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Development Institutions, Projects, and Aid in the Water Development Program of East Pakistan*

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*The name East Pakistan is used because the discussion and analysis in this paper is limited to the period before March 25, 1971 and the creation of Bangladesh.

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Development Institutions, Projects, and Aid in the Water Development Program of East Pakistan

On the cover of a book on the subject of economic development is a picture of three villagers sitting in the shadow of a huge dam watching, with vague curiosity, while bulldozer and tractor tear up the earth as they prepare the site.[1] This unintentionally illustrates an important problem of low income countries today: the inappropriateness of an approach to development based on large projects, centralized autonomous developmental agencies, and the injection of masses of foreign aid to ensure that the necessary technological transfer will occur. It is the hypothesis of this paper that this approach to development is often unable to meet the needs and objectives of the developing nation. It should therefore be evaluated and compared with alternative modes of development.

To bring these concerns into focus, this paper will concentrate on the largest single problem in the development program of East Pakistan, water management, and the agency created outside the regular bureaucracy to deal with it, the East Pakistan Water and Power Development Authority (EPWAPDA). In the decade of the 1960's, 19.7 percent of East Pakistan's development resources were allocated to EPWAPDA for Water development. The next two largest sectors were

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[1] John A. King, Jr., Economic Development Projects and Their Appraisal: Cases and Principles from the Experiences of the World Bank (Washington, 1967)

agriculture with 14.3 percent and transport and communications with 13.1 percent.[1] Although foreign aid figures were difficult to obtain, information for the year 1967-68 indicates that in that year 31.2 percent of East Pakistan's foreign aid went to the water sector.[2]

In the 23 years between independence in 1947 and 1970, per capita income in East Pakistan rose only $2 from a meager $63. Natural disaster, civil war, and the creation of Bangladesh have drawn world attention to the overwhelming problems of poverty in that area. The net transfer of resources from East to West Pakistan and the expenditure of only about one third of Pakistan's development resources in East Pakistan are obvious factors in this issue of East Pakistan's level of economic development.[3] In spite of this, development expenditure in East Pakistan amounted to roughly Rs. 49 billion ($9 billion) between 1950 and 1970.[4] As an expenditure of this magnitude suggests, there are other considerations related to East Pakistan's economic performance which also deserve analysis. These are the systems for utilizing these resources and the overall objectives of development.

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[1] Calculated from Government of East Pakistan, Approved Development Programs of the East Pakistan Government, for the years 1960-61 through 1969-70.

[2] Government of East Pakistan, Statistical Digest of East Pakistan 1968 (Dacca, 1968). Calculated from Table 17-2, p. 329.

[3] Economic disparity is documented in Edward S. Mason, Robert Dorfman, and Stephen A. Marglin, Conflict in East Pakistan: Background and Prospects (mimeo, April, 1971). See particularly Tables I, II, III, pp. 4-6.

[4] Ibid., p. 4, Table II.

Water is the critical factor in East Pakistan's economy. The territory of East Pakistan comprises the deltaic plain of the Brahmaputra and Ganges Rivers. Of the total surface area, 6 percent is river. An annual average of 1.2 billion acre feet of water flow through the former Province into the Bay of Bengal, an amount equal to the annual discharge of the Amazon River.[1]

The rural inhabitants who comprise over 90 percent of the area's population are subject to both flood and drought. The adverse effects of these natural calamities are so widespread that 70.7 percent of the villagers responding to the Government's Sample Survey in 1961 reported that they had sustained loss due to natural disaster in the preceding year.[2] The annual monsoon brings an average 80 inches of rainfall concentrated in the months of June, July, and August and produces an annual flood that covers nearly one third of the land area of the Province. But from November to May there is almost no rainfall, and agriculture is possible only if water for irrigation can be obtained from the rivers that traverse the area or from the supply of groundwater. With dry season irrigation between 10 and 15 million acres, half to two thirds of the total cultivable area, could be planted in a third crop annually. Since 57 percent of Gross Domestic Product and 95 percent of the export earnings were derived from the agriculture sector, its dominant role in the economy and the potential benefits of irrigation are

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[1] Haroun er Rashid, East Pakistan: A Systematic Regional Geography and its Development Planning Aspects (Lahore, 1965), p. 113.

[2] Government of Pakistan, Central Statistical Office, National Sample Survey (Third Round) (Karachi, 1963), p. 27.

clear.[1] Both for the control of natural disaster and increase in levels of production and income, water management is critical.

During the 1950's the Government of East Pakistan searched for the most effective means of dealing with a problem and resource of the magnitude of water. In 1957 at the request of the Government a team of experts under General Krug, a former head of the U.S. Army Corps of Engineers, visited East Pakistan under the auspices of the UN Technical Assistance Program to advise on ways to manage and develop water resources. The Krug Mission concluded that a system of comprehensive, integrated planning was needed. Noting the rigidity and the inefficiency of the existing bureaucracy, they recommended that a new agency outside the existing administrative system and autonomous in its operations should be established. In this way they expected that a new, efficient institution could be created for water resource management, avoiding the difficult and slow process of change and reform of the governmental structure.

Their recommendations were strongly supported by other aid-giving agencies and were formally accepted by the Government of East Pakistan. In Ordinance No. 1 of 1959, it created the "East Pakistan Water and Power Development Authority...to provide centralized control of water resources and power development." The Authority was granted broad powers including eminent domain to plan and construct water resource and power projects, establish rates, and collect revenues, and take over works in progress under other agencies, all subject only to

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[1] Government of East Pakistan, Economic Survey of East Pakistan, 1969-70 (Dacca, 1970), pp. 24, 102-3.

the approval of the Provincial Government. The Ordinance also directed EPWAPDA to prepare "a comprehensive plan for the development and utilization of water and power resources in East Pakistan on a unified and multi-purpose basis." The result was a powerful, autonomous agency operating in its sphere of responsibility, withoug the limits placed on other agencies.

Although the motives of the aid givers who urged this solution on the East Pakistan Government are not explicitly stated, they undoubtedly paralleled the thinking of aid donors elsewhere who saw the autonomous agency as a neat administrative device to enable them to assist the recipient country toward a clear objective. It was presumed that the new autonomous agency would be removed from the traditional bureaucratic sphere where politics and personal influence, corruption, low wages, incompetence, frequently changing personnel, excessive heirarchy, inefficient procedures, and a host of other problems were perceived by aid givers as making efficient development administration almost impossible. In an autonomous agency technically qualified staff selected on the basis of competence would serve as counterparts to work with foreign advisors. Foreign resources could be channeled into aid projects with maximum impact, and modern management methods could be instituted by foreign consultants. There are few developing countries which do not have autonomous agencies established for some combination of these reasons. This organizational form as a conduit for aid has become an accepted mode of operation for the aid-giving agencies and the recipient countries.

The conditions and problems which EPWAPDA had to deal with were large and complex. Some could not be solved within the geographical confines of East Pakistan.[1] They had to attempt to control flooding where 90 percent of the annual river flow entered East Pakistan from catchments outside their border, from areas over which they had no control and very little data.[2] In the sandy deltaic soil of East Pakistan, rivers shifted their courses frequently. The Brahmaputra river carried a huge silt load which made embankments hazardous. Portions of the Province were subject to tidal action and saline intrusion.

If the problems were formidable, the resources made available to WAPDA were impressive. WAPDA had all the advantages built into the international model of the autonomous agency. It had funds to hire the best engineers of East Pakistan. With UN financing for the first three years, and subsequently with support from the U.S. aid program, WAPDA obtained in 1959 the services of the International Engineering Company (IECO), an American consulting firm, to provide a team of 19 general consultants to assist in the preparation of the comprehensive plan. In addition to IECO, consultants were provided for management services, project design, engineering feasibility studies, construction supervision for specific projects, and special studies. Table 1 indicates that in 1966 85 foreigners were working with WAPDA on water projects

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[1] See Peter Rogers, A Systems Analysis of the Lower Ganges-Brahmaputra Basin (mimeo, Cambridge, 1967). The analysis of water development problems of the Ganges-Brahmaputra Basin suggests that many of the solutions necessitated the building of facilities in India, a political impossibility before 1972.

[2] Government of East Pakistan, Master Plan, Volume I (Dacca, 1964), p. 87.

Table 1

Foreign Consultants to WAPDA in Water Development (as of 1966)

Consultants	Foreign Personnel	Period	Cost(million)	Source
IECO General Consultants	19	1959-68	$12.1/Rs 27	USAID/UN
FAO Hydrological Survey	12	1966-68	? /Rs 16.4	UNDP
Leeds-Hill-Deleuw Coastal Embankments	17	1962-71	$3.0/Rs 7.5	USAID
Brahmaputra Right Bank	3	1963-66	$.44/Rs 1.1	IBRD
Haig-Zinn Associates and Associated Consulting Engineers Chandpur Project	7	1963-69	$.78/Rs 7.2	IBRD/WAPDA
Erich Lachner Chandpur Project	1	1964-67	? /Rs 89	German Aid
Rangpur Irrigation	1	1963-?	? /Rs 12	WAPDA
Vinnel Company Mechanical Equipment	5	1964-65	$.26/Rs .42	USAID
achiyo Engineering Company G.K. Auxiliary Pumphouse	2	1965-66	$.04/ ?	WAPDA
Calif. Water Resources Dept. Management Consultants	3	1965-67	? /Rs 2.4	USAID
Associated Consulting Engineers Dacca Southwest	3	1966-68	? /Rs 2.4	USAID
Holweg and Watts Electric Pump Irrigation	4	1965-?	$.10/Rs .50	USAID
Karnaphuli Irrigation	6	1965-?	$.24/Rs .73	USAID
Swiss Boring Groundwater Investigation Mymensingh	?	1964-66	? /Rs 1	WAPDA
M/S Johann Keller Groundwater Investigation Dinajpur	?	1964-66	? /Rs 1.2	WAPDA

Source: EPWAPDA, Technical Assistance to EPWAPDA Water Development (Dacca, 1966) mimeo

at a very considerable cost. Foreign aid became available from bilateral or multilateral sources for every major project they were to undertake, and the same sources provided management consultants and logistical support in the form of cars, jeeps, boats, a computer, and airplanes to assist the agency's work. The general consultants' services and the related institutional and logistical support cost alone rose to $2 million a year by 1969.[1]

While WAPDA was receiving a large proportion of the aid coming to East Pakistan, probably 15 to 20 percent of that aid was paid out to firms in the donor countries to purchase consulting services. Foreign consultants were preparing a Master Plan for water development and even undertaking much of the design work on specific projects, with the result that they generally chose the technology and set the specifications. The Pakistani leadership of WAPDA made choices among projects and established priorities. Because of its close tie with aid donors and the technical skills at its command, WAPDA became very powerful within the Government of East Pakistan. Agencies like the Planning Department did not have the competence or manpower to analyse or challenge the assumptions of their projects, which were prepared by the best available technicians and documented in multi-volume feasibility studies. Neither Planning nor other Departments had the political strength in the decision-making process that WAPDA had.

Given the nature of WAPDA as a powerful, centralized agency with inputs to its decisions from the best Pakistani technicians and

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[1] Information from World Bank reports.

engineers as well as foreign consultants with training and experience in the design standards of developed nations, and given the desire to produce projects that would continue to attract the support of aid donors, the output is predictable. As one summary of organization behavior states, "Governmental behavior can be understood...less as deliberate choices and more as outputs of large organizations functioning according to standard patterns of behavior." [1] For WAPDA that standard pattern involved aid-financed foreign consultants who designed projects according to their own and the aid donors' concept and standards of efficient design. This meant high cost and long construction periods but assured aid support for the project. This usually entailed complex technology that must be constructed in an accessible location so that foreign engineers could supervise the work. Project designs also satisfied the Government's desire to have the most modern technology used to solve their problems. The fact that WAPDA projects were attracting aid made the agency powerful within its own government and facilitated the obtaining of funds and project approval. This in turn was one reason WAPDA was attractive to aid donors.

The work of WAPDA can be grouped, for purposes of analysis, into three categories: 1) comprehensive planning of water development 2) major projects (those costing over Rs. 50 million) and 3) minor projects. This paper will analyse important aspects of six major projects. Minor projects are not evaluated although cost and construction time data for a selected group of six are included in Table 2.

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[1] Graham C. Allison, Essence of Decision (Boston, 1970), p. 67.

Project locations are shown on Map 1.

1) Comprehensive Planning. In 1964 IECO and WAPDA presented their Master Plan, a two-volume plan with five supplemental volumes on specialized topics. The Master Plan was a 20-year program containing 51 large projects with a total estimated cost of Rs. 17.6 billion ($3.2 billion) with 46 percent of the cost, or $1.5 billion, the estimated foreign exchange requirement.[1] Individual projects ranged in cost from Rs. 14.7 million ($3.1 million) to Rs. 1291 million ($271 million). All projects had positive benefit-cost ratios although these were calculated at the unrealistically low discount-rate of .04.[2] Plan projects were designed to protect 12.1 million acres from flooding and to irrigate 7.9 million acres. Despite emphasis in the Plan and in previous documents on the inter-relatedness of projects, there was no priority among them or suggested phasing. The Master Plan made no provision for small projects or incorporating private investment in pumps, wells, or water activities that might be carried out under other agencies. Other important topics were omitted or treated in a highly superficial manner. These included questions of demand for irrigation water, agricultural technology, farmer organization, funding of projects, the impact of debt service, and the consideration of how beneficiaries might help bear project cost.

The Master Plan was never officially accepted by the East Pakistan Government, although its projects served as the basis for the

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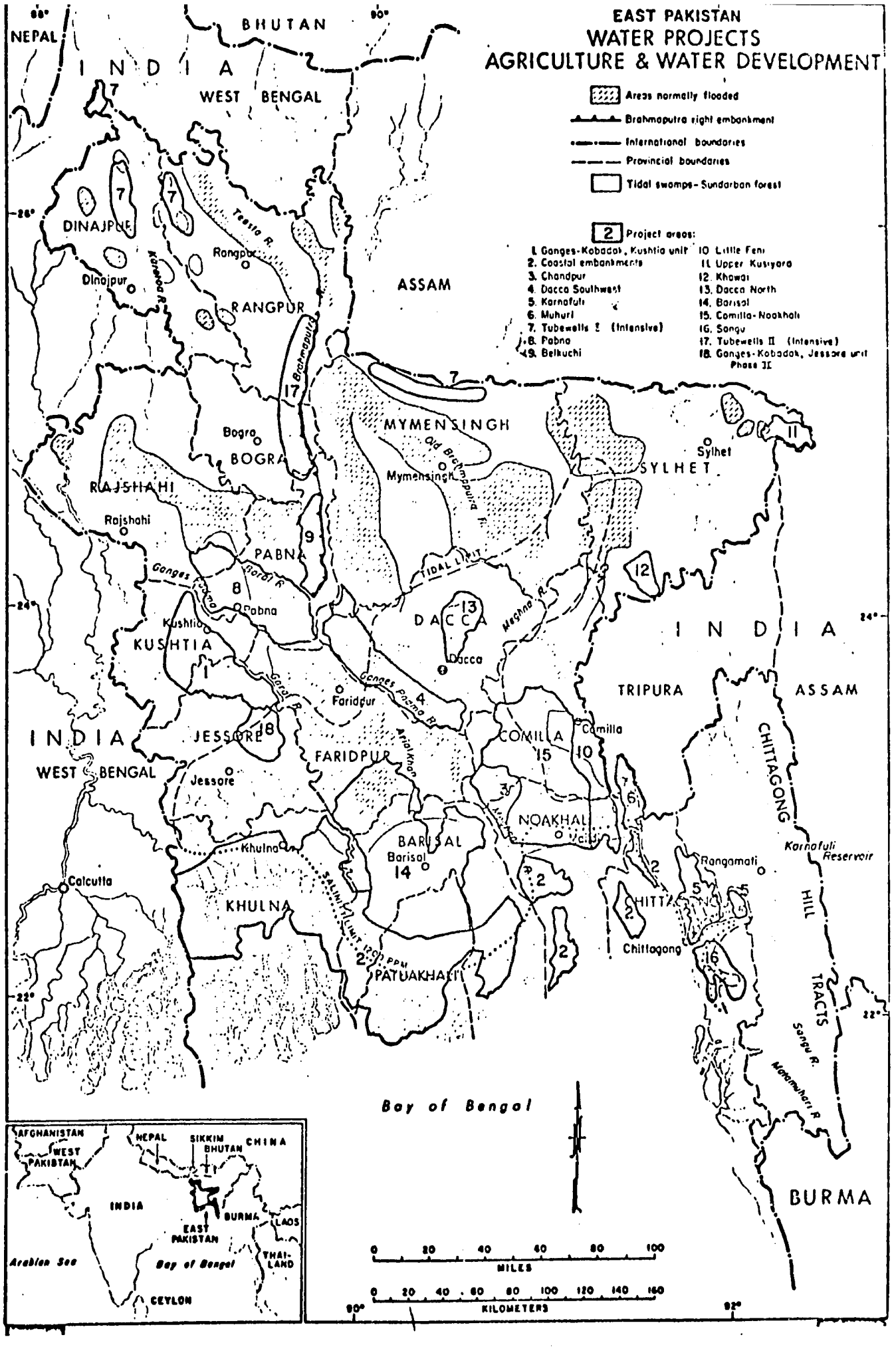
[1] EPWAPDA, Master Plan, Volume I, p. 174.

[2] Ibid., p. 46.


EAST PAKISTAN
WATER PROJECTS
AGRICULTURE & WATER DEVELOPMENT
Areas normally flooded
Brahmaputra right embankment
International boundaries
Provincial boundaries
Tidal swamps - Sundarban forest
2 Project areas:
1. Ganges-Kobadak, Kushtia unit
2. Coastal embankments
3. Chandpur
4. Dacca Southwest
5. Karnafuli
6. Muhuri
7. Tubewells I (Intensive)
8. Pabna
9. Belkuchi
10. Little Feni
11. Upper Kusiyara
12. Khowai
13. Dacca North
14. Barisal
15. Comilla-Noakhali
16. Sangu
17. Tubewells II (Intensive)
18. Ganges-Kobadak, Jessore unit Phase II
NEPAL
BHUTAN
INDIA
WEST BENGAL
ASSAM
DINAJPUR
Dinajpur
Rangpur
Teesta R.
Karatoya R.
RANGPUR
Brahmaputra R.
Bogra
BOGRA
MYMENSINGH
Old Brahmaputra R.
Mymensingh
Sylhet
SYLHET
RAJSHAHI
Rajshahi
PABNA
Pabna
Ganges
Padma R.
Nagar R.
TIDAL LIMIT
Meghna R.
DACCA
Dacca
KUSHTIA
Kushtia
Garai R.
Ganges Padma R.
Faridpur
TRIPURA
JESSORE
Jessore
FARIDPUR
Arial Khan
COMILLA
Comilla
CHITTAGONG
Karnafuli Reservoir
Rangamati
HILL TRACTS
Sangu R.
Matamuhuri R.
Chittagong
NOAKHALI
BARISAL
Barisal
Khulna
KHULNA
Calcutta
SALINITY LIMIT 2.0 PPM
PATUAKHALI
Bay of Bengal
BURMA
0 20 40 60 80 100
MILES
0 20 40 60 80 100 120 140 160
KILOMETERS
90°
92°
22°
24°
26°
AFGHANISTAN
WEST PAKISTAN
NEPAL
SIKKIM
BHUTAN
CHINA
INDIA
BURMA
LAOS
EAST PAKISTAN
THAILAND
Arabian Sea
Bay of Bengal
CEYLON

WAPDA Third (1965-70) and Fourth (1970-75) Plans. It was attacked by the World Bank and other aid donors, but its fault from their perspective was not in the general strategy of large, high-cost projects but in its superficiality and narrow focus. As a result, the IECO contract was terminated in 1968 after nine years and over $12.1 million and Rs. 15.1 million had been spent on their services. UNDP funds administered by the World Bank were used to hire new general consultants. By 1969 a combination of Acres International of Canada and ILACO of the Netherlands had a 38-member team located in WAPDA as the new general consultants. One of their chief accomplishments was to produce in March, 1970 a "Hard Core Program"[1] consisting of 26 projects from the old Master Plan that were considered to be feasible and economic. Although the work was done quickly and in more depth, it was an obvious continuation of the Master Plan project concept.

The system of general consultants to prepare a comprehensive plan and project consultants to design and supervise projects at times came close to overwhelming WAPDA with foreign consultants. Consultants with training and experience similar to that of the personnel evaluating projects have become an important link in the preparation of fundable projects, one which donors will pay for and recipients accept to assure projects that will attract aid. Ironically, projects undergo their most critical scrutiny after they have been designed and before they are actually sanctioned and funded, and not after completion. The appraisals by the aid donors' engineers and economists determine whether

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[1] EPWAPDA, EPWAPDA Hard Core Program, 1970-73, Two Volumes (Dacca, 1970).

aid will be forthcoming for projects. Both donors and recipients are anxious to find projects that meet the engineering and economic tests of project appraisal.

The National Academy of Science panel on East Pakistan points out another dimension of the work of consultants. "Frequently such contracting firms undertake feasibility studies at less than actual costs with the expectation that losses will be regained if the contract for project design and construction is secured. Such practices create pressures within contracting firms for maximizing expectations for benefits from project development...Design alternatives are often selected to be most favorable in meeting feasibility criteria rather than selected as the best for the total program."[1]

Although donors and consultants are aware of these practices, they assume that the provision of technical assistance and highly trained supervision during the project implementation stage will solve any unanticipated problems that arise. Unfortunately, although the system is good for attracting aid, it is less satisfactory for producing projects with the anticipated benefits.

2. Major Projects. For purposes of more detailed analysis five major WAPDA projects are briefly analyzed, Ganges-Kobadak and Coastal Embankments, because they were the two costliest projects, $132 million and $370 million respectively. The Dacca-Naranganj-Demra

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[1] Report of the National Academy of Science Ad Hoc Panel, Food and Water Programs for East Pakistan (mimeo, Washington, 1971), Chapter on Project Planning and Contracting Procedures, p. 1.

system for pumping water off the Ganges river into the project area, in the construction of the distribution channels, and in the water utilization aspects of the project.

The pumphouse intake channel constructed off the Ganges has regularly silted up in the monsoon season, cutting water intake by 40 percent, and no solution other than dredging has been found. This can only be done in the few weeks after most of the siltation has occurred and before water levels drop below the operational depth of the dredge. The pumphouse, scheduled to begin operating in 1958, was designed to have three large, high-capacity pumps (1300 cusecs-cubic feet per second). Problems of inadequate foundations for heavy pumps in East Pakistan's rockless, deltaic soil, difficulties of maintenance and repair of submersed pumps which created a situation where pumps could only be repaired in the dry season, and voltage fluctuations which burned out pump motors meant that the pumphouse has never functioned reliably or been used regularly.[1]

In 1962 a small subsidiary pumphouse was built with 12 pumps of 125-cusec capacity as a supplement to and ultimately a replacement for the main pumphouse. The silting and design problems kept even this facility from functioning at its design capacity. The powerhouse, built exclusively for this project, also encountered severe problems, which added to the cost, delayed operation, and through voltage fluctuations damaged pumping equipment. These, however, were eventually solved.

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[1] EPWAPDA, Task Group Report, Ganges-Kobadak Project, Kushtia Unit Phase I (mimeo, Dacca, 1969), p. 7.

For the farmers who were supposed to benefit from the project there were more serious problems. Despite the pumping problems, the embankments were constructed, halting the flooding of the rice fields which was necessary for production. With regular flooding stopped and irrigation water unavailable, it was impossible to produce a rice crop. In 1964 and again in 1965 farmers of the area, desperate for water, attempted to cut openings in the embankments. They were met both times by police who opened fire on them to save the embankments, and on each occasion several farmers died. This was the unfortunate culmination of a series of WAPDA mistakes that resulted from the gross neglect of the agricultural dimension of the project.

In the initial project planning, maximum demand for irrigation was assumed; farmers were not consulted nor even informed of what was to be done. Yet it was assumed that farmers would construct all the tertiary and field channels at their own expense. No provision was made to train farmers in the techniques of irrigated farming, and no organization was established to determine water rotation schedules or the other details of water utilization. As a UN water development advisor reported, "the most important reason [for the project's serious difficulties was] the whole farm side engineering part and also the agricultural layout of the project was completely neglected in the first instance, in detailed engineering design, and was not included with the cost estimates or the construction program."[1] (sic) As a

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[1] M. Mueller, Comments on the Present Stage of the Kushtia Unit of the Ganges-Kobadak Project (mimeo, Dacca, 1967), pp. 4,5.

result of this neglect, lack of communication between project officials and farmers, and bitterness over the stoppage of flood water, farmers refused to construct field channels and had little interest in irrigation water.

In quantitative terms the project can only be considered a serious failure. The cost was Rs. 580 ($122) million over the original estimate. After 16 years of construction, redesign, and reconstruction, the project failed to perform at even 50 percent of the original design standard. As a result, anticipated benefits of 350,000 irrigated acres have not been realized. A WAPDA taks force reviewing the project in 1969 reported "33,000 acres of transplanted aman (monsoon season rice crop) were irrigated in 1968, and ultimately this figure will reach 60,000."[1] Since an aman crop was grown on the land prior to the project, there is little net gain in total production from the project, although there is some benefit from diminished flood damage.

Ganges-Kobadak was the classic failure in a large project; no other WAPDA project encountered difficulties of the same magnitude. Yet the same operating procedures have been utilized in other projects, and the same pattern of problems has recurred.

In 1961 the World Bank extended a $1 million credit to WAPDA to help finance the Rs. 15 ($3.2) million Dacca-Naranganj-Demra (DND) project. This was conceived as a pilot project to test the idea of constructing polders around the project area to provide comprehensive water management inside, with both irrigation and flood control benefits.

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[1] EPWAPDA Task Force, op. cit., p. 2.

The project area was small, 19,200 acres, and was located on the edge of Dacca where maximum supervision and control were possible. The project completely enclosed the area. A large pumping station was built on the Lakhya River which bordered one side of the project area (see Map 2). The intention was that in the monsoon season, excess water accumulating within the polder could be pumped out, and in the dry season, water from the river could be pumped inside the polder area for irrigation. Scheduled for completion in 1964-65, it was actually finished in 1967-68 at a cost of Rs. 19.7 million. The expectation that farmers would voluntarily construct field channels proved incorrect and was responsible for delaying irrigation benefits up to two years.[1] However, intensive agricultural extension work and a decision to pay farmers for construction of field channels finally solved the problems.

The Dacca-Naranganj-Demra (DND) project was one of the successful WAPDA projects, but the problem that arose in 1969 illustrates the difficulties of depending too greatly on the reliable operation of equipment and effective project management, both scarce characteristics in East Pakistan.

In the late 1960's new high yielding rice varieties were beginning to be used in East Pakistan. However, the difficult growing conditions of the area meant that many new varities were not well suited to the area. East Pakistan's farmers usually produce two rice crops in the monsoon season, the aus crop from May to July and the aman from July to November. The two crops distribute the risks of loss from

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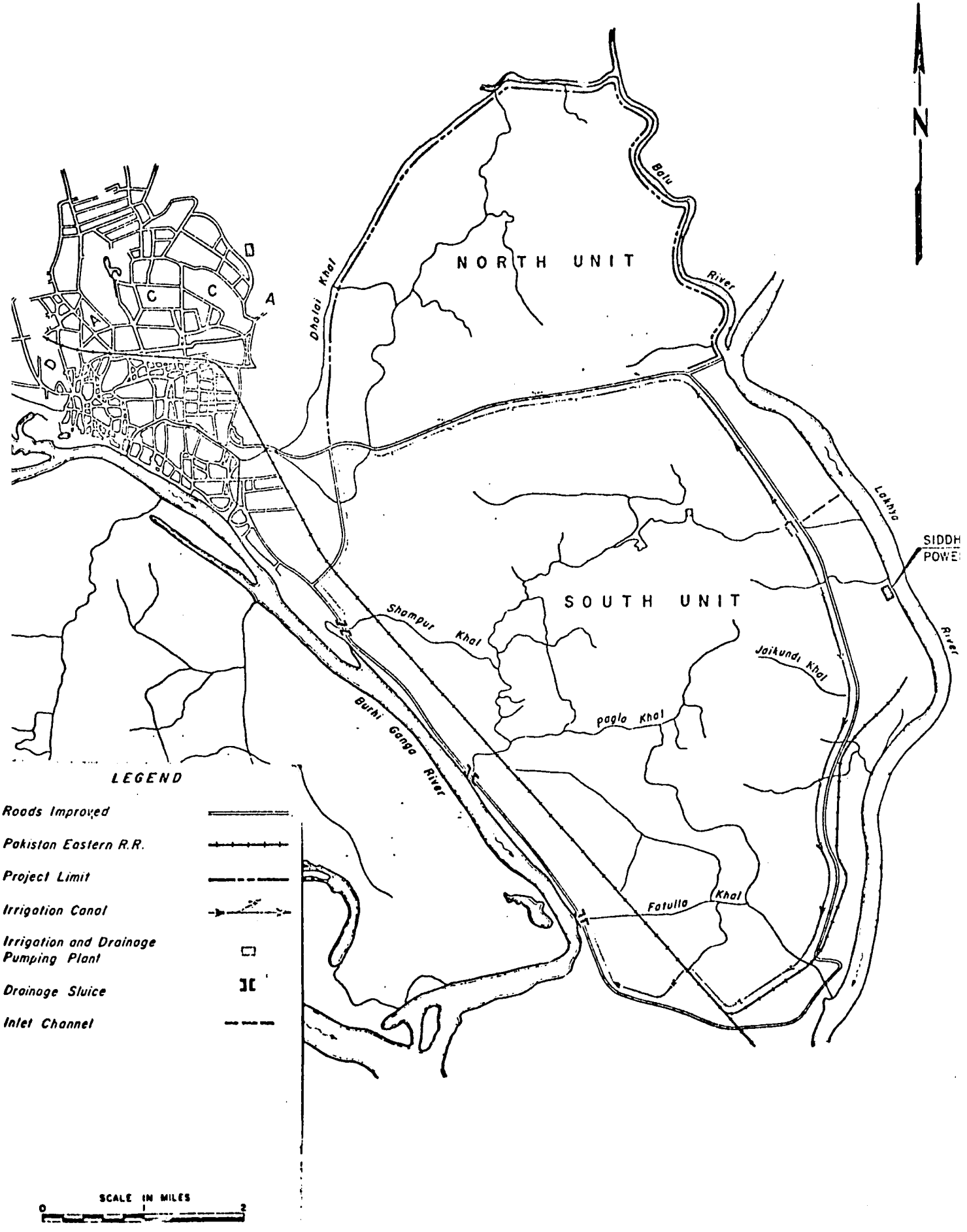
[1] EPWAPDA, Two Years of DND Project (mimeo, Dacca, 1969), pp. 3-4.

DEMRA PROJECT



monsoon floods. The IR-5 rice variety provided high yields, but its longer growing season meant that only one IR-5 crop could be produced in the aus and aman seasons. Despite the fact that the single IR-5 crop would yield more than the two traditional crops, farmers were reluctant to grow it because of the risk of losing their entire annual rice production. In 1969 agricultural extension agents in the DND project area persuaded farmers of the area to forego the extra crop and plant about 1,500 acres of IR-5 since the project assured water control. IR-5 was a dwarf variety that could withstand only about four feet of water. In August, 1969 two weeks of heavy rain raised water levels inside the DND polders to an average of nine feet. The pumps were turned on to lower the water, but large quantities of water hyacinth accumulated around the pump intake. The WAPDA pumphouse manager then shut down the pumps claiming that if the hyacinth were sucked in they would burn out the pumps. The result was the destruction of the IR-5 crop and of the regular aman crop as well since the enclosing of the area with polders prevented the natural runoff of rainwater. The result was a disastrous loss for the "modern farmers" who had planted IR-5 and serious losses for others in the project area. For the pump operator the decision to shut down the pumps was perfectly rational. He was not punished for the crop loss, but had he burned out the pumps, his job would have been in serious danger.[1]

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[1] Mr. A. H. S. Alam, Member, East Pakistan Planning Board, told me about this situation in September, 1969. A few days later, I visited the project area and verified the facts related above. At the time, I calculated the crop loss at roughly Rs. 1.2 million, 6 percent of the total project cost.

This experience suggests that there is considerable risk in an area like East Pakistan in dependence on mechanical and human efficiency, particularly if the decision-maker, the operator of the machinery, does not share the priorities and interests of those dependent upon him. The hazards of creating a situation in which the welfare of a large number is dependent upon the precise timing and reliable operation of a human and mechanical system in an environment not conducive to this type of precise efficiency constitutes a drawback of the polder project concept.

Generally the DND project has functioned well. The gross cropped acreage (including double cropping) has risen from 14,673 acres before the project to 29,200 acres by 1968-69.[1] There has been no serious reoccurance of the flooding problem inside the polders. There have been conflicts between farmers and WAPDA officials attempting to charge for water. These subsided when WAPDA withdrew the payment requirements. The greatest benefit to farmers of the area, however, is that project land, close to Dacca, is now being sold for commercial and industrial uses at very high prices.

The polder concept was demonstrated feasible in the DND and is now being used in other, larger projects. The Chandpur project with World Bank credits of $18 million is in the construction phase. Begun in 1963, with a $9 million credit from the World Bank, the project called for enclosing 127,000 acres and providing irrigation and

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[1] L. H. Huizenga (Acres International), Economic Evaluation of an EPWAPDA Project (mimeo, Dacca, 1969), p. 6.

flood control. The irrigation features were dropped in late 1965 and the credit reduced to $5.3 million. Work proceeded on the flood control features, but these too were halted in 1967 and the remaining portions of the credit used to engage new foreign consultants to revise the project and restore the irrigation benefits. The six years consumed in trying to solve design problems and the complete inadequacy of the initial design work, in which $5 million was invested, suggest that, while DND may have proven the polder concept possible, many problems in the concept remain. The early stages of construction were halted by civil war in 1971.

The Dacca Southwest project, using the same polder concept, is designed to provide irrigation and flood control benefits to about 375,000 acres. Bank-financed feasibility and engineering design studies have been carried out by foreign firms, and preparations were being made to hire foreign engineers to supervise construction at the outbreak of the civil war.

The design of Dacca Southwest has been seriously challenged by Robert Repetto, on economic grounds for utilizing design standards, justified by the consultants primarily because they are "common engineering practices" in western nations, which were inappropriate to conditions in East Pakistan. Adjustments in common practice could reduce capital cost by "first, acceptance of the occasional risk of smaller benefits in return for much lower capital costs; second, advancement of the time stream of benefits with little change in capital costs."[1]

[1] Robert Repetto, "Economic Aspects of Irrigation Project Design in East Pakistan" in Falcon and Papanek, eds., Development Policy II: The Pakistan Experience (Cambridge, 1971), p. 134.

Under the standards presently applied, "a large part of the total resources available for irrigation would be used in building extra irrigation capacity to meet improbable and infrequent contingencies in some project areas, rather than extending basic facilities to additional areas."[1] Further savings are possible if relatively obvious facts are taken into consideration. The phasing of construction to coincide with organizational development and the growth of effective demand for irrigation would provide major savings of capital. Minor design changes would reduce the land consumed for irrigation canals in this area of land scarcity, and more flexibility could be built into project planning where organization is a critical constraint on water resource development, a fact frequently overlooked by engineers. Despite these suggestions made verbally and in writing to the Dacca Southwest engineers and subsequently published, the project design continues to adhere to western "common engineering practice."

The largest WAPDA undertaking is the Coastal Embankments Project financed by U.S. aid through PL 480 generated rupees. Begun in 1960, Rs. 1.2 billion (U.S. $241 million) or 4.4 times the original cost estimate had been spent by 1970,[2] and it was anticipated that up to five more years and an additional Rs. 650 ($137) million were needed for completion.[3] The project is designed to provide protection

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[1] Ibid., p. 135.

[2] Government of East Pakistan, Planning Department, Gestation Period of Public Sector Schemes in East Pakistan (Dacca, 1969), p. 18.

[3] World Bank estimate.

against inundation from saline tidal waters in an area of three million acres divided into 108 polders. Construction has consisted of earth embankments averaging 12 feet in height, with numerous sluice gates through the embankments to provide interior drainage. Although the project has provided important benefits through the elimination of saline flooding, the embankments have caused serious problems for some residents of the area.

In many of the coastal areas a few miles upstream from the Bay of Bengal, the incoming tide backs up the fresh river water flowing toward the Bay and raises the water level by several feet causing it to run inland into channels and canals. This fresh water is vital to agriculture in the area. In the construction of the coastal embankments, many small channels were closed, cutting off this water needed for agriculture. Occasionally this has also caused drainage problems in times of heavy rainfall. The result, as in the Ganges-Kobadak project, was the cutting of embankments by local residents.

As in other projects the problem lies in undertaking major construction that transforms basic elements in the existing relationships between land, water, and human activity. With only superficial knowledge of the environment and human behavior, WAPDA and its consultants have seldom established adequate contact with the project area and the intended beneficiaries. Project designs have not been adequately planned on the basis of specific conditions, and too little effort has been made to inform and work with the farmers and other residents of the area.

In 1969 the East Pakistan Planning Department evaluating the reasons for the delay in the Coastal Embankments Projects reported that "the relatively long period of execution may be attributed, interalia, to the following factors:

1. Inadequate and untimely flow of funds during past years.
2. Difficulty in acquisition and obtaining physical possession of land.
3. Difficulty in procuring essential construction material."[1]

These problems, particularly difficulties of land acquisition, plagued every WAPDA project.

In view of these difficulties the World Bank undertook a major review of the Coastal Embankments project in the late 1960's. In 1971, 11 years after the start of the project, an evaluation mission studied the project and recommended a new approach. This would require additional water control works, pumps, and regulators, as well as intensive agricultural development efforts. It would also establish plans for the maintenance and repair of damaged embankments. The recommended five-year pilot program would cost about $11.2 million of which $3.3 million would be foreign exchange. "The largest expenditure would be for development services followed by management and consulting personnel." These management and consultant services represented 33 percent of the total cost.[2] Action by the Bank on this proposal

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[1] Government of East Pakistan, Planning Department, The Performance of EPWAPDA (Water Wing) (mimeo, Dacca, 1969), p. 2.

[2] Figures and quotes taken from the mission's report to the Bank.

was deferred by the outbreak of civil war.

EPWAPDA has undertaken one tubewell irrigation project, the Northern or Thakurgaon project, in the northwestern part of the Province. The area was selected for its plentiful groundwater supply. The feasibility study, design, including choice of well location and construction, was done by German engineers, and supplies and equipment were imported from Germany (including even the gravel packing to go around the well screen!). This was financed by a German supplier's credit of DM 22 million, and the total cost rose from an estimated Rs. 36 million to Rs. 100 million.

Agricultural benefits were anticipated from the production of sugarcane and rice on the irrigated land. Three hundred eighty wells were installed, each of 4-cusec output capacity. An electric generating plant was constructed solely for the purpose of electrifying the tubewells. The wells were sunk by power drilling rigs, utilizing high-quality pipe, screen, and turbine pumps, all imported from West Germany. The engineering and installation work was carried out between 1960 and 1965.

Of the wells installed, 362 are being used for agricultural purposes. Four are being utilized to cool the electric generating plant, and the remaining 14 failed. The wells have averaged 3 to 3.5 cusecs output. The cost of these wells was very high, approximately Rs. 260,000 per well or Rs. 87,000 per cusec of water. Just over half the cost went into electricity generation and transmission facilities. The wells installed have proven technically excellent. After completion

of the wells in 1963, it took two years to complete the powerhouse, meaning that the installed wells sat idle for that period, a sunk cost with no benefits.

The major problems of the Thakurgaon project have proven to be the location of the wells and inadequate utilization of water by farmers. The area chosen was one of porous soils, poorly suited for irrigation of rice. In project design soil conditions were not checked carefully. In addition, wells were located along the roads for ease of access, but the roads tended to follow the ridges, with the result that wells were selectively placed on the highest ground where runoff and percolation were at a maximum.

As with other WAPDA projects, no attempt was made to inform, organize, or train the farmers in the techniques of irrigated agriculture. As a result, in 1966, the year after the project was completed, according to a WAPDA study only 6.5 percent of the total water capacity of the wells was utilized.[1] In 1967 the performance did not improve appreciably. As a result, WAPDA brought in staff trained at the Comilla Academy for Rural Development to organize cooperatives and train farmers in irrigated agriculture. The use of water has greatly increased since 1967 but still only 35 percent of the area which the wells could irrigate,[2] and the farmers do not pay anything for the water.

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[1] EPWAPDA, Economic Study of Groundwater Projects in the Northern Districts (Dacca, 1966), p. 16.

[2] EPWAPDA, The Northern Tubewells Projects (mimeo, Dacca, 1970), p. 7.

The cost of these wells was inordinately high, Rs. 87,000 per cusec, where elsewhere in the Province similar wells were being sunk for a fraction of the cost per cusec.[1] This was because the most expensive capital intensive methods were used to sink the Thakurgaon well and the most expensive imported equipment and source of power chosen for them. One result was serious cost overruns. This, however, had little effect on their performance. The Thakurgaon project also completely overlooked the agricultural side of the project. Wells were located on the least appropriate soils; farmers were not prepared for and were never fully persuaded of the advantages of irrigation, so the agricultural benefits were only a third of what they should have been.

Despite the problems of the Thakurgaon project, there are substantial advantages to utilizing tubewells to rapidly expand irrigated farm land. Furthermore, initial investigations indicate excellent groundwater resources. Wells appear to avoid some of the problems WAPDA projects have regularly encountered. Wells can be sunk in one to six weeks depending on technique, and benefits from irrigated agriculture can begin in the same year, avoiding long lags in return on capital investment. The divisibility of well construction means that a

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[1] The performance in Thakurgaon contrasts sharply with the only other tubewell project of the 1960's, carried out at the Comilla Academy, where wells were financed entirely from East Pakistan Government funds allocated to the Academy. Labor intensive percussion drilling methods were adapted to local conditions by Pakistani engineers, and domestically-produced pipes, screens, and pumps, powered by diesel engines were used in wells. The cost of water was Rs. 17,730 per cusec, or 19 percent of the cost of a cusec of water in Thakurgaon. While water utilization was inefficient in technical terms, the demand for it exceeded the supply, and farmers met operating and maintenance costs according to a scale of increasing changes.

variety of technologies may be attempted simultaneously, and those proving most suitable can subsequently be utilized. It also means that the size of the program can be expanded or contracted as priorities or available alternatives change. There is flexibility in locating wells, which can be scattered and located in areas away from regular flooding or at sites with favorable groundwater levels. They can also be dispersed according to land characteristics to take advantage of soils best suited for irrigated farming, demand for water or where organizational problems have been solved. Despite these advantages, WAPDA has demonstrated a preferance for the large, multi-purpose projects.

Although each WAPDA project has had its own particular difficulties, there have been problems common to all of them. In all projects the choice of technology has been in varying degrees too complex for effective use in East Pakistan. In Ganges-Kobadak the original pumps never functioned. Elsewhere equipment either failed to operate at critical times or was made to do so by techniques so costly, as in the Thakurgaon wells, that the project could not be justified by any reasonable economic standard. Project designs were unnecessarily capital and land intensive, the critically scarce factors of production, and took too little advantage of labor, the most plentiful factor. Neglect of project phasing and of the complications that were inevitable but would delay project time tables wasted resources needlessly.

Typically large projects have been concentrated in a geographically limited area with the result that both risks and benefits have been borne by a relatively small number of farmers. Project design

also concentrated risk on the adequate performance of technical facilities at critical times.

Time and cost overruns have been a major element in all projects. As Table 2 indicates, major projects averaged 10.6 years to complete and minor projects 11.2 years. Costs overran estimates in major projects by a factor of 3.4 and by 2.7 in minor projects. Such overruns have deprived projects of all economic benefit. The importance of cost is obvious. Time is just as critical, although not as obvious. The return on investment in WAPDA projects was frequently deferred 10 years. Given the value of capital, if returns are deferred, they are diminished. As any interest table shows, the present value of any amount deferred 10 years at a 12 percent discount rate is (minimum for a capital short area like East Pakistan) 32 percent of the original value. Therefore, the extended construction periods had as serious consequences for the economic justification of the projects as the cost overruns.

Engineers working on every one of WAPDA's projects undervalued the importance of communicating with farmers to gain their support, organizing them for irrigated farming, and assisting them in learning to produce under new conditions. Too often the solution to agricultural problems was to go ahead with design that suited engineering requirements and assume that a call for more agricultural extension officers or technical assistance will solve the problems. WAPDA projects adequately proved that this easy formula was totally inadequate.

The conclusion is that engineering quality supersedes other

Table 2

Time and Cost Overruns in Selected Major and Minor Water Development Projects

Projects	Date Project Sanctioned	Completion Target	Actual Completion Date	Construction Time	Estimated Cost (Rs million)	Actual Cost (Rs million)	Overrun Factor
Major:							
Ganges-Kobadak	1954	1963	1971	17 years	157.0	629.4	4.0
Coastal Embankment	1960	1967	est 1975	15 years	261.8	1794.8	6.9
Dacca-Naranganj-Demra	1961	1965	1967	6 years	15.0	19.7	1.3
Brahmaputra Right Bank	1960		1969	9 years	44.4	77.7	1.8
Northern Tubewells	1960	1965	1966	6 years	36.2	100.0	2.8
Average Major Projects				10.6 years			3.4

Table 2 (continued)

Projects	Date Project Sanctioned	Completion Target	Actual Completion Date	Construction Time	Estimated Cost (Rs million)	Actual Cost (Rs million)	Overrun Factor
Minor:							
Faridpur Drainage	1956-57		1968	11 years	27.5	38.8	1.4
Feni Flood Control	1957		1968	11 years	4.0	8.9	2.2
Gumti River Dredging	1956		1967	11 years	4.1	12.6	3.1
Noakhali Drainage	1960		est 1973	13 years	8.7	32.8	3.8
Daktia, Feni River Control	1958		1968	10 years	12.9	29.1	2.3
Average Minor Projects				11.2			2.7

Sources:

Major Projects: Government documents cited in the text

Minor Projects: Government of East Pakistan, Planning Department, Gestation Period of Public Sector Schemes (Dacca, 1969) p. 17,18

requirements. Western perceptions are substituted for beneficiary perceptions; and the needs and requirements of the aid-giving, powerful autonomous agency, international consultancy system is given more consideration than those of the farmers who are the theoretical beneficiaries.

Benefits from WAPDA projects were expected from two sources, increased agricultural production with irrigation and protection against natural disaster, through flood or tidal action control. There are important distinctions between these two categories of benefits. Irrigation provides new income, improves an individual's food supply or the economy's output, and provides a sense of change and improvement. Flood control is essentially a negative benefit--it provides nothing new or additional but prevents potential losses. It is much easier to perceive the increased production and income than the benefits of a possible loss that has been avoided. The positive benefit undoubtedly has a larger impact for the beneficiary than the negative benefit.

The performance of WAPDA can be summarized with the fact that, in all the projects discussed in this paper, the ratio of benefits to costs was negative. These projects constituted a net drain on the economy rather than a benefit. While this may be more common with development projects in East Pakistan and elsewhere than is generally recognized, it is not a situation that can be tolerated over time.

By 1970 WAPDA projects had irrigated 174,222 acres, which represented an increase in total cropped acreage of .007 percent, and

an increase in production of an approximately equal amount.[1] This is a small return on the investment in WAPDA and one which has virtually no impact on the economic conditions of East Pakistan.

The area protected from flooding is not available as a consolidated figure, but the major projects, Coastal Embankments, Brahmaputra Right Bank, Ganges-Kobadak, Dacca-Naranganj-Demra, and Chandpur, encompass areas totalling over two million acres. These water control benefits must be discounted to some extent for losses in production they have caused. The stoppage of regular natural flooding needed to grow regular rice crops in Ganges-Kobadak, the Coastal Embankments, and the Brahmaputra Right Bank projects certainly detracts from these benefits. Nevertheless, WAPDA multipurpose projects have affected about 10 percent of the area of East Pakistan. In these areas benefits from flood control are being received.

Benefits have accrued to the staff of WAPDA and to the foreign and domestic consultants and engineers that WAPDA hired. It is difficult to document precisely the amount that goes to consultants. On 15 new WAPDA projects reviewed by the Bank, 12.5 percent of the

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[1] This is in sharp contrast to the Government's scattered low-lift pump program, begun in 1967-68, which irrigated 700,000 acres in the subsequent three years, at a cost of Rs. 175 million (of which the beneficiaries paid Rs. 26 million).

Figures on area irrigated both from Government of East Pakistan, Economic Survey of East Pakistan, 1969-70 (Dacca, 1970), pp. 46-47.

Cost of low-lift pump program from Government of East Pakistan, Approved Development Programme, op. cit., for the years 1967-68 through 1969-70.

project cost or $69.2 million was for consultant assistance. In addition to this is the cost of the General Consultants which averaged $2 million a year in the 1960's and WAPDA operating costs.

WAPDA engineers and professional staff are better paid than their counterparts in other agencies. They also enjoy the prestige of working for one of the most powerful agencies in Government. Whether their positions are also a basis for illegal profit is not easy to document. WAPDA engineers are generally considered in Dacca to have outside incomes.[1] Although WAPDA and its projects were viewed by many East Pakistani leaders as important for attracting more foreign aid to East Pakistan, much of the benefit of that aid was either going abroad or to the urban areas and not promoting development by increasing either growth or equity.

The 90 percent of East Pakistan's residents who live in the rural areas probably saw little benefit from these projects. There was no perceptable gain in production from water development investments. Given this fact, combined with the knowledge that 19.2 percent of East Pakistan's public sector development resources were invested in WAPDA for water development, it is necessary to ask serious questions about the effectiveness of the development system that included WAPDA, its foreign consultants, and large quantities of foreign aid.

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[1] One particularly amusing story circulated in Dacca in early 1969. In the last days of the Ayub regime when government controls were at a minimum, low-paid employees were demanding higher wages in confrontations with officials. The WAPDA Class 3 and 4, clerical and menial employees gheraoed (a sit-in, keeping officials in their offices until demands are met) the Chairman G. A. Madani and the senior engineers of WAPDA. After discussing the inflexibility of his budget, Mr. Madani turned to his engineers and asked how much of their "extra" income they were willing to share.

This system, that performed so badly in East Pakistan's water development, is not unique. The weakness of various elements of the system, as it has performed elsewhere, have been pointed out. Albert Hirschman, in his analysis of development projects, discovered both the frequency and the hazards of using the technique of creating autonomous agencies. He says it is "an attempt to infiltrate something alien and new into an old structure--a tall order which can probably be carried out under some exceptionally favorable conditions.... but hardly with the frequency and routine regularity with which such agencies are established around the world."[1]

There is a growing concern with the limits of project appraisal techniques and a widespread bias towards capital intensive techniques. In many areas domestic capital and foreign exchange are underpriced and labor over-priced. While shadow prices correct some of these distortions, there is frequently reluctance to shadow price labor at levels below the market price. Despite shadow prices, the actual cost figures for projects reflect these unrealistic valuations. Problems of labor management when added to price distortions frequently bias contractors or agencies toward machinery in the process of project construction.[2]

These are serious problems of controlling autonomous agencies and insuring that they adhere to natural economic priorities. Planning

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[1] Albert O. Hirschman, Development Projects Observed (Washington, 1967), p. 154.

[2] These points are clearly made in Walter P. Falcon, Agricultural Unemployment in Less Developed Countries: General Situation, Research Approaches, and Policy Palliatives (mimeo, 1971), pp. 14, 15, 16.

agencies frequently cannot adequately evaluate plans of agencies with aid-financed consultants in technical capacity. When confronted with multi-volume studies defending proposed projects, economic and engineering feasibility in endless figures, and four color technical drawings, they have little choice but to give their approval.

Unfortunately, the big autonomous agencies do not share the objectives of the planning agency. They are usually more concerned with the number of projects and the size of their aid support which insure their governmental power, than they are with national economic objectives. Furthermore, the agencies are usually not responsible for debt repayment and so are more concerned about the total amount of aid that can be attracted than they are about the terms and conditions on which that aid is offered.

Development projects in East Pakistan and elsewhere have been plagued by cost and time overruns and by problems caused by inappropriate technology. While the cost and time overrun factors on large water projects undoubtedly exceed standard international experience, it is a question of magnitudes, not of uniqueness.

Finally, the neglect of the production side of projects, those aspects involving human behavior and organization, has been common. Too frequently projects have been carried out by an agency like WAPDA which is fundamentally an engineering organization and neglects the non-engineering but equally essential dimensions of the project.

The sources of this problem are well summarized by Hans Singer:

> "The real objective of irrigation projects is to produce more and better food. Yet, when you concentrate your attention on the physical investment, your attention is concentrated on the engineering aspect...The other part is taking water to the farmer and following through into what the farmer does with the water. Well, that is an involvement with nature and with people, that is not an engineering project. The planners and project formulators and the people who make feasibility studies and the consulting engineers, the designers of the project, the contractors who carry out the projects, the aid givers--they all tend to limit their interest to the engineering aspect."[1]

All these criticisms focus on one part of the larger administrative system that carries out big projects, pointing out weaknesses or suggesting changes. In East Pakistan it was the entire inter-related system that failed. To try to change the output of the system by changing particular portions or procedures of its standard operation has little likelihood of success. Where this administrative system has failed as completely as it has in East Pakistan there is little basis for supporting any action but the attempt to find substantially different methods of administering development programs.

The choice of technology plays a crucial role in determining the administrative system. It imposes specific requirements and defines the limits of the administrative alternatives that can be used in conjunction with it.

The technology being used in WAPDA projects in East Pakistan and frequently elsewhere is a "modern" technology being transferred

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[1] Hans Singer, "Keynesian Models of Economic Development and Their Limitations: An Analysis in Light of Gunnar Myrdal's Asian Drama", The Asian Institute for Economic Development and Planning, Occasional Papers (Bangkok, December, 1969), pp. 15, 16.

from Western nations to developing countries. That technology, however, evolved to meet the needs of societies, economies, skill levels, and other attributes vastly different from those of a developing nation, and it has repeatedly proved inappropriate for promoting development. This technology must be replaced by a new or adapted technology created specifically for the environment in which it is to operate and for the objectives it must promote.

This concept has already been recognized in the field of agriculture. After attempts in the 1950's to transfer Western technology, the focus shifted in the 1960's to creating a new technology, particularly of seeds, created and adapted for the specific environment in which it was to be utilized. Research stations were established in many countries to develop the agricultural technology suited to the climate, water availability, farming practices, and other conditions of a specific area.

It is important to extend this approach to infrastructure projects in the public sector. Ways must be found to utilize the resources, labor, skills, equipment, and accumulated knowledge of the environment for building new facilities according to the specific requirements of a given locale.[1] It is necessary to use varying technologies of irrigation or drainage or road building or water control, just as different varieties of the new high yielding rice strains are used in different countries.

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[1]The major study presently under way in the Economics Department of the World Bank to determine appropriate technologies for road construction in Africa is an important initiative in this direction.

This new technology will require new administrative systems that can be built around local requirements and objectives rather than those of technological transfer. The first element in this new system will be much more extensive research organizations creating and adapting technology for specific countries or regions, a technology that can be implemented with only minor increases in the technical capacities of the nation.

Because of the nature of the technology and the need to spread benefits equitably, the implementation of this technology would logically give a greater role to local government or to strong field units of national organizations. These would not only need technical help, but should operate within a carefully structured and supervised system. Allocation of funds and coordination of activities should be functions of the national government. Procedures limiting the choices in technology to those which have been carefully tested and found feasible under local conditions and which are also consistent with national priorities would be necessary. Such a decentralized system should allow public participation in decisions at the local level and public knowledge and scrutiny of the performance to insure that there is not serious misuse of funds.

Local planning capacities can be developed to feed into the national system of planning. This would require a carefully established framework geared to local capacities in which local officials would formulate plans sufficiently uniform that they could be aggregated at the national level. Such a system would take advantage of

local knowledge and would avoid conflicts of the sort which arose over projects like Ganges-Kobadak and Coastal Embankments in which the project actually diminished rather than enhanced the farmers' productive capacity. This approach would not only broaden the administrative capacity of the nation; it would also provide important knowledge and training through participation of local people in construction and operation of these facilities. This participation, particularly in the operation and maintenance of facilities, should increase the reliability of the new technology. In addition, changes will come in smaller units, and therefore future risks will be more diversified. With the beneficiaries involved, there should be strong incentive to prevent failure.

Implementation of development programs at the local level would facilitate the use of labor intensive methods. Large scale participation in projects would have benefits in terms of education and knowledge of how facilities operated at the local level. These methods would also insure that the expenditures on construction went into the rural areas and not back to the cities or abroad.

Despite important advantages, administration focused at the local level is no panacea. It would be far more appropriate in some areas such as East Pakistan with its long tradition of local government and relative homogeneity among the rural populace than in other places with different conditions. No universal model such as the project system would be applicable. Rather, each country would have to evolve the system of development administration most

applicable to its own needs and conditions.

Nor would a shift to a new technology and administrative system do away completely with the need for large projects. Some objectives can only be achieved in this manner. Presumably the large projects would utilize an adapted technology and be closely related to demands created by smaller projects.

This shift in "the system" from large projects, centrally administered for purposes of transferring an alien technology, toward an adapted technology, locally tested and administered, will have important political and social consequences. Political control will be harder to achieve in such a system since large groups in the populace will be participating in local matters and feel some degree of control over their own affairs. It will no longer be necessary for them to await the beneficence of the center. Such a system will provide a broader distribution of benefits and a greater sense in most areas that things are changing and improving. What impact this will have on the political system is a matter of conjecture.

This change will not be easy to accomplish. There are powerful forces at work to perpetuate the existing system. In the developing countries, agencies like WAPDA are among the most powerful, and they will resist changes in the system. They will lose that power rapidly, however, if it becomes clear that they are no longer necessary conduits for foreign aid. The international consulting firms will also resist such change, for it would mean a major decline in their business. The aid-giving agencies and many of their personnel

are presently geared to this system. Hopefully, people will perceive the importance of this change and shift development and aid resources to the creation of a new technology adapted to its environment for a whole range of activities loosely categorized as infrastructure, as well as an administrative system more appropriate to this technology and the requirements of development.

The new nation of Bangladesh has a unique opportunity to abandon the institutions and administrative systems that served East Pakistan so badly. Unless it can create a system more appropriate to its needs than East Pakistan's, there will be a continuing waste of the nation's very scarce resources.