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DEVELOPMENT OF A NATIONAL EMIS SYSTEM

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for the
Primary Education Development Program

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DEVELOPMENT OF A NATIONAL EMIS SYSTEM

I. OVERVIEW

Successful planning, cost-effective resource allocation, and accurate evaluation all depend upon access to valid, timely, and appropriate data. To strengthen management and policy formation capabilities in the two provinces, an education management information system (EMIS), will be designed and implemented. The EMIS will make school-level data available to analysts and decision makers in formats that are standard across schools, districts, and provinces. The data will also be available quickly and will contribute significantly to monitoring attendance data (if feasible), assessing program accomplishments, and strengthening management and decision-making functions within the MOE and Ministries of Finance and Planning. This component of the program will build on the advances already made by S&T/ED's BRIDGES project through the buy-in mechanism. Commodities, TA, and R&D support will be provided to establish a fully operational national EMIS with efforts focused on NWFP and Baluchistan. EMIS activities in these two provinces will be coordinated with the work of other donors in Sind and Punjab and the GOP federal level education planning units to support a national EMIS for education.

A. Objectives

A fully operational EMIS, whether hand-tabulated or electronic, has several principal objectives:

1. Collection and reporting, in tabular, statistical, or graphic fashion, of facts that describe the current status of quantifiable elements of an education system. These elements include both inputs (e.g. textbooks, teachers, classrooms, and fiscal resources) and outputs (e.g. initial enrollments, drop-outs, and achievement test scores).
2. Documentation of historical trends regarding inputs and outputs, translation of past trends and current needs into projection of future needs, and system characteristics.
3. Analysis of data to identify inefficiencies in resource allocation, resource utilization, performance optimization, and policy choice.
4. Simulation of outcomes associated with particular policy options and resource allocation.

5. Decision-making based on data produced in an accurate, timely fashion to inform debate on policy choice and resource allocation. The objective is to base decision-making on an empirical understanding of costs and benefits as well as on the political merits of particular policy alternatives.

Although some of these objectives are being met under current education data collection and reporting schemes, a number of problems hinder the incorporation of data and analysis into the planning, decision-making, and budgeting cycle.

B. Current System Constraints

1. Lack of Uniformity

The Federal government and each Province have their own annual education statistical collection and reporting requirements. The annual Federal reporting requirements produce a set of responses from each Provincial secretariat to a common set of questions. At the Provincial level, however, there is wide variation in the definition of data requirements, in the collection procedures employed, in reliability and validity checks on the data reported, and even in dates and levels of enumeration. Because of variations in data collection forms, information in many cases must be re-categorized and re-tabulated to comply with standard Federal forms. The variance in forms and procedures also makes direct comparison of statistics across Provinces cumbersome at best, and inaccurate and misleading at worst.

2. Timeliness and Errors

Hand-tabulation of data at the district level is a slow and error-prone process. At each successive level of aggregation (Provincial and Federal), errors are compounded and significant investment of time and resources is required to compile, tabulate, and present the data. As a result, statistics often are not available to decision-makers until after critical decisions are made on policy and resources allocation issues. Instead of performing a prescriptive function, education data are too often used to describe and justify choices after the fact.

3. Utility of Information Collected

Institutionalization of an electronic EMIS will have a positive impact on three critical aspects of the Pakistan primary education system and ultimately on all levels of the education hierarchy: (1) improving access to basic educational opportunities, (2) improving the quality of educational services and outcomes, and (3) improving the efficiency of the education system.

a. Access

Collection of valid, current educational data will facilitate improvement in access to educational opportunities in three ways:

- (1) Through identification of existing facilities and resources, deficiencies can be identified relative to actual cohort size and resource needs;
- (2) Through analysis of population and enrollment data, projections can be made of future human, fiscal, and instructional needs based upon anticipated growth trends; (Note that care must be taken at each successive level of aggregation not to merge data on student gender as happens currently or access questions will not be routinely answerable).
- (3) Through a determination of the location and size of variance in access to schooling, enrollment rates that vary by gender, urban-rural distribution, geographic location, etc., can be better targetted with resources and policy options can be aimed at reducing inequity.

b. Quality

The addition of resources to the educational system in the form of better instructional materials, more and better teacher training, and improved facilities provides no guarantee of improved educational quality. The quality of a system is a function both of the availability of resources and of how well they are utilized by teachers and students.

(1) Student Achievement

Education quality must be measured against the extent to which the objectives of the system are achieved. Although most systems have multiple objectives including socialization (both political and social), skills training, and social selection, mastery of the school curriculum is perhaps the most important and among the easiest to measure.

Student achievement and in its aggregated form, school performance, can be measured via cross-district, or cross-provincial annual and school-leaving examinations. Data from exams that are statistically valid, conceptually sound, and that accurately assess implementation of curriculum can be extremely useful tools for measuring the quality of activities in the classroom. Examination scores may identify classrooms and schools where the syllabus is not being implemented with sufficient completeness or success. Consistently high scores achieved by the pupils from certain schools, or of one or the other gender, or who are taught by particular teachers, may isolate policies or practices that are particularly productive

and worthy of emulation in other settings. Student performance is not the only measure of the quality of an education system, but it is perhaps the most important, and also one of the most manageable to monitor and analyze.

(2) Teacher and pupil attendance

Estimates of the amount of time teachers and students are actively engaged in the teaching-learning process during classroom time range from 7% to 80%. In developing countries, there is a fairly strong correlation between effective use of instructional time and level of socio-economic development; the lower the level of development (hence teacher salaries, quality of resources, etc.), the lower is teacher and pupil attendance, and the less time is spent on teacher-pupil interactions that are related to learning outcomes. When teacher and pupil absences are high, the amount of time available for instruction is low. As a result, student achievement suffers.

Education management information systems will not solve the problem of absenteeism. However, quick identification of problem schools or teachers permits education authorities responsible for monitoring and improving school quality to design and implement interventions to help solve the problem.

c. Efficiency

In Pakistan, a high investment is required to produce a primary graduate due to excessively high dropout rates. When children repeat a grade or grades, resource inefficiencies are produced. Students who drop out of school, especially before they have achieved sustainable literacy and numeracy, also represent a less than efficient, if not wasted social and economic investment.

EMIS systems in themselves do not prevent inefficiencies from occurring. They do, however, permit education analysts to identify consistent patterns of inefficiency as they occur by classroom, schools, or district. EMIS-generated data also help decision-makers identify inefficiencies among cohorts of students along gender and geographic lines, as well as by resources available to students such as number of textbooks, teacher characteristics, and other inputs associated with school quality. By identifying the inefficiencies and the correlates of the problem, planners can better target resources and strategies to lower unit and cycle costs of primary education and to increase the number of students who develop the learning skills necessary to become literate contributors to economic growth and development.

C. EMIS project components

The proposed EMIS is a national project covering all four provinces with linkages to the Federal Ministry of Education. Schools are recommended as the basic unit of analysis. Data will be reported down to the classroom level in the form of enrollment, attendance, completion, and dropout rates by gender. Grade level achievement will be reported annually by gender.

The basic design of the EMIS will be uniform across all provinces and will meet all provincial and federal statistical and information reporting requirements. Data will be aggregated first at the district level, then at the provincial level, and finally at the federal level. The system will contain sufficient design flexibility to permit officials at each level of the reporting hierarchy to add additional or modified reporting requirements to the data collection instrument in order to meet local presentation and analytic needs. The EMIS will be electronic-based with micro-computers serving as the storage and retrieval mechanism at the district level and mini-computers serving the same function at the provincial and federal levels.

The utility of a national EMIS is directly dependent upon the success with which data requirements can be standardized across provinces and for which the process of information collection can be made uniform. Ultimately, speed of access to information and the uniformity of the statistics are worth little if the data are not also reliable and valid. Consequently, not only must the development of the EMIS include training in data collection procedures, but also it must provide exposure to education personnel, including teachers and principals, about why the data are important and how accurate reporting of information will benefit the suppliers of it.

To accomplish this ambitious undertaking, five components are recommended: (1) Equipment, (2) Training, (3) Topical Seminars, (4) Reports and Publications, and (5) Technical Assistance.

1. Equipment

School-level data will be collected and stored at the district level. Each district office will require a micro-computer with a 40 MB hard disk drive and printer as a minimum hardware package. Another 10 micros are required at the federal level, to be distributed among the ministries of education, finance, and planning. Each provincial office should also have a minimum of two micros to edit data and perform routine office tasks related to the EMIS. A mini-computer is required in each provincial office as well as at the federal level.

Maintenance, repair, and other problems will require additional back-up machines to ensure that long delays due to mechanical

failures are prevented. A replacement/reserve pool of machines should be purchased equivalent to 25 percent of the total system requirements. Other equipment needs, including software, printers, etc. are included in the draft budget.

Early in the EMIS development effort, a decision should be made on the cost-benefit tradeoffs associated with the use of electronic data recording devices such as optical scanners. As noted earlier, hand-tabulation of data nurtures unintended, hard-to-detect errors. Scanners electronically read information from coded forms and automatically code information for storage into computers. Human coding and key-punching errors are eliminated; however, this process can not guarantee that the initial recording of information at the school level is fault-free. The use of coded forms may, in fact, exacerbate reporting errors at this initial, critical point in the information cycle. Durable scanners that have been field-tested in developing countries cost approximately \$1,500 per unit. A side benefit to the purchase of scanners for coding school characteristics data is their potential use for automatically scoring achievement test results should standardized examinations be administered at the regional level as proposed in another section of these documents.

Total equipment costs for a national EMIS are estimated to be approximately \$1,200,000. Purchase of equipment and installation would be closely tied to the GOP and private contractor's capability to train staff to operate the machines. The mini-computers should be purchased and installed immediately. Provincial level training would take most of the first year following acquisition of the equipment.

Implementation of the EMIS should be phased both at the provincial level and, within provinces, at the district level. An illustrative implementation schedule is presented in section D

2. Training

In order to fully utilize the benefits of a national EMIS, extensive training must be offered to information users and providers. Training is needed in both analytic tools and techniques, in questionnaire design, and electronic data-base management.

a. Short-term

(1) Federal level

During the first two years of activity, it is recommended that relevant federal level personnel attend a minimum of two weeks of local training per year. This training is in addition to that which will be provided by the resident technical advisor (RTA) for the EMIS component of the USAID-assisted portion of the

program. (The RTA's responsibilities will include planning and evaluating training activities to ensure full operation of the mini-computers at the federal and provincial level). Training topics will primarily address EMIS implementation and operational questions. At least one week of additional training should be provided each year in years 3-10 of the program.

(2) Provincial level

Ministry of Education staff from each province should receive two weeks of training per year on operations topics. At least five individuals from each provincial staff should participate in the training programs.

(3) District level

The heart of the EMIS is at the district level. Staff in the district offices will have responsibility for coding, storing, and aggregating data. Training efforts and technical support should be concentrated at this level. Because of the numbers of individuals involved, one and two week seminars will draw participants from across districts into approximately 10 geographic groups. External TA will be provided for training for two-week seminars in years one and two of PED and for one-week seminars annually in years 3-10.

It is essential that direct, frequent, technical assistance be provided to district officials throughout the year, especially in the first three years. It is recommended that local contractors with experience in using micro-computers, spread-sheets, and data-base management be employed as full-time consultants to the districts. One consultant could serve four districts on a rotating weekly basis. These individuals would be responsible for day-to-day training, preparation of training materials, and for back-stopping coding and data entry. In-country consultants could be supplemented by external volunteer assistance programs like Peace Corps and VSO. Many young, undergraduate, social science degree holders have the computer skills and training abilities necessary to make EMIS implementation at the district level feasible.

(4) School heads

The cooperation and support of primary school principals, headmasters, and head teachers is essential to ensure that valid data are obtained from schools. During the first two years of PED, school heads should attend each of two one-week seminars per year. Topics should include reasons for developing an EMIS, procedures, schedules, and anticipated problems. (It is assumed that the data collection instrument will have been pilot-tested

prior to national implementation). Heads should be provided with an additional two days' training per year on EMIS-related issues for years 3-10 of PED.

(5) External Seminars

Senior policy-making and technical staff should have the opportunity to benefit from the experience of other countries in the design and implementation of the EMIS. MOE officials in Indonesia, Egypt, and Thailand, for example, have developed extensive training materials and elaborate implementation schedules that would assist and inform the EMIS effort in Pakistan. Approximately ten (total) individuals per year from the federal and provincial governments should be funded for up to one month of training and networking with their peers from developed and developing countries. Seminar topics could include EMIS design and training, EMIS as a policy tool, presentation of data for decision-making, etc.

b. Long-term

An EMIS system should have a practical orientation, not an academic one. Thus, the bulk of training should be short-term and applied. However, it is essential that at least a core of senior level planners and technicians also have a deeper conceptual understanding of the assumptions underlying the operation of an effective EMIS and of the possible uses to which the output can be applied.

Insight of this sort must be obtained through longer-term, more broad-based training. To achieve this, two individuals per year from each of the four provinces and the federal ministry should be funded for M.A. level training in subjects to include policy analysis, planning, data analysis, research methods, computing, and management information systems. A total of ten individuals specializing in such subjects will be supported for Ph.D. studies over the life of the program. Assuming that 25% - 50% of the individuals trained may be lured out of the education sector by other occupational possibilities created as a result of their training, the number of scholarships proposed is a minimal number sufficient to sustain EMIS leadership beyond the termination of the PED program.

3. Topical seminars

EMIS systems have two principal functions. They describe existing conditions and resource allocations in the education sector, and they enable policy-makers better to prescribe what changes and interventions will lead to a stronger, higher quality education system. In order to capitalize on the contribution that an EMIS can make towards realizing these functions, special

analytic and topical seminars are proposed for the federal and provincial levels each year: one at the federal level and two per province. Topics will build on the enhanced data capabilities provided by the EMIS and may include topics such as:

- o projections and resource needs;
- o determinants of academic performance;
- o incentives and teacher performance; and
- o regional and gender variance in access to schooling.

One national conference per year would integrate information, accomplishments, and research findings from throughout the country. The seminars will be problem-motivated and solution-oriented.

4. Reports and publications

In order to promote application of the EMIS to problem-solving and analysis, one research study per year at the federal level and in each of the provinces will be funded for the life of the PED program. Research topics should focus on a problem of particular thematic or timely importance. When possible and appropriate, a given topic may be the focus of research in more than one province at a time, thereby achieving not only economies of scale, but comparability of findings. Research activities may be performed by MOE staff or may be contracted out to local or national private sector or academic institutions. Topics need not focus on the EMIS itself, but rather on the application of the EMIS as a tool to better understand education problems related to improving access, quality, and efficiency.

5. Technical assistance

External technical assistance will facilitate the design and initial implementation phase of the EMIS-building effort. An RTA will be provided by PED for a minimum of eighteen months. It is recommended that the RTA be involved in the design and equipment-ordering phase of the project. The RTA will be responsible, together with Pakistani counterparts, for designing the training and operational schedule for the introduction of the EMIS nationwide.

Short-term technical assistance in support of the EMIS will be used throughout the program. Consistency of personnel and regularity of visits are critical to the success of short-term technical assistance. Visits should be made for at least three weeks duration, and at least four times per year, by the same

group of individuals. On-site, long-term technical assistance in the form of local consultants, Peace Corps, or other volunteer assistance is highly recommended.

D. Implementation schedule

Implementation of an EMIS may be divided into three phases:

- o Phase I: Planning and design (1990)
- o Phase II: Installation of equipment and basic training (1991-1994)
- o Phase III: Development and maintenance of system (1995-1999)

The speed and effectiveness with which an implementation schedule can be realized depends upon necessary technical assistance, cooperation and support of school and district level education officials, inter-provincial agreement on the core content of an EMIS, expeditious ordering and installation of equipment, and GOP processing of the PC-1 documents necessary to establish requisite federal and provincial staff positions. The primary accomplishments to be achieved during each Phase are outlined below.

1. Phase I

The most important task affecting the success of the EMIS is the development of a high-quality, well-integrated, comprehensive long-term plan. During 1990 a cross-provincial Commission of senior educators should be formed to identify the elements of an EMIS necessary to ensure full and accurate reporting of data across provinces. At appropriate junctures, the Commission should involve the donor community that is providing financial and technical support to the development of an EMIS. The Commission should draw upon existing research and development efforts that may inform their deliberations. The work of USAID-funded BRIDGES project is an example. At minimum, the Commission should address the following issues:

- o principal objectives of an EMIS,
- o core information content of an EMIS system,
- o need for a bi-annual school census,
- o unit of analysis,

- o federal, provincial, district, and school-level staffing requirements,
- o training needs and schedule for each level,
- o target provinces and level,
- o donor coordination,
 - funding,
 - management,
 - technical assistance,
- o equipment needs and procurement,
- o recurrent cost implications,
- o maintenance/support requirements, and
- o reporting requirements/formats,

Reports, perhaps developed with the help of external TA, should be prepared and discussed on each of these and perhaps other issues. A national meeting to present/consider/adopt the Commission's recommendations should be scheduled for early 1991.

2. Phase II

Based upon the findings of the Commission, equipment should be ordered and installed as soon as possible. Purchase and installation should be closely coordinated with the training schedule and phasing recommendations contained in the Commission's report.

It is recommended to not operationalize an EMIS in all four provinces simultaneously. Consideration should be given to sequencing and training based on the following illustrative example:

- 1991 - Equipment ordered for federal and provincial offices and for 1/4 of the Districts in Sind; training for staff where equipment is in place; equipment ordered for NWFP districts.
- 1992 - Equipment and training for remainder of SIND; training for NWFP; equipment ordered for Baluchistan.
- 1993 - Training for Baluchistan; equipment ordered for Punjab.
- 1994 - Training in Punjab

This illustrative schedule could be adjusted if other sources of TA were available and if the Commission were confident that the pace of training could be speeded up without sacrificing quality for expediency.

3. Phase III.

With all equipment in place and initial training completed, activities in Phase III would shift to removing "bugs" in the system, to routinizing data collection and reporting, to advanced, more "issues-oriented" training, and to analytic work as an addition to the descriptive functions expected of the system during Phases I & II. Smooth, efficient operation of the system should not be expected until Phase III.

In Phase I, the Commission should consider the cost and benefits of having a dual-track (current and electronic) EMIS system in place. Transition from hand-tabulated processing to computer-based will produce anxiety and in some instances confusion regarding data credibility. A plan needs to be developed during Phase I to minimize duplication and competition between the two systems during the transition period. Early in Phase III, the dual system should be supplanted by a single, integrated, national/provincial system.

E. Management

It is recommended that the Commission contract with a Pakistani management/training firm to operationalize and implement the recommendations contained in its report. TA to be provided by USAID would be managed by an AID-contracted firm. U.S. contractors would coordinate activities with their Pakistani counterparts. A Steering Committee should be formed to oversee the EMIS effort during Phase II. The Committee would be composed of a representative from each of the provinces, the federal ministry, USAID, and the USAID Chief of Party (or designate) for the PED.

The principal Pakistani contracting firm will have responsibility for preparing an annual work plan based on discussion with and recommendations by Steering Committee members. Approval of the work plan should be required by the Steering Committee and provincial secretaries of Education.

The USAID-funded contractor will submit to USAID and to the principal Pakistani contractor an annual work plan for TA. The plan will be based on the needs identified by the Steering Committee or otherwise anticipated. USAID will retain the right to rescind the USAID-funded TA component if the TA plan or overall EMIS agenda for the year is not in the best interests of the long-term GOP and PED objectives.

At the beginning of Phase III, the need to continue the Steering Committee will be evaluated. If its life is extended, the terms of reference described above will remain in effect. If the Committee is disbanded, USAID TA will be coordinated directly with the provincial secretaries of education or their designates.

Other conditions and covenants that apply to USAID-funded TA will be detailed in the master contract negotiated with the US-based institutions under terms to be defined by PED authorization.

F. Donor coordination and funding

Several donors besides USAID have expressed interest in funding all or part of an EMIS system in Pakistan. These include UNDP, ADB, and the World Bank. Although this working paper addresses the development of an EMIS for all of Pakistan, USAID is not presently committed to assuming total funding and TA responsibility for the effort. The PED has, as an explicit focus, the provinces of NWFP and Baluchistan. USAID is prepared to support full implementation of an EMIS in these two provinces. Financial and TA support from other donors might more appropriately be targetted on Sind and the Punjab. Under the USAID-funded BRIDGES project, significant headway has been made in laying the groundwork for an EMIS in SIND. USAID would like to ensure that this progress is built upon either by the PED or by other donors working in collaboration with PED. The resources, both human and fiscal, required to develop an EMIS in the Punjab would be enormous. It is recommended, therefore, to convene a meeting of donors interested in supporting the development of an EMIS prior to formal signing of the PED Program Agreement. Donor agreement should be reached on:

- o conceptual and programmatic leadership and coordination;
- o levels and geographic areas of support to be provided by each donor;
- o types of assistance to be provided;
- o implementation/obligation schedule; and
- o benchmarks of progress.

It is proposed that USAID assist the GOP in convening a meeting of donors as early as possible and that once general agreement is reached on levels and types of support, those conclusions be discussed with GOP officials and be reconsidered/ revised as necessary and appropriate.

DRAFT BUDGET

<u>COMPONENTS</u>	<u>COSTS</u>
A. <u>Equipment</u>	
1 Micro-computer system/District for each province 100 districts @ \$5,000/per unit	\$500,000
Mini-Computers: 1/Province & Federal Ministry + backup 6 @ \$20,000	120,000
Software & Peripherals 30% of Equip. Costs + scanners	440,000
Miscellaneous/Supplies/etc. 12% of above items	125,000
Sub-Total Equipment	----- 1,185,000 =====
B. <u>Training</u>	
<u>Short Term</u>	
Federal Ministry & Provincial Sr. Staff	24,000
Year 1-2 : 2 weeks/year @ \$2,000/week	[8,000]
Years 3-10: 1 week/year @ \$2,000/week	[16,000]
Provincial Technical Staff	[160,000]
2 weeks/year (long-term T.A.) @ \$2,000/wk 4 provinces	[40,000]
District level staff (x10)	240,000
Years 1 & 2: 2 weeks/year	[8,000]
Years 3-10: 1 week/year	[16,000]

School Principal (x24 Province x4)	[394,000]
Years 1 & 2: 2weeks/year	[8,000]
Years 3-10: 2 days/year	[6,000]
External Seminars/Networking	800,000
10 people/year x 4 weeks @ \$2,000/week	
Sub-Total short-term	----- [1,608,000]

Long Term

M.A. level	1,500,000
Province + Federal level/year 5 x10 yrs. x \$30,000)	
Ph.D. level	1,000,000
Total of 10 @ \$100,000/degree	-----
Sub-total long-term	2,500,000
Sub-Total training	----- 4,108,000 =====

C. Analysis and Special Topics Seminars

Federal level 1 week/year @ \$5,000	50,000
Provincial level 1 week/year x 2/Province @ \$5,000	200,000
1 National Conference/year @ \$25,000	250,000
Sub-Total Seminars	----- 500,000 =====

D. Reports and Special Publications

5 years @ \$200,000/each	1,000,000
Sub-Total Reports	1,000,000

E. Technical Assistance

Long Term: 18 mos @ \$200,000/year	300,000
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Short Term:

2 consultants x 3 wks	
x 4 times/year @ \$6,000/mo	1,500,000

Sub-Total TA

1,800,000
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SUMMARY

1. Equipment	1,185,000
2. Training	4,108,000
3. Seminars	500,000
4. Public./Reports	1,000,000
5. T.A.	1,800,000

GRAND TOTAL	\$ 8,593,000
