormick, Academic Officer and Chief-of-Party, IEP; Sydney M. Stafford, former Treasurer, MUCIA; Vivian L. Rider, Administrative Assistant, International Programs (IP) office, Purdue; Marilyn Buchan, Chief, Contracts and Commodities, USAID/Pakistan; Harold Dickherber, Chief, Agricultural Production and

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Mary Joy Pigozzi, MUCIA Associate Executive Director, (left) and George McCormick, IEP Chief-of-Party (center) confer with M. H. Qazi, Pakistan's University Grants Commission (in white); G. A. Miana, Chairman, Chemistry Department (front); and faculty members during the preliminary site visit to Gomal University in June 1990.

individual departments and formulated an initial draft of a six-year development plan for each of them. In October 1990, four additional institutions were added to the schedule, and these assessments were scheduled for early 1991.

The outbreak of hostilities in the Gulf disrupted the initial project plan because consultant travel to Pakistan was prohibited, and on January 13, 1991 the American long-term field staff were ordered evacuated to the United States. The American staff of the Islamabad Project Management Office (IPMO) arrived at the Purdue Project Management Office (PPMO) at Purdue University on January 18 and 21. The activities of the IPMO continued from the PPMO during the absence from January 21 to April 1, 1991. During this period assessment reports were finalized, and plans were made for resumption of assessments upon the return of the American staff to Islamabad. However, in February it was learned that major reductions in assistance funds to Pakistan were being implemented, that the IEP was subject to termination, and that 40 percent of the existing obligated funds to the IEP were to be deobligated. MUCIA was then notified on March 17, 1991 by USAID that the cooperative agreement with MUCIA for the implementation of the IEP was to be terminated for the convenience of the U.S. government. MUCIA activities for the IEP formally ceased on June 30, 1991.

## **1.1 PURPOSE OF THE FINAL REPORT**

During the short life span of the project MUCIA accomplished a great deal. It established an excellent infrastructure for the project, completed three institutional assessments, developed strengthening plans for three higher education institutions, and added to the knowledge base on problems and probabilities of university-private sector linkages. The purpose of this document is to describe the project and propose how a similar project might be initiated in light of what was learned from IEP.

### **1.1.1 IEP Description**

This final report describes the project goals, the participating institutions chosen by the Government of Pakistan, the project approach, completed departmental assessments, and plans for a "small grants" program. It also discusses the strengths of

the approach, and the changes MUCIA would recommend if this or a similar project were to resume.

### **1.1.2 Feasibility of a Reformulated Project With Similar Objectives**

We hope that this report will provide useful information to any assistance agency planning to take up this or a similar project. We also hope that the report will be useful to the Government of Pakistan so that it might encourage institutional and procedural changes that would attract foreign assistance for such a project. Based on our findings, it is also possible for faculty research capabilities in Pakistani universities to be improved even without foreign assistance.

The plan to assist Pakistan's economic development by building the research capabilities of its universities to support the growth of Pakistani industry is well founded. The market economy philosophy of the recently elected Pakistani government and its policy of privatizing previously nationalized industries improve the prospects for success of an assistance project having the IEP's goals. At the time of this writing, there is an excellent opportunity for good leadership and coordinated efforts and support to establish successful university-industry linkages for cooperation in applied research. A renewed program for transfer of applied science and technology to Pakistani industry via its universities should lead to growth of Pakistan's internal research-and-development resources, and eventually to enhanced foreign trade that would bear a good "return on investment."

## **1.2 BACKGROUND**

Numerous studies have demonstrated the crucial importance of indigenous science and technology to the development of a strong economy. The development of several Asian countries presents encouraging examples of success wherein scientific and technological resources have been marshalled and focussed on developing indigenous industry and improving the technical service sector.

Pakistan is on the threshold of such development. Numerous industries have been established which provide the potential for strong economic growth, given better organization and sufficient support. The World Bank has noted the comparative advantage of several industries such as textiles, chemicals and agriculture. Pakistan's

natural resources and favorable location for participation in the economic growth of the Pacific Rim and other markets offer multiple opportunities for additional advantages to develop.

At this point, little organized use has been made of Pakistan's science and technology resources. Progress is hampered by low production of the most highly trained experts at the M.S. and Ph.D. levels. Efforts have been made to increase the production through overseas training, but this does little to affect the indigenous capability for training and has resulted in a "brain drain".

Industry, for various reasons, makes little use of the expertise now available. Foremost among the reasons are a lack of confidence in the abilities of the science and technology community, a perception of inadequate training of new scientists and engineers in Pakistan, and a lack of understanding by universities of the specific needs of industry for quick solutions to problems if results are to be of practical economic value.

Therefore, the future technological and economic development of Pakistan depends heavily on its ability to improve the science and technology base and to foster the interaction and cooperation of industry and the academic community to contribute to economic growth. It was toward these national development needs that the Institutional Excellence Project (IEP) was directed.

### **1.2.1 Role of Universities and Technology in National Economic Development**

There is worldwide recognition that the university is a primary contributor to economic growth by being a source of new scientific knowledge and its technological applications, and by training scientists and technicians for employment by industry. In developed countries, universities are not only sources of fundamental research and new theories, but their efforts are combined with those of applied research laboratories and institutes and industry to provide sustained technological progress. Examples abound of the increasingly coordinated efforts for economic development. Japan and the U.S. provide perhaps the most striking example of integrated research and development, combining efforts of universities, industry, and the government to produce a highly coordinated, successful, and competitive technological economy.

In Pakistan, efforts to bring about such greater integration of providers and consumers of scientific and technical knowledge and manpower have been impeded by a number of factors:

- The policy of rapid proliferation of universities was initiated to provide greater public access to educational opportunities; however, this has diffused the limited financial and human resources that are available for quality improvements;
- A tradition of isolation of research and development activities within individual universities, applied research laboratories, and institutes, with little or no interaction or cooperation among institutions or interdisciplinary collaborations within institutions;
- The lack of focus of research and development on well-defined national needs. For example, in the universities faculty members typically choose government-sponsored research activities which suit their own personal interests, and government does not strongly influence the topical range of research through funding policies that are linked to specific national development objectives;
- Increasingly outdated curricula caused by inadequate faculty training, lack of textbooks and library materials, and poor laboratory facilities. Consequently, technical graduates are unable, without further training at company expense, to contribute effectively to private sector productivity; and
- A dearth of research results because of inadequate facilities and research support. The lack of facilities and research support have frustrated and discouraged many potentially productive researchers and contributed to the brain drain to better opportunities abroad.

A reorganization of scientific and technological research is needed to overcome these obstacles. Industry and the technical service sector have repeatedly stated their willingness to participate in such a reorganization and to cooperate on updating curricula, providing on-site training for students, and participating in cooperative development projects, provided that an effective mechanism is established which provides a real, improved economic return for their efforts.

### **1.2.2 Role of Applied Research Laboratories and National Institutes in Economic Development**

To overcome the obstacles to technological growth which have faced Pakistan, numerous applied research laboratories and national institutes have been established to focus on specific technical areas. In general, these institutes have not made major contributions to economic growth because of their narrow focus and their isolation from industry.

The applied research laboratories of the Pakistan Council for Scientific and Industrial Research (PCSIR), while reasonably equipped and staffed, have also acted in isolation, without significant interaction with university departments and centres. They have tended to develop processes and products that do not correspond to needs perceived by industry, rather than responding to specific problems and needs.

Considering all of these factors, it is evident that a coherent strategy is needed which effectively strengthens and organizes research and development capabilities, and provides a mechanism to identify and respond to industrial needs. The Institutional Excellence Project provided a model strategy for supporting economic development through university-based science and technology. The intent of the IEP was to demonstrate the effectiveness of this model.

### **1.3 PROJECT GOAL**

The overall goal of the IEP was to improve Pakistan's capabilities to develop, adapt, utilize and advance scientific and technological innovations in support of further technological development. The goal was to be achieved by supporting and strengthening research and teaching in up to nine selected university science and technology departments in phased activities over ten years. The primary mechanism for supporting this effort was to consist of formal and informal linkages between selected Pakistani academic departments and U.S. departments, Pakistani industry, and Pakistani government research laboratories. A secondary mechanism was a "small grants" program to support individual and group research projects.

The IEP strategy assumed that increasing and maintaining the quality of manpower in science and technology required raising the quality of higher education, and that appropriate deployment of quality manpower would contribute to national development. These are solid assumptions. The positive correlation between human

resources development and economic development has been demonstrated through research in many nations.

The approach of the IEP to improve scientific and technological capability was to target those individuals essential to and responsible for the development of the nation's science and technology sector. These individuals included the academic engineers and scientists who could conduct "leading-edge" research and train future scientists and technicians, and the private sector representatives who, along with government, are responsible for introducing and disseminating the technologies necessary for development. This approach focussed on training university researchers in key departments. It also addressed reform of curricula, of teaching methods and of the entire research system. IEP stressed consolidation and strengthening of existing resources. It was anticipated that this approach would:

- establish linkages between participating research departments and the needs of private industry and government laboratories,
- improve linkages between Pakistani universities and other Pakistani and U.S. institutions,
- provide a model of scientific and technological professionalism, and
- develop sustainable institutional foundations.

These results were to be achieved to the extent that the university centers participating in the IEP were engaged in the following activities by the end of the project:

- Research focussed on problems relevant to Pakistan's development,
- Obtaining resources from the private sector as well as government to support this work,
- Providing higher quality education to the nation's future scientists and technicians, and
- Active participation by Pakistani academic engineers and scientists in the activities of international scientific networks.

## **1.4 PROJECT STRUCTURE AND COMPONENTS**

The IEP was to be implemented over a ten-year period at an estimated cost of \$80 million. The project was divided into a *base* period and two *option* periods. The *base* period extended for five years (1990-1994) for which USAID had made available \$30 million. The two *option* periods were scheduled for two and one-half years each (1994 - 1997) and (1997 - 1999), and USAID had programmed \$25 million for each option. These options were to be exercised if there was a favorable review of the project's progress during 1992.

The IEP was structured in two parts: an Institutional Development (ID) component and a Small Grants (SG) component. Seventy-five percent of project resources were to be devoted to the Institutional Development component and the remaining twenty-five percent to the Small Grants component.

Key to MUCIA's approach to both components was its initial focus on problem-specific scientific networks rather than on more traditional departmental linkage arrangements. The approach rests on the knowledge that scholars develop long-term linkages through shared interest in similar or related problems. From the beginning of IEP, MUCIA provided first rate scholars and internationalists to serve as Subject Area Facilitators (SAFs). Each SAF was well known in the IEP discipline under consideration and was committed to the IEP concept. The SAF was responsible for coordinating all activities in a specific discipline in IEP and for linking Pakistani scholars with individuals with similar interests in U.S. and Pakistani universities, research institutes, and private enterprise. Thus, institutional linkages would be built on the foundation of particular scholarly interests, an approach that has proven to be much more effective than traditional ones.

### **1.4.1 Institutional Development Component**

A total of up to nine Departments, Centres of Excellence or Institutes, hereafter referred to as entities, were to be selected to participate in the Institutional Development component from a list of 15 such entities proposed by the Government of Pakistan. The entities were to be selected on the basis of their efficient utilization of existing resources and their high probability of becoming productive research units. The criteria for selection required participating entities to have applied programs in science or technology that were relevant to the development goals of Pakistan. The entities must also offer M. Phil. or Ph.D. degrees, undertake research in development-

related activities, and demonstrate a desire to adopt those changes in structure, policies and procedures that would assist them in achieving excellence under the project.

Assistance at each of the nine participating entities was to be divided into two parts: Assessment and Implementation.

#### 1.4.1.1 Assessment

Each of the 15 entities selected by the Government of Pakistan were to be visited by an assessment team to determine how effectively they were using their present resources and their probability of success in the IEP. Those nine which were rated with the best chance of success overall were to be chosen to participate.

Each of the assessments was to take two years or less to complete. Thus, the implementation phase was to be started in some of the entities that had been assessed early in the process and deemed to have a high probability of success in the IEP, before assessments were completed on all 14 entities. The following table lists those entities which were chosen by the Government of Pakistan for assessment and possible participation in the IEP.

**Table 1**  
**Possible IEP Participants**

UNIT	INSTITUTION	LOCATION
Centre of Excellence in Geology	Peshawar University	Peshawar
Department of Electrical Engineering	University of Engineering and Technology	Lahore
Centre for Advanced Molecular Biology	University of the Punjab	Lahore
Department of Chemistry	Gomal University	D.I. Khan
Department of Biological Sciences	Quaid-i-Azam University	Islamabad
Centre of Excellence in Mineralogy and Department of Geology	University of Balochistan	Quetta
Centre of Excellence in Solid State Physics	University of the Punjab	Lahore
Department of Geology	University of Sind	Jamshoro
Centre for Advanced Studies in Applied Genetics and Saline Agriculture	University of Agriculture	Faisalabad
Department of Pharmacy	Bahauddin Zakariya University	Multan
Department of Electronics	Azad Jammu and Kashmir University	Muzaffarabad
H.E.J. Institute of Chemistry	Karachi University	Karachi
Department of Livestock Management	Sind Agricultural	Tandojam
Institute of Economics	University of Karachi	Karachi

Assessments of seven entities were to be completed by March 1991. These included:

- Mineralogy and Geology at University of Balochistan
- Chemistry at Gomal University
- Electrical Engineering at the University of Engineering and Technology
- Geology at Peshawar University
- Center for Advanced Molecular Biology at Punjab University
- Geology at University of Sind
- Biological Sciences at Quaid-i-Azam University

The implementation phase for up to three of these institutions was to begin no later than March 1991. The assessments for the remaining eight entities were to be completed by late 1992.

The assessment and formulation of a six-year development plan for each entity was designed as a two-month collaborative process. An assessment team for each entity consisted of the following individuals: the IEP Academic Director, a UGC representative, a Pakistani subject area specialist from another Pakistani institution, a USAID representative, a MUCIA subject area facilitator, up to two MUCIA scientists representing the discipline, the Chairman of the entity being assessed, and one other faculty member from the unit being assessed. Involvement of other Pakistani professionals in this activity was essential. It encouraged in-country networking and demonstrated the process of peer participation and review.

The institutional assessments and formulation of a six-year development plan began with a general outline format. This step ensured consistency in addressing specific issues and that certain topics be considered in each assessment/plan. Examples of these considerations were:

- A survey of interests and past research activities of the staff, with the aim of identifying researchers in fields germane to national and provincial development priorities.
- Selection of national or provincial development topics on which the department will focus efforts to strengthen its research and educational programs.

- The desired number and level of post-graduate academic degrees (long-term training) to be acquired by the faculty, with a priority listing of proposed candidates and completion schedule, if possible.
- Type of short-term training required, specifying the year, training location, and proposed trainees, if possible.
- Proposed research activities, listing researchers and proposed team members.
- Requirements for upgrading facilities and equipment.
- Existent and proposed networking activities identified by subject area and participating departments, groups, institutes or companies.
- Identifying already existing national and international linkages, and formulating plans for their further development.

The six-year development plan was to be prepared in considerable detail for the first few years and be left more flexible for the later years. The plan was to be reviewed annually and revised as the project progressed.

Using the institutional assessments guidelines, the second step in developing the six-year development plan was for the assessment team to meet at the entity being reviewed in order to:

- Determine the priority of needs and decide which ones should be selected for strengthening research and education programs.
- Identify possible U.S. departments for linkage(s).
- Identify possible private-sector industrial and government laboratories for research collaboration.
- List expected project outputs.
- Decide on a mix of training, research and networking activities that will produce the desired outcomes.
- Develop a plan that details activities in relation to expected outputs, complete with specified schedule and progress indicators.

The plan was to be circulated to the faculty members of the entity being reviewed, and to USAID, UGC, and MUCIA for comments and additions or deletions. The plan was then to be finalized with UGC and MUCIA/USAID.

The implementation phase did not need to wait until all 14 assessments of candidate participants in the IEP were completed. As the assessment process progressed, some entities would immediately appear as prime candidates for selection, others would appear as unsuitable for the project, and the remainder might or might not be included. Those that immediately appeared as prime candidates in the assessment were to be selected to begin the implementation phase immediately while the assessment phase progressed with other entities. For implementation purposes, the nine institutions to be selected would be divided into sets of three, and each set of three was to participate for 6 years: set 1 (1991-1997), set 2 (1992-1998) and set 3 (1993-1999).

#### **1.4.1.2 Implementation**

The six-year development plan for each entity specified two or three major national development problems that were to be the focus of research in that entity for purposes of the IEP. The six-year plan contained the training, commodities, and supplies, listed in order of priority, that were needed to establish the proper laboratories and trained personnel to accomplish research in the proposed areas. Therefore, it would be possible, even before the total package for each entity was determined, to begin long-term training and initial commodity purchases by beginning at the top of the priority list in each category. When all of the assessments were completed, and a clearer picture was available of the total number of units to be supported and the nature of support requested, it would then be possible to determine total support for each entity and to proceed with short-term training and more commodity purchases by simply moving down the prioritized list for each category in the six-year plan.

An important part of the implementation phase was a review of the progress of the project in the entity on a yearly basis. Over the six-year development period, some changes would certainly be needed in order to keep the plan current for each entity, such as additions or deletions of commodities or training. Furthermore, if unsatisfactory progress toward the objectives of the IEP were being made, support for the entity could be withdrawn and transferred to another entity. The design of the Institutional Development component recognized that conditions may change in these

targeted institutions during the life of the project, and considerable flexibility would be required in order to permit changes in activities and even substitutions of individual institutions, based upon mutual GOP and USAID agreement.

The flexible design of the IEP made it very different from most educational assistance grants. Instead of stipulating the exact amounts of funds allotted to each department and the specific number of training grants and specific items of commodities to be furnished before release of any funds, the IEP developed a flexible plan and adjustable resources based upon performance and progress toward the objectives of the plan. Past assistance practices have allotted funds to a department, and then not monitored progress nor removed the funds if the department did not demonstrate sufficient progress to improve its research output or teaching. The IEP was designed to avoid this locked-in situation, and even planned to begin supplying funds for training and commodities before the total amount of assistance was completely determined for each participating entity.

#### **1.4.2 Small Grants Component**

The primary intent of the Small Grants component was to focus research and development capability on improvement in products and processes, and the creation of indigenous technology, with industry playing a leading role in identifying the research problems to be undertaken. In this sense it was also considered to be complementary to the Institutional Development component in demonstrating the effectiveness of improved capabilities.

The Small Grants component was not limited to university departments, Centres of Excellence or university institutes. Other laboratories, research centres, and private industries were to be eligible for support. Institutions receiving support under the Institutional Development component were not to be directly eligible for support under the Small Grants program, but could participate in joint programs in cooperation with other organizations that were eligible to apply for a small grant.

Small Grant awards were to be made in three technological areas per year. Proposals were to be evaluated by a joint committee of Pakistani and American scientists and experts from the private and public sectors, under the direction of the University Grants Commission in collaboration with the Ministry of Education, the Ministry of Science and Technology, and USAID.

Twenty million dollars was budgeted for the 10 years of the project, and five and one-half million dollars for the first five years of the project. It was intended that the grants be awarded on the basis of competitive proposals much as are awards by the National Science Foundation in the United States. The proposed competitive grants could include requests for salary support, equipment, expendable supplies, library materials, travel to conferences and meetings, and costs of publications. The objectives and administrative structure of the Small Grants component are outlined in Annex A.

### **1.5 REASONS FOR CLOSEOUT**

Iraq invaded Kuwait on August 2, 1990 just 15 days before the Chief-of-Party of the IEP arrived in Pakistan to begin the project. The political climate between the U.S. and the Middle Eastern countries became more troublesome and complicated throughout the autumn of 1990.

One of the first tasks of the IPMO staff in Pakistan was to make projections for training and a budget for 1991 to ensure that sufficient, but not excessive resources were present in the pipeline to accomplish the projected tasks for 1991. Early in September of 1990 there was the prospect of USAID project budget cuts, because the United States Congress had made large cuts in the foreign assistance budget for FY 1991. Inasmuch as Pakistan was no longer earmarked as in earlier years, it meant that assistance to Pakistan would also have to share those cuts. The matter became more serious in October 1990 when President George Bush declined to certify that Pakistan has refrained from developing nuclear weapons, a step that was required for continuation of U.S. assistance to Pakistan.

By March it became apparent that no new funds would be added to the Pakistan assistance budget for 1991. Furthermore, several million dollars were also being removed from the existing pipeline. The IEP was a new project which had barely begun. It required a large sum of money and at least five to ten years to complete all the necessary training, establishment of laboratories and technical exchanges as planned. Also, the University Grants Commission, after nearly a year into the project, had still not written a Planning Commission PC-I document that was necessary to obtain authorization from the Government of Pakistan to spend money on individual institutions.

It was essential for USAID/Pakistan to terminate some projects and to make severe cuts in others to keep within the budgetary and time constraints required by Washington. MUCIA was, therefore, notified on March 17, 1991 that the cooperative agreement with MUCIA for the implementation of the IEP was to be terminated for "the convenience of the U.S. Government". MUCIA activities on behalf of the IEP ceased on June 30, 1991. At the time this report was prepared, it was expected that all IEP activities would cease within a year following the termination of the cooperative agreement with MUCIA.

## **2. ACCOMPLISHMENTS AND FINDINGS**

### **2.1 IEP ACTIVITIES**

The IEP activities during the life of the project consisted of Institutional Assessments preparatory to the Implementation Phase of the project, project support activities, and the design of an administrative plan for the Small Grants Component. As noted earlier, the Administrative Plan for the Small Grants Component appears in this report as Annex A.

#### **2.1.1 Institutional Assessments**

The technical proposal written by MUCIA in response to the RFA and incorporated into the cooperative agreement required that four institutional assessments be completed in 1990-91 -- the Department of Chemistry at Gomal University, the Department of Electrical Engineering at the University of Engineering and Technology, the Department of Geology and Centre of Excellence in Mineralogy at the University of Balochistan, and the Department of Geology at the University of Sind. During June, 1990, Dr. George R. McCormick, Chief-of-Party, Dr. Charles Rhykerd, MUCIA Project Officer, and Dr. Mary Pigozzi, Associate Executive Director of MUCIA made a preliminary visit to three of these four, along with Dr. A. Q. Ansari, Chairman of the University Grants Commission and Dr. M. H. Qazi, Academic Advisor to the Chairman. The planned visit to the University of Sind was prevented by political unrest. However, the senior staff of the Geology Department at the University of Sind did meet with the team in Karachi. The team was satisfied that there was enough

interest in each department to proceed with a complete assessment for all four departments.

Based upon the information obtained from this preliminary assessment, the Department of Geology and Centre of Excellence in Mineralogy at the University of Balochistan were scheduled for the initial assessment from August 22 to September 14. The dates and order of the remaining three assessments were to be decided in September after the arrival of the long-term field staff and after review of the experience gained from the first assessment at the University of Balochistan.

The assessment of the Department of Chemistry at Gomal University was carried out from October 1-8, 1990, and that for the Department of Electrical Engineering at the University of Engineering and Technology (UET) from October 31 - November 12, 1990. MUCIA was unable to schedule an assessment for the Department of Geology at The University of Sind because the political situation in Sind remained serious throughout the autumn, and the U.S. Government restricted travel to that area. The detailed schedules for the complete assessments of these three universities are presented as Annex B.

Project participants believed that additional institutions should be assessed during 1991 in order to have a reasonable pool of candidates from which to select participants for the first implementation phase. It had not been possible to assess the University of Sind, and the internal academic situation at the University of Balochistan made it a very poor candidate for the startup round, inasmuch as the continuation of the project after year five depended on evidence of success during the first three years, so institutions having strong potential for success were especially important to the first round of the IEP. Therefore, there were only two real possibilities for the first year -- Electrical Engineering at UET and Chemistry at Gomal.

The project was designed to help medium to strong research departments become stronger and even become "world class". There was concern that some stronger departments were not scheduled for assessment early in the project. And, for example, the H.E.J. Institute of Chemistry at the University of Karachi, a potential IEP candidate, had been omitted from the original list of Pakistani institutions.

Dr. John Monagle (USAID Project Officer), Dr. James Norris (USAID Mission Director), and Dr. David Sprague (Chief, USAID/Human Resources Development), discussed the matter with the Chairman of the University Grants Commission and the

Secretary of the Ministry of Education. They agreed to add the H.E.J. Institute of Chemistry at the University of Karachi and the Centre for Advanced Molecular Biology at Punjab University to the list of institutions to be assessed. They also agreed to advance two strong institutions to the list to be assessed in 1991. These were the Centre of Excellence in Geology at the University of Peshawar and the Department of Biological Sciences at Quaid-i-Azam University. MUCIA planned to complete these assessments as well as one for the Department of Geology at the University of Sind during January and February of 1991. The planned schedule for these assessments is presented as Annex C.

By January 1, 1991, the assessment teams had all been selected and travel arrangements made, but these additional assessments were never completed because of the Gulf War. USAID notified MUCIA on December 30, 1990 that there could be no travel of consultants to Pakistan, and thus all of the forthcoming assessments and the scheduled team visits were cancelled. On January 13 the long term field staff were also ordered out of the country by the Ambassador and were not allowed to return until early April 1991.

The methodology for the assessments consisted of several distinct steps all designed to obtain data that addressed five evaluative questions. These questions are discussed in Annex D along with other details of the assessment process. The data collection involved a visit to the department and a description of the IEP by the Academic Officer, the department's completion of a survey questionnaire requesting basic information about the department (see Annex E), and then an extended visit by an evaluation team which conducted detailed interviews with faculty, administrators, knowledgeable businessmen, government officials, and in some cases, entertained proposals from the faculty in the department. A set of measurable criteria was developed by Dr. Monagle and Dr. McCormick for evaluating and choosing the institutions to participate in the IEP. This set of criteria is presented as Annex F, along with a point system for assisting the selection process.

Questionnaires with basic data were returned by all seven units that were to be assessed in 1990-1991. Three assessments were completed as outlined in Annex B before the Gulf War forced evacuation of the Long Term Field Staff, and USAID budget restrictions forced the termination of the project.

During the first three assessments, several observations emerged that point to the potential benefits of the IEP and also to major constraints. The following items identify several of these benefits and constraints.

- Existing financial and equipment resources for performing research are severely limited in virtually every university department. Nevertheless, there are several dynamic individuals in some of the departments that were assessed who are active in pursuing research and have produced laudable results in spite of limited resources.
- The productive individuals in the assessed departments provide the potential for IEP success. However, many of these individuals are junior faculty or faculty who do not have strong influence over the activities of their department or the allocation and use of existing research resources. Care would need to have been taken to ensure that they were important participants in IEP-supported activities.
- The focus of the IEP on applied research, i.e., research specifically directed to the industrial development needs of Pakistan, is not a familiar priority to most Pakistani faculty. Consequently, additional effort was required to explain this concept, to demonstrate how the concept applies to Pakistan, and to illustrate how it can be implemented. Based upon extensive discussions with faculty and industrial representatives, the assessment teams were convinced that the concept of applied research directed to the developmental needs of Pakistan is sound.
- Team research is also a new concept to most Pakistani faculty. Current research practices focus almost exclusively on individual research activities. There are a few examples of group research efforts in Pakistan, but they need to receive increased encouragement from universities. The IEP could have made a significant contribution by identifying these examples, providing resource support, working with university administrators to encourage those activities, and providing opportunities for expanding team research programs.
- One critical success factor in any departmental setting is the commitment of the university and departmental leadership to the objectives of the IEP and to the effective management of resources to achieve those objectives. For example, targeting funds to faculty and research programs which have a high probability of successful outcome runs counter to the all too frequent tendency to spread funds among all faculty in a department regardless of demonstrated talent and

productivity. A commitment to target resources does exist in some of the institutions assessed, but not all. Hence, administrative leadership displaying a commitment to these objectives emerged as a key criterion for selecting institutions for participation in the IEP.

- The initial response to the IEP by many faculty interviewed was a request for general funds for research equipment and supplies. These solicitations were seldom presented persuasively in terms of well thought out research objectives and outcomes that the faculty member expected to achieve. The ability of a department or centre of excellence to define such objectives and to organize research plans to meet IEP objectives would have been an important factor in the ultimate selection of IEP participants. Therefore, one major contribution of the IEP would have been the training it would bring to Pakistani faculty in developing and effectively presenting the rationale for a thoroughly planned research program. If a department can prepare a successful research program rationale/proposal through participation in the IEP, it should become more successful in competing for research funding from all sources, including the UGC, ministries of the Government of Pakistan, USAID, and international agencies.

With regard to the results of individual assessments, the reader is directed to the detailed Six Year Development Plan for the Department of Geology and Centre of Excellence in Mineralogy at the University of Balochistan, the Plan for the Department of Chemistry at Gomal University, and the Plan for the Department of Electrical Engineering at the University of Engineering and Technology. These reports discuss in detail the situation within each department at the time they were reviewed, and present specific recommendations for developing the research capabilities in each. The following is a brief summary of the review of each of these departments.

***Department of Geology and Centre of Excellence in Mineralogy,  
University of Balochistan***

This institution could be a productive centre of geologic research for Pakistan. It is ideally located in an undeveloped, mineral-rich province, and the national office, laboratories, and library of the Geological Survey of Pakistan are next door to the

centre. Unfortunately, very little productive research in geology or cooperation with the Geological Survey has occurred or is taking place in these departments.

The Centre of Excellence in Mineralogy has ample facilities and a good budget. However, these funds are not being spent for scientific or research purposes. Only the director has produced research other than the degree dissertation. The other staff members have not completed research degrees, nor are they qualified to conduct research. Two of the six staff members have a Ph.D. degree. Three or four faculty staff positions remain unfilled.

The Department of Geology has barely any budget at all, but has a reasonably qualified and interested staff. Two of the sixteen faculty members hold a Ph.D. degree, and five more are currently enrolled in a Ph.D. program in the U.S. or Europe. Three faculty members and their students are actively pursuing research problems with their students.

For at least six years the two departments have not associated collegially with each other; the library and research facilities have all been split into separate parts for the Geology Department and the Centre; and there has been very little cooperation between the two units. The political unrest at the University of Balochistan has kept it closed much of the time. Thus, teaching and research in the departments has been sporadic.

The review team did not believe that support should be given to these departments at the University of Balochistan until the internal political differences are resolved, and until there is supportive leadership in both departments so that the two organizations work together in a coordinated, professional effort. The team recommended that when cooperation is achieved, and when there is a focus on research topics corresponding to regional and national needs, then support from an IEP-type program would be justified. The most logical research focus is hydrogeology, with supporting contributions from geochemistry and geophysics. The latter technical areas also would encompass mineralogy and economic geology (i.e., mineral resource exploration and development). Successful strengthening of hydrogeology and supportive disciplines will require outside funding, as well as cooperation with the Geological Survey of Pakistan and other university units. There is an opportunity to catalyze and develop an excellent project that could achieve national significance.



*IEP chief-of-party, George R. McCormick (third from left), with Balochi villagers near the Afghan border.*



*MUCIA and UGC personnel getting acquainted with Balochi transportation traditions during the June 1990 site visit to the University of Balochistan in Quetta. Left to right: Camel driver, Charles L. Rhykerd, Mary Joy Pigozzi, George McCormick, A. Q. Ansari, Vice-Chancellor S. H. Baloch, and a pedestrian.*

### *Department of Chemistry, Gomal University*

Gomal University was established in 1974 and is located on a new, visually attractive campus 14 km north of the city of Dera Ismail Khan. The University has fifteen departments, of which the Departments of Chemistry, Physics, and Pharmacy constitute a core with primary responsibility for teaching and research in science. There are 24 members in the Chemistry Department faculty, and 72 students distributed between the M.Sc. previous and final classes. Graduate programs leading to M.Phil. and Ph.D. degrees are relatively new and are in an early stage of development. The existence of a well-trained senior faculty and a pool of enthusiastic students, coupled with the pervasiveness of chemistry throughout modern industry, indicate that the Department of Chemistry of Gomal University has the potential of playing a significant role in the economic development of Pakistan, both as a resource and a driving force.

The immediate goal of the IEP for the Department of Chemistry at Gomal University was to organize the talents and the wide range of research interests of the senior faculty into two or three research programs that are highly focused toward Pakistan's technological development. The sustainability of these programs could have been ensured by giving the junior faculty an opportunity for graduate training in related areas, and by linking these programs to Pakistan's evolving industry.

It was proposed to expand three existing primary research programs: applied biochemistry, polymer technology, and natural products chemistry, by providing equipment, supplies and training. In addition to assisting these programs directly, a new state-of-the-art analytical spectroscopy laboratory was proposed as a core facility which could serve all areas of chemistry. Not only could this spectroscopy laboratory have provided essential services to the three primary research programs, it could have stimulated other research programs. By providing an atmosphere in which faculty and students could effectively pursue meaningful research, and by providing funds for modest improvements to the department for teaching chemistry, the IEP could have stimulated the production of trained manpower in chemical sciences and technology, as required for further development of Pakistan's chemistry-based industry.

The review team was concerned about the extremely isolated location of Gomal University. The isolation presents difficulties in maintaining advanced instruments for mass spectrometry and nuclear magnetic resonance spectroscopy. Necessary supplies for routine operation, such as liquid helium, cannot be obtained locally, and will have

to be produced on site. The operating costs are thus greatly increased over those for a similar laboratory in urban sites like Karachi or Lahore. Also, the isolated location will make interaction with private-sector and government research laboratories difficult to achieve.

***Department of Electrical Engineering,  
University of Engineering and Technology***

This university is the strongest engineering school in the country. As a major educational institution in the Punjab, it attracts the best students in the nation's most populous province, and serves as the major source of engineering manpower for both the semi-private utilities, such as the Water and Power Development Authority, and private industry. Therefore, UET has considerable potential for upgrading technology in Pakistan. The Electrical Engineering Department attracts many of the strongest students coming to UET, making it very attractive for the IEP.

Although the physical facilities are poor, the personnel of the Electrical Engineering Department at UET are fairly well qualified. A number of the faculty hold Ph.D. degrees from abroad, and the department is already operating its own postgraduate degree program. The strongest group is the computer engineering faculty, even though their computing facilities are quite modest. This strength has been sustained by international linkages that provide periodic leave opportunities, and this faculty has produced research publications in international journals. However, this group's capability has not yet been exploited by local industry. Electronics and communications are related interest areas in the faculty that are not as well developed on the research level, but which offer opportunities for local industrial applications.

The assessment team recommended that UET be included in the IEP, with research focussing on computers and applications in industrial automation, electronics, and communications. IEP resources would have been used to provide facilities, to train staff, and to provide technical assistance. Special emphasis would have been placed on establishing lasting linkages with professional colleagues in the U.S. and on attracting research contracts from industry in Pakistan. Because another USAID project to support energy-related education was scheduled to provide a significant portion of the



*M. Sc. final chemistry students, Gomal University.*



*Electrical Engineering students, University of Engineering and Technology.*

required equipment, the IEP could have focussed on establishing industry-university linkages and on effecting required changes in institutional procedures. Contacts with industry would have been developed through seminars, workshops, and graduate student thesis research projects. These activities could have generated more financial support for the university, and faculty were to have been trained in effective methods of research administration.

One interesting aspect of the proposed program was the use of a "sandwich" Ph.D., in which young teaching staff at UET would begin their Ph.D. work in Lahore, take some classes and conduct research at an U.S. university under co-supervision of American and Pakistani professors, and then complete their degree requirements at UET. There are two particular advantages to this approach to Ph.D. training: 1) The thesis topic can be tailored to meet Pakistan's local needs, and 2) the participant is more likely to return to UET from abroad than are those who receive a foreign Ph.D.

### **2.1.2 Project Support Activities**

The Institutional Excellence Project was a cooperative venture between the Government of Pakistan through the University Grants Commission, the United States Agency for International Development, and the Midwest Universities Consortium for International Activities, Inc. (MUCIA). The progress achieved during the short time of operation owes much to the close cooperation and commitment to the principles of the IEP held by these participants.

Direct support for the IEP involved the activities of three offices: the Purdue Project Management Office (PPMO), the Islamabad Project Management Office (IPMO), and the two offices of MUCIA in Columbus, Ohio and Washington, D.C. MUCIA held the Cooperative Agreement with USAID and chose, with USAID concurrence, Purdue University to serve as the "lead university" with legal, contractual, fiscal, and operational authority and responsibility for the conduct of the project. MUCIA continued to have responsibility for project policy matters and project monitoring and evaluation. The staff who worked on the Institutional Excellence Project in these offices are listed in Annex G.

Additional support for the project came from the office of the Chairman of the University Grants Commission -- the Pakistani government's counterpart organization

for the IEP -- and from the Human Resources Development office of the USAID Mission to Pakistan.

The **Purdue Project Management Office** was organized by Purdue University to manage the IEP and to backstop all operations in Pakistan. It was affiliated with the International Programs Office at Purdue University led by Dean D. Woods Thomas. In addition to Dr. Thomas, the staff consisted of a project director, an administrative assistant, and a secretary, all full-time. In December, a half-time Deputy Project Officer was added.

The activities of the PPMO included everything from the refinement of the project design to arranging documents and schedules for travel and procuring commodities. Personnel were recruited for the assessment teams, often on very short notice. Unique arrangements were worked out with the many universities involved. Maintaining communications both internationally and domestically and following and coordinating all the myriad administrative details were major challenges. The PPMO was also responsible for the editing, production, and distribution of all project reports and documents.

The **Islamabad Project Management Office** was established to implement the project by managing all in-country activities and maintaining close liaison with the USAID Mission. Full-time project activities in Pakistan began with the arrival of the chief-of-party on August 17, 1990. The IPMO began operations under less than ideal circumstances because no physical space or equipment were available at the time project activities were initiated.

After initially borrowing space from USAID, the IPMO worked in cramped quarters provided by the University Grants Commission in a training hostel while permanent IPMO quarters in the UGC complex were under construction. This construction was completed in late December, and the new space was occupied in early January. Equipment was acquired by the Administrative Officer, Dr. Nick Poulton. The Finance Officer was the first local employee to be hired followed by two drivers in November when two vehicles were obtained. A secretary was added in January when the IPMO moved into the new quarters. At the time of the



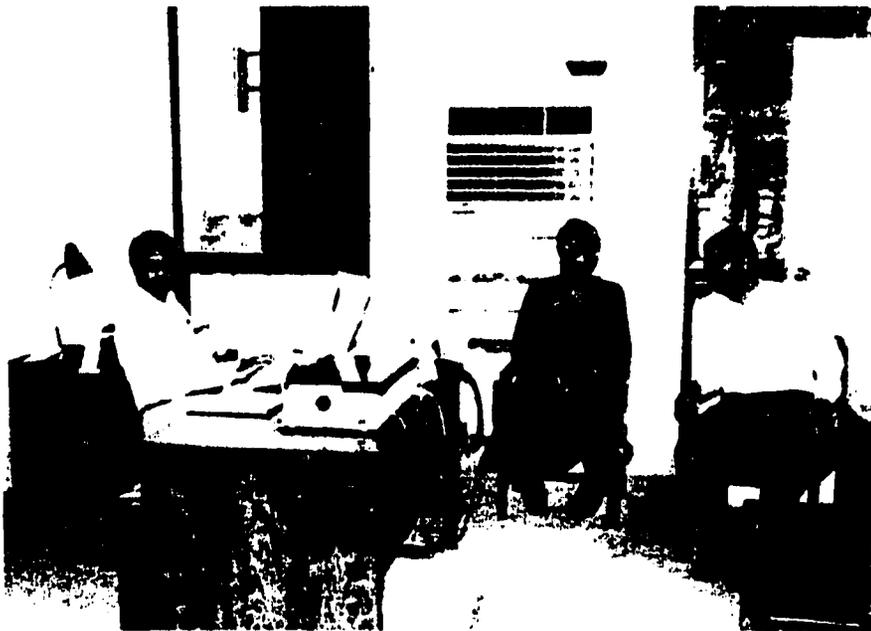
*Linda Branson, secretary, and George McCormick in the Purdue Project Management Office.*



*Nick L. Poulton, IEP Administrative Officer of the Islamabad Project Management Office, inspects progress in construction of the IEP's office in the new office complex of the University Grants Commission in Islamabad.*



*Syed Khalil Ahmed, IEP Finance Officer, in the just completed Islamabad Project Management Office (IPMO).*



*IPMO staff Mohammad Tariq, secretary (at desk), and drivers Sharafat Ali Abbasi and Syed Sakhawat Hussain Kazmi.*

ordered evacuation of the long term field staff to the United States in early January, the IPMO facility had just been completed, staffed and fully equipped for an eventual staff of nine personnel on the grounds of the University Grants Commission.

IPMO activities concentrated on providing support to visiting assessment teams; continuing liaison with the potentially participating university departments and centres; investigating linkage opportunities between universities and organizations in the public and private sectors of Pakistan; cooperating with USAID on planning the financial resources and support activities of the project; and collaborating with the UGC on the implementation of the project, including meeting the requirements of the Government of Pakistan for aided projects. The IPMO also maintained regular contact with both the PPMO and MUCIA project staff.

## **2.2 LINKING UNIVERSITIES TO THE PRIVATE SECTOR**

The importance and potential productivity of linkages between universities and private enterprise has been clearly demonstrated in the United States, in other developed countries, and in some developing countries. Linkages typically develop in ways that adapt to the unique strengths of a university and the economic circumstances of the enterprises to which the university relates. The principal forms of linkage consist of university placement centers, formal college/department linkages, and individual faculty relationships with businesses.

Placement centers serve business, students, and faculty. Students have a wider range of job possibilities to consider, businesses have a larger pool from which to select employees, and faculty can monitor the results of their programs of study.

Formal college/department linkages typically promote training programs for business, business and technical advisory councils for the colleges and departments, business-faculty exchange programs, and collaborative research and development projects which benefit both business and the university. The latter type of linkage is a primary focus of the IEP. Sponsored programs provide the university community with opportunities to work collaboratively with industry on research, development, and training programs. These efforts benefit the entire faculty through the generation of funds that often cover costs of faculty salaries, laboratory equipment, and graduate

student scholarships. Industry and government benefit from the pool of university talent available to address their needs.

Individual faculty relationships typically take the form of consultancies for business and government which can be financially rewarding for the faculty member, solve problems for private businesses and government agencies, and build relationships between these sectors which can lead to other linkages. During the IEP assessment of university departments, one of the points of inquiry was how and in what ways faculty collaborated with businesses and government agencies and how these contacts might be developed into more formalized and productive linkages.

The experience that MUCIA has had with university-business linkages both in the United States and in developing countries points to the following typical benefits:

- Increased financial support for the universities through direct project funding and through political support for the base funding to the universities
- Increased use of university resources by business and government agencies
- Increased relevance of the university's curricula
- Creation of practical training opportunities such as work-study, technical training and executive education programs
- Increased recruitment and job placement for students and businesses
- Increased university visibility
- Increased financial independence for those faculty members who must work several jobs to make ends meet

While these linkages function well in developed countries and have been achieved in some developing countries, the norm in developing countries is that such linkages do not exist, or they exist in forms that provide little support to students and faculty. Furthermore, university graduates are often perceived as being unqualified for jobs in business. Many university students also perceive the government as a better place to work, because, while the pay is low, there is long-term employment security and some employment benefits. Pakistan is no exception to these norms.

### 2.2.1 Existing Linkages

In Pakistan, it is necessary to consider both the private and public sectors as one views the technical and industrial economy. Much of the economy that is typically in the private sector in other countries is operated by the Government of Pakistan through state-owned industries. During the early 1970's Zulfiqar Ali Bhutto nationalized all major industry. The energy and technology sectors came under the public domain. As a result, the independent, private sector in Pakistan is very small, has limited resources for supporting development projects, and has virtually no resources to support research.

In the nationalized industries there has been little interest in research and development. The research and development that was being done before nationalization ceased within a few years after nationalization. Pakistani industry has largely been interested in making "quick" money by producing local versions of international products for quick sale in Pakistan to capture the discretionary wealth held by many in the middle and upper classes. An example is the large pharmaceutical industry in Pakistan. This industry is totally concerned with manufacturing and packaging for internal use in Pakistan. There is no interest in or facilities for research and development. Consequently, the local pharmaceutical industry exhibits little interest in supporting research in the pharmacy colleges of Pakistan.

During the past 15 years since nationalization, several agencies of the Government of Pakistan have established research laboratories that are reasonably well equipped and staffed by permanent employees. Examples include SUPARCO, PCSIR, and the Atomic Energy Commission. Unfortunately, these laboratories have little connection with universities. Funds that in earlier years probably would have been used to assist university research facilities have been diverted to establish and operate government laboratories.

These government research facilities have for the most part not been very effective in meeting the development needs of Pakistan. The researchers and facilities quickly become out-dated. Most researchers do not keep up with the literature or broaden their interests. They tend to concentrate on their dissertation material, and do not stay abreast with advancing frontiers of research in their field. Little attention is paid to the technological needs of Pakistan.

Virtually no formal research linkages currently exist between university departments and industries in Pakistan. However, consulting relationships exist

between individual faculty and industries, and these potentially could be developed into more formal linkages given the proper incentives and conditions. Senior ranking geologists and mining engineers from the universities have consulted with mineral industries and with the Geological Survey of Pakistan for many years. However, these industries have not financially supported research in the university departments. Furthermore, junior faculty in university departments, whether trained in Pakistan or abroad, seem to have developed little or no interest in consulting with industry.

Many of the engineering faculty (electrical, mechanical, mining, and civil) at the University of Engineering and Technology at Lahore also have consulting arrangements with private industry. However, there appears to be no general support from industry for faculty research or students' projects in these departments. An exception may be the High Voltage Laboratory section of the Electrical Engineering Department of UET. For a number of years this laboratory has performed testing of transformers for local industry and for the Water and Power Development Authority (WAPDA). However, the fees for this service have gone one-half to the general university treasury and one-half as salary for those faculty performing the tests. No money has been set aside for upgrading, repair or replacement of equipment, none for support of students in the department, and none for faculty research.

At one time all engineering students spent at least one term on a co-op program with industries. Then industry would seek out good students for future employment. Students learned the operation of industry and became aware of the technological problems that needed to be solved. Unfortunately, this co-op program has not operated at UET for at least 10 years.

Interviews were conducted with officers in WAPDA, Descon and PECO, all companies in Lahore having extensive need of engineers. Universally they said that industry would welcome a linkage with the engineering schools. However, they were quick to point out that because of the falling academic standards at Pakistani universities, they are forced to give examinations to potential employees, and less than 20 percent of the engineering graduates can pass these exams. They are pleased with those students who do qualify, and these few students do perform very well.

Industry representatives also indicated that they are hesitant to make any financial commitments through linkages with the universities because the academic bureaucracies are constantly changing, and they need to be confident that the university

can deliver on its commitments. Time is of the essence in business, and industry cannot afford to lose time in long bureaucratic delays when a problem needs a solution.

Since there is little history of, or experience with, industry support of research in universities, there is no system of handling the financial arrangements. Faculty members and university administrators generally believe that faculty could not receive any extra pay over their scheduled salary for performing research under a contractual linkage between the university and an industrial concern. Also, research money paid to the university by industry typically has been expended at the discretion of the Vice-Chancellor of that university regardless of the reasons for which the funds were provided. Examples were offered where a Vice-Chancellor distributed funds to meet other needs, not necessarily to the unit performing the research. These policies are obviously a deterrent to faculty seeking out linkages and contracts between the university and industry. Consequently, faculty limit their outside industry activities to private consulting relationships.

It was not clear to the assessment teams, however, that current beliefs were in fact fixed policies, or whether in fact there is no formal policy and/or faculty were using these reasons as excuses for not seeking industry assistance. One Vice-Chancellor indicated that his university has a standing policy of dividing any incoming research contract funds from industry into thirds -- one-third for the faculty members carrying out the research, one-third for their department, and one-third for general use by the university. Therefore, it is very possible that the activities of the IEP could have made considerable progress in clarifying and shaping the practices in those university departments selected for participation.

### **2.2.2 Lessons Learned**

The staff of the IEP has concluded that the objectives and design of the IEP was right on target for developing new linkages between Pakistani universities and industry. However, industrial managers clearly indicated that the initiative to build these linkages rests on the shoulders of the university research departments, and these units were the targets of the IEP. The universities must have competent faculty, qualified students, operating laboratories, and information useful to industry. Once the linkage with a given industry is established, both the utility of the research department to the industry and the support of the research department by the industry would grow. Industry will turn to the universities for assistance when the universities are able to supply

knowledge and technology that helps industry to expand and compete more successfully in the marketplace.

The organizations which must take the lead in the development of linkages with industry are the few university research institutes such as CAMB at Lahore and the H.E.J. Institute of Chemistry at Karachi which have a reputation for quality research and do attract considerable research funds from outside Pakistan. They are competent organizations, are well equipped, and stand the best chance of attracting relationships with industry. However, the initiative still rests with the research institute to prove that they can serve Pakistani industry, and the IEP was the mechanism which was being developed to make the approach.

Investment must then be made in the next tier of university research departments. These are the ones with competent faculty and moderate research facilities. They must be developed into first rate or even "world class" research departments equivalent in stature to CAMB or H.E.J. Institute of Chemistry. These departments and their faculty would then be able to develop their own linkages with industry for additional support. But investment should not be made in weak departments with incompetent and disinterested staff that will take years to develop with even large sums of money. The IEP was designed precisely to identify those first- and second-tier research departments through the assessments and help them develop their research capacity to serve the economic development of Pakistan.

Linkages will be attractive to faculty when the linkage results in more salary for the faculty members, more equipment and support for their laboratories and students, and more research time away from teaching duties. A policy, or policies, should be established for the universities which would include rules for disbursement of funds received from industrial linkages as well as research grants from other sources. These rules must mandate that the major amount of such funds go for the support of faculty, students and facilities where the work is being performed. Procedures for conducting university research activities in the United States would serve as a useful model for initial adaptation to the conditions of Pakistan.

The IEP had planned to sponsor several technological conferences bringing scientists from the best research departments in the universities together with managers and technical experts from industry to discuss industrial needs and university capabilities to solve many of the current problems. Conferences were planned at both

the national and provincial levels. Efforts should be continued to find support for these activities independent of specific university development programs, for these opportunities permit the most important elements of linkages, namely the people involved, to begin to establish those contacts which could lead to forming cooperative liaisons in the future.

### **3. NEXT STEPS - BUILDING ON THE IEP FOUNDATION**

Although the socialist policies inherited from the Z. A. Bhutto regime have discouraged linkages of university researchers with the private sector, there is now much cause for optimism. In democratic elections, Pakistan recently installed a national government dedicated to development by market economic principles. This new government is thus in better philosophical harmony with U.S. social and economic principles than any Pakistani government in several decades. The developing parallelism of outlook and the prospects for the new government's political effectiveness and stability seem likely to regenerate U.S. interest in assistance to Pakistan.

Recently, the Government of Pakistan has begun to implement a national policy of privatizing the major industries of the country. This is a very positive development for the purposes of the IEP. The government emphasis on private-sector development is coming at a time which could have paralleled the development of university departments through the IEP to work with those industries. There is now an excellent prospect that good leadership and coordinated efforts and support would establish successful linkages.

At the time the IEP agreement with MUCIA was cancelled, only three of 14 departmental assessments were completed, and no training, commodity, or research assistance was provided to participating departments. As stated earlier, the project staff and participants are convinced that the basic design of the project is sound, and this would have been demonstrated if funding conditions had been different. Nevertheless, there are a few adjustments that are recommended which would improve the implementation of the project design.

### **3.1 DESIGN LESSONS FROM IEP**

***Project Funding.*** The principal problem discovered immediately in the implementation of the IEP was that the schedule of technical assistance mandated by USAID in the RFA did not correlate with the funding schedule provided by USAID in the cooperative agreement. Project funding for the first five years was set at \$30 million of the total \$80 million planned for the entire project. At the end of year two, a review was to be conducted that, if positive, would yield a two-and-one-half year extension and \$25 million more. Again in year five, another positive review would yield the final two-and-one-half year extension and the remaining \$25 million. The greatest need for funds mandated by the technical requirements was in years four and five. Yet the funding plan provides the majority of the resources after year five! The IEP needed to have the majority of the funds in the first five years for there to be a reasonable expectation to achieve the desired results by the end of the project.

***Small Grants Component.*** The Small Grants component of the IEP was separated from the Institutional Development component and was to be funded at \$20 million from the \$80 million total. There were two problems with this separation from the Institutional Development Component as required by USAID.

First, whereas the Institutional Development component was sponsored by one ministry -- the University Grants Commission of the Ministry of Education -- the Small Grants Component was to be under the control of both the Ministry of Education and the Ministry of Science and Technology. It is recommended that all activities of the entire IEP should be under the Ministry of Education with advice sought from interested persons in other ministries. This would prevent major logistical hurdles.

Second, the Small Grants component should have been integrated with the Institutional Development component. The research grants should continue to be judged as the Small Grants activity was originally designed, but all participants in the IEP should have appropriate access to the research funds. Departments participating in Institutional Development Component should have a mandate to design research projects to include other university departments, government laboratories and industrial organizations as appropriate.

The original design and expected budgets for departments participating in Institutional Development did not include money for "seed grants" or small research grants to cover essential items as chemicals and supplies. This deficiency was raised

immediately by faculty members in each of the three departments that were assessed. They emphasized the great difficulty they face in obtaining the most elementary research supplies. Hence, it was planned to incorporate such "seed grants" in the institutional development plans when the Program Agreement was to be amended. This provision should definitely be considered in any plans for continuation of this or any similar project.

***Planning Commission Documentation.*** The Government of Pakistan (GOP) requires that all assistance programs be authorized by the Planning Commission of the GOP, and that assistance project budgets be included in the national budget of the GOP. There are two forms of documentation used by the Planning Commission for handling these matters -- the PC-I for project implementation and the PC-II for project development and planning. The IEP began operations having only an approved PC-II, not a PC-I. Institutional assessments and development plans could proceed under this authorization. But no resources could be expended to assist any university department, whether for commodities or participant training, until the PC-I was drafted and approved and the associated assistance funds incorporated into the national fiscal year budget. The PC-I typically is a very detailed document that lists specific items and values of assistance to the recipient organization.

It became evident early in the project that it would be extremely difficult to obtain a PC-I that was sufficiently flexible so that resources to participating departments could be adjusted to allow for the evolution of departmental conditions and progress toward IEP objectives. The very nature of the IEP requires periodic reviews and adjustments of resources to account for emerging conditions and changes in the situation of a participating department. It was absolutely essential that the PC-I for the IEP allow for changes in the resource support as successes and shortcomings evolved during the course of the project. The project staff was convinced that it was possible to obtain such a document. It was also clear that the approval of this document would require the strong support of the University Grants Commission and a direct appeal from the USAID Mission to the Ministries concerned. Without a PC-I of this type, it is *not* recommended that the IEP be resumed in Pakistan.

***Department Selection.*** Several university departments were selected by the GOP and included in the RFA as candidates for participation in the Institutional

Development component of the IEP. All of the departments included on the list were not of equal quality, however, and other very strong science and technology departments were omitted from the list for potential participation.

The attitudes of many GOP and university personnel indicated that they did not have a full appreciation of the screening function of the assessment phase of the project, and the expectation that some candidate departments may *not* have been selected as final participants in the IEP. The general belief was that once a department appeared on the list, it would automatically participate in the project. Furthermore, new departments were added by the UGC after the IEP began operations. It was also possible, but not a simple matter, to have one of the previously omitted strong departments added to the list for assessment. Proposed changes in participants met with resistance because of the numerous difficulties that could result. It is essential, however, that the strongest science and technology departments participate in the IEP. Without the full commitment of the UGC and the USAID Mission to supporting the strongest university departments, it is not recommended that the IEP be resumed.

### **3.2 LOOKING TO THE FUTURE**

If the opportunity presents itself, it is recommended that the Institutional Excellence Project be permitted to proceed as originally designed. However, given the current circumstances facing the IEP, there are several alternatives that should be considered regarding how the concepts contained in the IEP could be achieved in future projects.

First, the project does not have to be implemented in its entirety but could be implemented in stages. The advantage of a phased approach is the opportunity it provides to test further the principles incorporated in the IEP design and to explore the most effective means to accomplish project goals with a smaller initial commitment of resources. The disadvantage is the potential loss of Ph.D. training because these programs require secure funding over a long period of time. Selecting the initial technical area to support would also be more problematic, because fewer participants would receive support at the outset of the project.

Second, the original design could be retained, but implemented with a reduced level of resources and a reduced scope of participation. Obviously, fewer university

departments would benefit, but those that would participate would have to be the best in their field. The opportunity to permit anything less than the best to participate would be eliminated by the limited resources available.

Third, the initial focus of the project does not need to be the Institutional Development component for university departments, which was the original design of the IEP. If linkages between university research capabilities and either private sector applications or government research agendas are the highest priority goals, the project could begin with establishing the research agenda first and building the research capabilities and linkages as the means to address those agenda topics. The selection of participating university departments could then be based upon a competitive review of the departments that have the best potential to study the best potential to study the specified research topics. The scope of the project could then be expanded based upon the size of the established research agenda, not on an arbitrary number of departments nominated by the GOP and limited by the funding available from the assistance donor.

These are only a few alternatives to the original project design. Each alternative would require careful analysis and planning in order to maximize the return on the resources invested and to minimize the losses when compared to the benefit potential of the original design. MUCIA continues to be committed to the goals and objectives of the Institutional Excellence Project and would welcome the opportunity to study design options and prepare alternative proposals for their implementation.

## **ANNEXES**

<b>Annex A</b>	<b>IEP Small Grants Program</b>
<b>Annex B</b>	<b>Schedule of Institutional Assessments Completed</b>
<b>Annex C</b>	<b>Schedule of Institutional Assessments Scheduled</b>
<b>Annex D</b>	<b>IEP Assessment Methodology</b>
<b>Annex E</b>	<b>Assessment Questionnaire</b>
<b>Annex F</b>	<b>Measurable Criteria for Evaluation/Choice of Participating Institutions</b>
<b>Annex G</b>	<b>Institutional Excellence Project Staff</b>

## ANNEX A

### IEP SMALL GRANTS PROGRAM

#### Objectives

1. To provide funds for research in targeted areas considered critical to the technological development of Pakistan.
2. To encourage close collaboration in research between university, government laboratories, and the private and public sectors.
3. To encourage group research efforts, particularly with scientists from diverse disciplines collaborating on the same project.
4. To encourage research projects incorporating technological transfer.

#### Administrative Structure:

##### *A. IEP Grants Coordinating Committee:*

This is a permanent committee which will meet at least twice a year and is the supervisory committee for the small grants program. The committee will be responsible for the following:

1. Approve areas of critical development for which grant applications will be sought each year. They may appoint an Advisory Board each year to assist in this task and also appoint the chairman of the Advisory Board.
2. Approve review panels for grants.
3. Approve criteria for proposal evaluation.
4. Approve grants.
5. Review progress of grants.
6. Recommend continuation/termination of grants.
7. Plan workshops and seminars relating to small grants.
8. Set yearly budgets for grants program.
9. Determine grant limits and categories for grant support.

The membership of the Grants Coordinating Committee must have a critical mass but not be cumbersome. We recommend the following:

1. UGC representative - Chairman
2. Ministry of Science and Technology representative
3. MUCIA representative
4. USAID representative
5. Pakistan Science Foundation chairman or member
6. USA scientist
7. Pakistani scientist
8. Ministry of Education - Joint Educational Advisor - Higher Education Wing
9. Chairman of Implementation Unit of the IEP for the University Grants Commission - Permanent Secretary

***B. Implementation Unit:***

The administrative and liaison work for the small grants program will be handled by the Implementation Unit of the University Grants Commission under the direction of the Chairman of the University Grants Commission in liaison with the MUCIA Chief-of-Party. Activities should include:

1. Announcements, publicity.
2. Administration of workshops, seminars, conferences.
3. Printing and distributing proposal forms.
4. Processing proposals for review and action.
5. Processing periodic payments to grantees.
6. Selecting review panel personnel.
7. Monitoring research progress and financial reporting.
8. Establishing linkages between public and private sectors and R&D laboratories.
9. Administrative and liaison activity.

**C. *Advisory Board:***

This committee will be appointed at the discretion of the Grants Coordination Committee. They will:

1. Advise on three central areas for research each year.
2. Make suggestions for guidelines for proposals.
3. Finalize evaluation criteria.
4. Serve as peer reviewers for proposals each year.

The membership should be composed of presently active researchers in the public and private sector. We recommend the following:

1. Two university faculty members appointed by the University Grants Commission or Centres of Excellence.
2. Two members from government laboratories appointed by Ministry of Science and Technology, such as Pakistan Council of Scientific & Industrial Research, etc.
3. Two scientists from the private sector.
4. Implementation Unit Chairman (Ex officio) Permanent Secretary.
5. One MUCIA representative (Ex officio).
6. One USAID representative (Ex officio).
7. Additional U.S. scientists as required.

**D. *MUCIA:***

Will arrange and conduct workshops on linking scientific research to development priorities and on development of research proposals.



**Gomal University, Dera Ismail Khan**  
Department of Chemistry

**Subject Area:**  
**Site Visit:**

**Chemistry**  
**Oct. 1 - 8, 1990**

**Assessment Team Personnel:**

*Dr. David L. Smith*, chemistry subject area facilitator and team leader.  
Professor of Pharmacological Chemistry, Purdue University.

*Dr. D. Howard Miles*, technical subject area consultant/U.S. Professor of  
Chemistry, University of Central Florida

*Dr. Zafar H. Zaidi*, technical subject area consultant/Pakistan. Professor of  
Chemistry, University of Karachi

*Dr. George McCormick*, IEP academic director in Islamabad. Professor of  
Geology and Mineralogy, University of Iowa.

*Dr. John Monagle*, IEP project officer, USAID/Islamabad. Formerly served as  
Director of the Arts and Sciences Center of New Mexico State  
University.

**Assessment Status:**

**Assessment Report - First Draft:** Completed December 15, 1990

**Report Review with Department:** Completed January 7-8, 1991

**Assessment Report - Final Draft:** Completed March 28, 1991

**Development Plan Status:**

**Plan - First Draft:** Completed December 15, 1990

**Commodity Cost Estimate:** To be determined

**Plan Budget Estimate:** To be determined

**Participation Status:** To be determined

**Notes:** Not applicable

**University of Engineering and Technology  
Lahore**

**Subject Area: Electrical Engineering**

**Department of Electrical Engineering**

**Site Visit: Oct. 31 - Nov. 12, 1990**

**Assessment Team Personnel:**

*Dr. Thomas W. Chapman*, engineering subject area facilitator and team leader.  
Professor of Chemical Engineering, University of Wisconsin.

*Dr. Richard S. Marleau*, technical subject area consultant/U.S. Professor of  
Electrical Engineering, University of Wisconsin

*Dr. Sadaruddin Shaikh*, technical subject area consultant/Pakistan. Professor of  
Electrical Engineering, Mehran University, Nawabshah Campus

*Dr. H. Oner Yurtseven*, technical subject area consultant/U.S. Professor of  
Electrical Engineering, Indiana University Purdue University  
Indianapolis

*Dr. George McCormick*, IEP academic director in Islamabad. Professor of  
Geology and Mineralogy, University of Iowa.

*Dr. John Monagle*, IEP project officer, USAID/Islamabad. Formerly served as  
Director of the Arts and Sciences Center of New Mexico State  
University.

**Assessment Status:**

Assessment Report - First Draft:	Completed January 18, 1991
Report Review with Department:	Planned January 10-11, 1991 (Cancelled by USAID)
Assessment Report - Final Draft:	Completed March 28, 1991

**Development Plan Status:**

Plan - First Draft:	Completed January 18, 1991
Commodity Cost Estimate:	To be determined
Plan Budget Estimate:	To be determined

**Participation Status:** To be determined

**Notes:** Not applicable

## ANNEX C

### SCHEDULE OF INSTITUTIONAL ASSESSMENTS PLANNED

University of Peshawar, Peshawar      Subject Area:      Geology  
National Centre of Excellence in Geology      Planned Site Visit:      Jan. 14 - 21, 1991

#### Assessment Team Personnel:

*Dr. F. William Cambray*, technical subject area consultant/U.S. Professor of Geological Sciences, Michigan State University.

*Dr. Robert R. Loucks*, technical subject area consultant/U.S. Research Associate in Geology, Purdue University, and IEP Deputy Project Officer, Purdue Project Management Office.

*Dr. A. D. Memon*, technical subject area consultant/Pakistan. Professor of Geology, University of Sind, Jamshoro.

*Dr. Lon Ruedisili*, technical subject area consultant/U.S. Professor of Geology, University of Toledo.

*Dr. George McCormick*, IEP academic director in Islamabad. Professor of Geology and Mineralogy, University of Iowa.

*Dr. John Monagle*, IEP project officer, USAID/Islamabad. Formerly served as Director of the Arts and Sciences Center of New Mexico State University.

#### Assessment Status:

Assessment Report - First Draft:      Planned March 11, 1991 (Cancelled)  
Report Review with Department:      Planned March 20-21, 1991 (Cancelled)  
Assessment Report - Final Draft:      Planned April 6, 1991 (Cancelled)

#### Development Plan Status:

Plan - First Draft:      Planned March 11, 1991  
Commodity Cost Estimate:      To be determined  
Plan Budget Estimate:      To be determined

Participation Status:      To be determined

Notes:      Not applicable

**Quaid-i-Azam University, Islamabad**  
**Department of Biological Sciences**

**Subject Area: Biology**  
**Planned Site Visit: Jan. 21 - Feb. 1, 1991**

**Assessment Team Personnel:**

- Dr. John R. Menninger*, biology subject area facilitator and team leader.  
Professor of Biology, University of Iowa.
- Dr. Robert M. Bock*, technical subject area consultant/U.S. Professor of  
Biochemistry, University of Wisconsin-Madison.
- Dr. Homer T. Erickson*, technical subject area consultant/U.S. Professor of  
Horticulture, Purdue University.
- Dr. A. R. Shakoori*, technical subject area consultant/Pakistan. Professor of  
Zoology, University of the Punjab.
- Dr. George McCormick*, IEP academic director in Islamabad. Professor of  
Geology and Mineralogy, University of Iowa.
- Dr. John Monagle*, IEP project officer, USAID/Islamabad. Formerly served as  
Director of the Arts and Sciences Center of New Mexico State  
University.

**Assessment Status:**

**Assessment Report - First Draft: Planned March 11, 1991 (Cancelled)**  
**Report Review with Department: Planned March 19, 1991 (Cancelled)**  
**Assessment Report - Final Draft: Planned April 6, 1991 (Cancelled)**

**Development Plan Status:**

**Plan - First Draft: Planned March 11, 1991 (Cancelled)**  
**Commodity Cost Estimate: To be determined**  
**Plan Budget Estimate: To be determined**

**Participation Status: To be determined**

**Notes: Not applicable**

University of the Punjab, Lahore      Subject Area:      Biology  
Centre for Advanced Molecular Biology      Planned Site Visit:      Feb. 1 -9, 1991

Assessment Team Personnel:

*Dr. John R. Menninger*, biology subject area facilitator and team leader.  
Professor of Biology, University of Iowa.

*Dr. Robert M. Bock*, technical subject area consultant/U.S. Professor of  
Biochemistry, University of Wisconsin-Madison.

*Dr. Paul M. Hasegawa*, technical subject area consultant/U.S. Professor of  
Horticulture, Purdue University.

*Dr. Anwar Waqar*, technical subject area consultant/Pakistan. Professor of  
Biochemistry, Aga Khan Medical University.

*Dr. George McCormick*, IEP academic director in Islamabad. Professor of  
Geology and Mineralogy, University of Iowa.

*Dr. John Monagle*, IEP project officer, USAID/Islamabad. Formerly served as  
Director of the Arts and Sciences Center of New Mexico State  
University.

Assessment Status:

Assessment Report - First Draft:      Planned March 11, 1991 (Cancelled)  
Report Review with Department:      Planned March 24, 1991 (Cancelled)  
Assessment Report - Final Draft:      Planned April 6, 1991 (Cancelled)

Development Plan Status:

Plan - First Draft:      Planned March 11, 1991 (Cancelled)  
Commodity Cost Estimate:      To be determined  
Plan Budget Estimate:      To be determined

Participation Status:      To be determined

Notes:      Not applicable

University of Sind, Jamshoro  
Department of Geology

Subject Area: Geology  
Planned Site Visit: Jan. 25 - Feb. 6, 1991

**Assessment Team Personnel:**

*Dr. F. William Cambray*, technical subject area consultant/U.S. Professor of Geological Sciences, Michigan State University.

*Dr. Robert R. Loucks*, technical subject area consultant/U.S. Research Associate in Geology, Purdue University, and IEP Deputy Project Officer, Purdue Project Management Office.

*Dr. Qasim Jan*, technical subject area consultant/Pakistan. Professor of Geology and Director of the National Centre of Excellence in Geology, University of Peshawar.

*Dr. Lon Ruedisili*, technical subject area consultant/U.S. Professor of Geology, University of Toledo

*Dr. George McCormick*, IEP academic director in Islamabad. Professor of Geology and Mineralogy, University of Iowa.

*Dr. John Monagle*, IEP project officer, USAID/Islamabad. Formerly served as Director of the Arts and Sciences Center of New Mexico State University.

**Assessment Status:**

Assessment Report - First Draft: Planned March 11, 1991 (Cancelled)  
Report Review with Department: Planned March 26-28, 1991 (Cancelled)  
Assessment Report - Final Draft: Planned April 6, 1991 (Cancelled)

**Development Plan Status:**

Plan - First Draft: Planned March 11, 1991 (Cancelled)  
Commodity Cost Estimate: To be determined  
Plan Budget Estimate: To be determined

**Participation Status:** To be determined

**Notes:** Not applicable

## **ANNEX D**

### **IEP ASSESSMENT METHODOLOGY**

The assessment methodology used in the Institutional Excellence Project combined both summative and formative evaluation techniques in order to select departments and Centres of Excellence for participation. The steps consisted of the following events:

1. Nomination of candidates by the Government of Pakistan;
2. Initial contact to describe the goals of the project;
3. Survey of basic descriptive information;
4. Assessment team visit to conduct an in-depth review;
5. Collaborative preparation of a six-year development plan;
6. Application of selection criteria to determine participation.

The initial contacts and information survey were summative activities. The review by the assessment team was both summative and formative. The six-year development plan was a formative action strategy for developing research activity. The most significant events were the assessment team's visit, preparation of development plans, and the decision regarding participation in IEP.

The fourteen institutions to be assessed, of which up to nine were to be participants in the implementation phase, were nominated by the Ministry of Education of the Government of Pakistan. These nominations were made through the University Grants Commission in collaboration with USAID. Those nominated were intended to be a representative sample of the leading science and technology departments in Pakistan.

Three to four weeks prior to the scheduled in-depth review by the assessment team, the chief-of-party visited with the staff of the unit to be assessed. He explained the process of the assessment and was careful to explain that the goal of the IEP was to assist in the formulation of a successful research activity plan directed toward the development of the needs of technology in Pakistan and NOT simply to supply equipment and resources. He also stressed that the research activity supported by the project must be focused on one or two areas of research with the majority of the faculty expected to participate in these activities. Inputs from the project entailed a planned

**mix of long-term and short-term training, visits by American scientists to Pakistan, and visits by Pakistani scientists to the U.S., as well as some support for facilities and equipment.**

**The chief-of-party then requested that a detailed survey questionnaire be completed by the department for the use of the assessment team (see Annex E). The information collected through this questionnaire provided a comparative descriptive data base for all departments being reviewed. These questionnaires were to be returned to the IPMO at least two weeks before the scheduled visit of the team. In several cases further issues arose, and the chief-of-party visited several units a second time to answer questions which evolved from the questionnaire. Questionnaires were returned by all seven units that were to be assessed in 1990-1991.**

**The review by the assessment team and the construction of a six-year development plan for each department were designed to be a two-month collaborative process. The assessment team for each review typically consisted of the following individuals: A MUCIA subject area facilitator, the IEP Academic Director, a UGC representative, a Pakistani subject area specialist from another Pakistani institution, a USAID representative, a MUCIA subject-area facilitator, up to two additional MUCIA scientists representing the discipline, the Chairman of the department being assessed, and one other faculty member from that department. The involvement in this assessment of Pakistani professionals from outside the department being assessed was essential. It encouraged in-country networking, and demonstrated the process of peer participation and review. It also added insight to the review that foreign nationals would not have been able to obtain.**

**The visit of the assessment team to the university department under consideration lasted a minimum of one week and usually longer. The visit typically began with appointments with the university leadership: the vice-chancellor, the dean, and the department head, during which the goal of the Institutional Excellence Project and the purpose of the assessment and the techniques employed were once again discussed. It was important to review these points since the IEP concept did not follow traditional university strengthening models.**

**The assessment teams visited all facilities of the department, reviewed documentation describing the academic programs, collected the resumes of all faculty, and arranged both group and individual interviews with all of the faculty of the department. In some cases several members of the team would meet individually with**

the department chairman, key opinion leaders and researchers in the department. The team also encouraged faculty members to draft position papers for submission to the team.

The team prepared a report in the form of a Six Year Development Plan for training, research facilities, and curricula in the department. The team was provided with a pro-forma outline of the major sections to include in a preliminary draft of the six-year plan. This preliminary draft was prepared before the team departed Pakistan and was then refined and completed in the United States. The team was asked to ensure that the report addressed the five questions below for each department being addressed:

- Does the department/centre have the overall present or potential strength to become a first-class department? (consider present and potential faculty strength in research priority areas.)
- Is the organization and leadership of the university and department strongly committed to the improvement, and capable of inspiring and managing the efforts required? (consider leadership at the Vice Chancellor level; department chairman level; recent efforts to improve and support the curriculum; attitude and degree of cooperation of faculty; overall atmosphere in department/centre.)
- Given both of the above, does the department's existing or potential strengths offer realistic possibilities for interaction with industry and providing important solutions to problems? (consider fields of research; location with respect to interactive industries; potential for interacting with other strong departments; present contacts with industry.)
- Where serious problems or questions have been identified in the foregoing, and given the six-year time frame for support, is it realistic to conclude that the department or centre can achieve the level of improvement in educational quality and research productivity consistent with the goals of the IEP? (consider time required to resolve serious questions and problems; attitude and commitment of key individuals, extent and difficulty of solving problems.)
- Is there evidence of sustainability after project support ends, both in terms of faculty strength and attitude, and university administrators' (particularly the vice chancellor's) commitment to support?

Following completion of the entire Six Year Development Plan, the chief-of-party sent copies to the department faculty, held detailed discussions with the faculty on-site, obtained their input and suggestions, and then re-drafted the plan

The three assessments outlined in Annex B were conducted. The products of the three completed assessments can be found in the three published Six Year Development plans described in other parts of this report. The development of those plans and their proposed implementation are discussed in section 1.4.1 of this report.

One key element in the assessment methodology employed by the IEP was the establishment of a set of criteria for evaluating and choosing the institutions to participate in the implementation phase of the project. This set of measurable criteria was developed by Dr. Monagle, USAID Project Officer and Dr. George R. McCormick, chief-of-party of the IEP, and is presented as Annex F. A point system based on 100 percent was also proposed for weighting the major elements of the criteria in the evaluation of a department. This system is also noted in Annex F. These criteria and the point system have not been fully tested and validated.



INSTITUTION NAME \_\_\_\_\_

DATE \_\_\_\_\_

DEPARTMENT: \_\_\_\_\_

**FACULTY RESEARCH**

**RESEARCH AREAS:** *(List areas of current and future research interests).*

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**RESEARCH FUNDING:** *(List the funding you have had to support your research in the last 10 years.)*

<u>Dates</u>	<u>Amount</u>	<u>Source of Funding</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

**PUBLICATIONS:** *Please furnish a list of your publications for the past 10 years. Mark any publication resulting from your Ph.D. research with an asterisk (\*). Be sure the information below is included for each publication.*

<u>Year</u>	<u>Author(s)</u>	<u>Title and Journal</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

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INSTITUTION NAME \_\_\_\_\_

DATE \_\_\_\_\_

DEPARTMENT: \_\_\_\_\_

**STUDENT CHARACTERISTICS**

1. NUMBER ENROLLED IN DEPARTMENT: Male \_\_\_\_\_ Female \_\_\_\_\_

2. NUMBER ENROLLED BY AREA SPECIALIZATION:

Specialization	Number
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

3. HOME DOMICILE OF STUDENTS:

Sind	_____	%
Balochistan	_____	%
Punjab	_____	%
NWFP	_____	%
A. J. Kashmir	_____	%
F.A.T.A.	_____	%
Foreign	_____	%

4. AGE DISTRIBUTION:

	Male		Average
	High	Low	
Female	_____	_____	_____
	High	Low	Average

5. DO STUDENTS WORK WHILE ENROLLED:

a) If so, number of hours per week. \_\_\_\_\_

b) Average salary per hour. \_\_\_\_\_

6. HOW MANY CLASSES ARE TAKEN EACH TERM BY EACH STUDENT?

	Ph.D.	M.Phil.	M.Sci.
_____	_____	_____	_____

7. EXAMINATION PASSING RATES:

	1986	1987	1988	1989	1990
<u>Ph.D.</u>					
No. Writing Annual Examination	_____	_____	_____	_____	_____
No. Passed Annual Examination	_____	_____	_____	_____	_____
No. Writing Supplementary Examination	_____	_____	_____	_____	_____
No. Passing Supplementary Examination	_____	_____	_____	_____	_____
<u>M.Phil.</u>					
No. Writing Annual Examination	_____	_____	_____	_____	_____
No. Passing Annual Examination	_____	_____	_____	_____	_____
No. Writing Supplementary Examination	_____	_____	_____	_____	_____
No. Passing Supplementary Examination	_____	_____	_____	_____	_____
<u>M.Sci.</u>					
No. Writing Annual Examination	_____	_____	_____	_____	_____
No. Passing Annual Examination	_____	_____	_____	_____	_____
No. Writing Supplementary Examination	_____	_____	_____	_____	_____
No. Passing Supplementary Examination	_____	_____	_____	_____	_____

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INSTITUTION NAME \_\_\_\_\_

DATE \_\_\_\_\_

DEPARTMENT: \_\_\_\_\_

**CURRICULUM**

1. CURRICULUM CONTENT:	<u>Ph.D.</u>	<u>M.Phil.</u>	<u>M.Sci.</u>
(a) Required Courses	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
(b) Required Research	_____	_____	_____
	_____	_____	_____
(c) Technical Skills Acquired	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

2. TEXTBOOK AVAILABILITY AND UTILIZATION: *(Please make photocopies of the pro-forma below and complete one for each required course in your degree program.)*

Name of course: \_\_\_\_\_  
 Name of textbook: \_\_\_\_\_  
 Author(s): \_\_\_\_\_  
 Date published and where: \_\_\_\_\_  
 Approximate cost: \_\_\_\_\_  
 How does student get access: *(Own, Use in Library, etc.)* \_\_\_\_\_

3. LIST AVAILABLE SUPPORT MATERIALS SUCH AS AUDIOVISUAL, ETC.  
 \_\_\_\_\_  
 \_\_\_\_\_

4. HOW ARE THE REQUIRED COURSES TAUGHT (lectures, seminars, labs, etc.)? *(Please list courses below.)*

<u>Course</u>	<u>How Taught</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

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INSTITUTION NAME \_\_\_\_\_

DATE \_\_\_\_\_

DEPARTMENT: \_\_\_\_\_

### FACILITIES AND EQUIPMENT

1. NUMBER OF: Classrooms \_\_\_\_\_ Laboratories \_\_\_\_\_

2. CLASSROOMS: *(List the information below for each classroom.)*

- a) Number of seats: \_\_\_\_\_
- b) Does it have audiovisual facilities? \_\_\_\_\_
- c) How many classes are held in the room daily? \_\_\_\_\_
- d) What is the length of the class in minutes? \_\_\_\_\_

3. LABORATORIES: *(List the information below for each laboratory.)*

- a) Number of student spaces in the laboratory \_\_\_\_\_
- b) Is the laboratory also used for lectures? \_\_\_\_\_
- c) If used for lectures, what is the percentage of time so used? \_\_\_\_\_
- d) What is the average length of each lab section in minutes? \_\_\_\_\_
- e) How many lab sections are in the laboratory per week? \_\_\_\_\_

4. EQUIPMENT AVAILABILITY AND UTILIZATION: *(List each major piece of equipment in your department and then give the following information for it, e.g., Pro-Forms below.)*

- Equipment name: \_\_\_\_\_ Date obtained \_\_\_\_\_
- Manufacturer: \_\_\_\_\_
- Source: (USAID, GOP, JAPAN, etc.) \_\_\_\_\_
- Present condition: (operates, out of repair, etc.) \_\_\_\_\_
- Use: (students, faculty only, or both) \_\_\_\_\_
- Repair: Is technical help to maintain and repair it available? \_\_\_\_\_

INSTITUTION NAME \_\_\_\_\_

DATE \_\_\_\_\_

DEPARTMENT: \_\_\_\_\_

### PROFESSIONAL ENVIRONMENT

1. STUDENT ADMINISTRATOR RATIO: \_\_\_\_\_

2. SUPPORT FOR PROFESSIONAL ACTIVITIES:

Type of Professional Activity	Amount Rs. Awarded (Ave)	No. Faculty Awarded	Length of Time to Use Award	Source of Monies
In-country Seminars	_____	_____	_____	_____
In-country Conferences	_____	_____	_____	_____
International Seminars	_____	_____	_____	_____
International Conferences	_____	_____	_____	_____
Advanced Degrees	_____	_____	_____	_____
Research Support	_____	_____	_____	_____
Other	_____	_____	_____	_____

3. DOES THE DEPARTMENT HAVE HIRING/PROMOTION POLICIES? *(If so, please attach a copy of the policies or explain what they are.)*

4. WHAT INCENTIVES EXIST WITHIN THE DEPARTMENT TO STRIVE FOR EXCELLENCE (research, publications, quality teaching)? \_\_\_\_\_

\_\_\_\_\_

5. AVAILABILITY OF SUPPORT STAFF:

Total number of support staff: \_\_\_\_\_

Ratio of support staff to administrators \_\_\_\_\_

Ratio of support staff to faculty \_\_\_\_\_

Number of support staff for each laboratory \_\_\_\_\_

6. DOES THE ADMINISTRATIVE STRUCTURE ALLOW THE DEPARTMENT TO CARRY OUT ITS FUNCTION? \_\_\_\_\_

\_\_\_\_\_

INSTITUTION NAME \_\_\_\_\_

DATE \_\_\_\_\_

DEPARTMENT: \_\_\_\_\_

**COSTS AND FINANCING**

**1. TEACHERS SALARIES BY QUALIFICATION:**

Please use the table below and give the salary of each rank individually per year--e.g, what is the yearly salary of a first year Associate Professor and that of a second year, etc. Be sure to include in the salary all of the benefits and allowances so there is a picture of a total compensation package for the faculty member for each year.

<u>Rank</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5</u>	<u>Year 6</u>
M. Phil. Cand.	_____	_____	_____	_____	_____	_____
Ph.D. Cand.	_____	_____	_____	_____	_____	_____
Lecturer	_____	_____	_____	_____	_____	_____
Assistant Prof.	_____	_____	_____	_____	_____	_____
Associate Prof.	_____	_____	_____	_____	_____	_____
Adjunct Prof.	_____	_____	_____	_____	_____	_____

**2. AGGREGATED BUDGET DATA: (In general, please list the amount of money in your yearly budget for the following.)**

Salaries	_____
Supplies	_____
Equipment	_____
Library	_____
Maintenance and repair	_____
Other	_____

**3. DEPARTMENT COSTS PER STUDENT BY DEGREE/YEAR:**

<u>Ph.D.</u>	<u>M.Phil.</u>	<u>M.Sc.</u>	<u>B.S.</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

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INSTITUTION NAME \_\_\_\_\_

DATE \_\_\_\_\_

DEPARTMENT: \_\_\_\_\_

### LINKAGES

We are interested in what linkages you have had with universities within Pakistan and with foreign universities. Also we would like to know what linkages and cooperative projects you have had with private industry and with government and semi-government laboratories, etc.

Below is a pro-forma as an example but you may well wish to expand on it.

<u>Type</u>	<u>Date of Linkage</u>	<u>No. of Faculty Involved</u>	<u>Research Areas</u>
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**ANNEX F**  
**MEASURABLE CRITERIA FOR EVALUATION/CHOICE OF**  
**PARTICIPATING INSTITUTIONS**

A point system was used for ranking qualifications in various categories of evaluation. The maximum number of points in each category is listed after its heading. The total number of points in all categories is 100.

**A. Faculty Academic Qualifications (15 points)**

1. Percentage of faculty members with Ph.D. degree.
2. Percentage of faculty members with M.Phil. degree.
3. Percentage of faculty members currently in Ph.D. training.
4. Number of faculty members with overseas post doctoral experience.

**B. Faculty Research Qualification (25 points)**

1. Number of papers published in international peer-reviewed journals in past three years.
2. Number of faculty members who have published in international journals in the past three years.
3. Number of papers published in Pakistani peer-reviewed journals in past three years.
4. Number of faculty members who have published in Pakistani journals in the past three years.
5. Percentage of Ph.D. faculty members who have published research work on material other than that used for their Ph.D. degrees.
6. Number of professional meetings in the subject matter attended in past three years (national or international).
7. Number of papers presented by faculty or students at national or international meetings in past three years.
8. Percent of faculty currently actively pursuing research projects relevant to national development (funded or not funded).

**C. Faculty Research Support (5 points)**

1. Number of research proposals submitted (Pakistan Science Foundation, UGC, NSF, private foundations, etc.) in past three years.
2. Number of research proposals funded in the past three years.
3. Percentage of faculty members who submitted research proposals in past three years.

**D. Student Qualifications (10 points)**

1. Quality of students admitted to the M.Phil. and Ph.D. programs in the past three years.
  - a. percent who were 1st division M.Sc.
  - b. percent who were 2nd division M.Sc.
  - c. percent who were 3rd division M.Sc.
  - d. percent who transferred without requirements (migrated).
2. Students are required to take additional basic science and mathematics courses in their faculty (or another faculty) other than their major discipline related courses.
3. Percentage of M.Phil. and Ph.D. students who are not from the province in which the school is located.
  - a. percentage 5 years ago
  - b. percentage 3 years ago
  - c. percentage at present time
4. Students (M.Phil. or Ph.D.) are required to have course work in addition to a thesis.

**E. Facilities (10 points)**

1. Laboratories and department library are open and used by students and faculty during afternoon and early evening hours.
2. Percentage of laboratories that have all utilities and exhaust hoods.
3. Most current laboratory equipment is in repair and usable.

4. Equipment obtained by assistance grants from U.S., Germany, USSR, Japan, etc. and from GOP during past 10 years has been installed and used
5. Laboratories are kept in good repair and orderly. Laboratory technician is available or commercial instrument repair service is available.
6. Students are allowed to use research equipment themselves with guidance
7. Availability of additional support facilities (government or private laboratories) in commuting distance from the university.
8. Number of faculty members who have made use of such support facilities.

**F. Administration (20 points)**

1. The vice chancellor and other university administration are committed to encouraging and supporting research in the university. Evidence.
2. The department chairman is committed to encouraging and supporting research in the university. Evidence.
3. Administrators and department chairman understand the advantages of a merit system for pay raises even though the system does not allow for it.
4. Vice Chancellor and department chairman will allow faculty with funded research grants to have a reduced teaching load.
5. The department chairman encourages faculty members to seek research support from other than university funds.
6. Administrative stability
  - a. vice-chancellor has been in office 2 years or longer.
  - b. number of vice-chancellors at the university in the past 10 years.
7. Department chairman is currently an active and published scientist or engineer.
8. Evidence of university/department long-term planning.

**G. Sustainability/Technology Transfer (15 points)**

1. Number of private or government agencies with which the department currently cooperates in research or training.

2. Number of private or government laboratories located close enough to research unit for easy day-to-day consultation and sharing of research facilities.
3. Department has scientists from industry or government agencies on its advisory boards.
4. The national and provincial needs in the field are taken into account when programs and curricula are planned in the department.
5. Willingness of faculty members to cooperate with researchers and to work at well-equipped private or government laboratories to carry out joint research efforts.
6. Percentage of faculty consulting part time with government agencies or private industry.
  - a. percentage 5 years ago
  - b. percentage 3 years ago
  - c. percentage at the present time
7. Does the department have a priority for research areas? If so, what is that priority?
8. Does the faculty have plans for industrial interaction? If so, what are they?
9. Is there a relationship of research in the department to private sector problem? Examples.

**ANNEX G  
INSTITUTIONAL EXCELLENCE PROJECT STAFF**

**University Grants Commission**

Dr. Abdul Qadir Ansari, Chairman  
Dr. Mahmood Hussain Qazi, Special Adviser - Academics  
Dr. Saeed Ullah Shah, Director of Planning & Development

**United States Agency for International Development**

Dr. David R. Sprague, Chief, Human Resources Development Office,  
USAID/Islamabad  
Dr. John R. Monagle, IFP Project Officer, USAID/Islamabad

**Midwest Universities Consortium for International  
Activities, Inc.**

Dr. William L. Flinn, President and Executive Director, Columbus, Ohio  
Dr. Mary Joy Pigozzi, Associate Executive Director, Washington, D.C.

**Purdue Project Management Office**

Dr. Charles L. Rhykerd, Project Officer, Professor of Agronomy, Associate  
Director of International Programs, Purdue University  
Dr. Robert R. Loucks, Deputy Project Officer, Research Associate in Geology,  
Purdue University  
Vivian L. Rider, Administrative Assistant  
Carol C. Kreul, Training Coordinator  
Linda Branson, Secretary

**Islamabad Project Management Office**

Dr. George R. McCormick, Chief-of-Party and Academic Officer, Professor of  
Geology, University of Iowa  
Dr. Nick L. Poulton, Administrative Officer, Visiting Professor of Technology,  
Purdue University  
Mr. Syed Khalil Ahmed, Finance Officer  
Mr. Mohammad Tariq, Secretary  
Mr. Sharafat Ali Abbasi, Driver  
Mr. Syed Sakhawat Hussain Kazmi, Driver