Rural Electrification Project

Report Date: December 1999

1 Project Summary and Japan's ODA Loan

This project forms one element of the "Rural Electrification Program" (approved in December 1985), which aimed to electrify 24,085 villages nationwide. ODA loan covered the electrification of 6,300 of those villages.
The ODA loan covered the entire foreign currency portion of the project cost, as well as local currency portion equivalent to 30% of the loan value.

Borrower	President of Islamic Republic of Pakistan
Executing Agency	Water and Power Development Authority (WAPDA)
Loan Amount	¥20,738 million
Loan Disbursed Amount	¥17,590 million
Date of Exchange of Notes	August 15, 1988
Date of Loan Agreement	November 1, 1988
Loan Conditions	
Interest Rate	2.75%
Repayment Period(Grace Period)	30 years (10 years)
Procurement	General Untied (Partial Untied for consulting portion)
Final Disbursement Date	December 31, 1998

2 Analysis and Evaluation

(1) Project Scope

Among the planned 6,300 villages, 5,977 (95%) were electrified.

(2) Implementation Schedule

The implementation schedule was nearly four times long as planned. The main reasons were as follows:
(i) Delays in the identification, selection and approval of target villages
The selection of villages to be electrified was carried out by federal and state assembly members within the budget available for each financial year, which made it impossible to determine all the target villages at once, and the selection process was slow. In some cases the villages designated by assembly members did not match the selection criteria and negotiations were required.
(ii) Delay in the Selection of Local consultants
Separate consultants were selected for nine regions, but the selection of the consultants

was prolonged by these problems:
(a) WAPDA Rural Electrification Office did not understand JBIC procurement guidelines.
(b) The consultant in Sind province was forced to resign due to prevailing law and order situation in the region.
The employment period for the consultants was scheduled to begin in November 1988 and end in April 1991, but it actually began in March 1989 and ended in April 1992.
(iii) Delays in the procurement of equipment and materials
The procurement of equipment and materials was delayed for various reasons, including the following:
(a) Shortage of local currency budget on the Pakistani side.
(b) WAPDA Rural Electrification Office was unable to appropriately monitor the large number of procurement procedures.
(c) WAPDA Rural Electrification Office lacked the ability to estimate the quantities of materials that should be procured for each village.
(d) This project was monitored centrally, together with other projects, which reduced the quality of inventory management. (WAPDA's procurement department handled procurement of materials for all projects together, with the result that it was often impossible to get the necessary materials for this project when they were needed because of the circumstances of other projects and the procurement department's priorities).
(e) There were many small-scale local suppliers and they often lacked the ability to deliver to order.

(3) Project Cost

The total project cost (Yen based) came to a substantial cost underrun, which was largely due to the depreciation of the Pakistani Rupee during the implementation period.

Comparison of Original Plan and Actual

Item	Plan	Actual
1.Project Scope		
i) New electrification and enhancement of capacity for exiting distribution lines accompanying new electrification and demand increase		
Punjab Province	3,297 villages	3,112 villages
Sind Province	1,317 villages	1,196 villages
Baluchistan Province	1,072 villages	927 villages
Northwest Frontier Province	614 villages	742 villages
Total	6,300 villages	5,977 villages
ii) Consulting Services	Study on villages to be electrified	As planned
	Making of bidding documents	As planned
	Making of completion reports by village	As planned
2.Implementation Schedule		
	36 months (Dec. 1988 to Dec. 1991)	120 months (Dec. 1988 to Dec. 1998)
3.Project Cost (ODA loan portion)		
Foreign currency portion[¥ 1 million]	14,517 (14,517)	11,564 (11,564)
Local currency portion[¥ 1 million]	41,551 (6,221)	10,198 (6,008)
Total [¥ 1 million]	56,068 (20,738)	21,984 (17,573)
Exchange rate	Rs.1 = ¥ 8.18	Rs.1 = ¥ 4.40

(4) Project Implementation Scheme

The executing agency, WAPDA, lacked institutional capacity (with centralized decision-making processes and slow response to problems) and managerial ability, and these deficiencies contributed to the project's severe delays (see 2. above). The other problems were as follows:
(i) WAPDA Rural Electrification Office was not used to handling small works contracts. This resulted in late payments to consultants and contractors, causing conflicts with both groups, which reduced working efficiency and invited implementation schedule delays.
(ii) A project director was appointed to coordinate between the departments within WAPDA and liaise with JBIC, but he was not given independent authority to manage all stages of the project, which made it difficult for him to take swift action.

(5) Operations and Maintenance Scheme

(i) Operations and maintenance is under the authority of directors (executive engineers) of the local offices of the Rural Electrification Office of WAPDA, the executing agency. Each local office has jurisdiction over its village. Operations and maintenance are carried out by standard procedures according to standard design manuals. WAPDA is aware of the need to use cranes and other vehicles in the installation of electrical distribution equipment and materials, and to provide more training to avoid accidents during such operations.

(ii) In some regions planned power cuts are carried out, and in some villages they can be prolonged. The safety standards laid down by WAPDA are largely attained, and there are no particular problems. However, some accidents due to inadequate earthing are reported.

(iii) As part of this evaluation, an impact assessment survey was carried out using participatory methods in eight villages which had been electrified between four and seven years ago. The survey was commissioned from a local NGO (see appendix for details). It found that most residents were satisfied with WAPDA's electricity services, but there were complaints in some villages, including the following: (a) When power cuts occurred, WAPDA is slow to restore power and tends to restore it first in areas where important people live,(b) In areas far from WAPDA offices, bills are issued without actual meter readers but based on estimate from the previous bills, and(c) Bills are issued late.

(6) Environmental and Social Impact

The positive effects of electrification are as listed below. One negative effect that has been reported is that electrification has led people to pump up excessive amounts of groundwater, lowering the water table.

(7) Project Effects and Impacts

This project electrified approximately 6,000 villages. The impact assessment survey mentioned above was conducted as a case study to investigate the specific effects of the project. The survey found that 70% of all households receive electrical supply. The following direct effects of the project have been confirmed.

(i) Improved Standard of Home Life

The use of electric lighting, fans, televisions and other appliances has made home life more convenient and comfortable.

(ii) Reduced Domestic Works

The use of fans, electric irons, washing machines, water supply pumps, electrical cooking tools and other appliances has reduced a housewife's daily household labor by between one and five hours.

(iii) Propagation of Information

Nearly half of households have televisions, and other than entertainment programming, people can access important information on world news, social life and economic activity.

(iv) Improved Hygiene

The use of fans avoids mosquito stings, thus reducing the incidence of malaria. Water pumps make it easier to get water, which encourages improvements in hygiene.

(v) Improved Educational Environment

In villages which have schools, the classrooms are equipped with lights and fans, which improve the educational environment. Lighting at home enables children to study at night.

(vi) Expanded Economic Activity

The use of electric lighting and fans increases the number of hours available for economic activity in shops and workshops by between two and four hours a day, and work itself has been made more efficient by electrical appliances. The reduction in the amount of housewives' time taken by household chores has increased the hours they can work from home in weaving and sewing.

(vii) Expanded Use of Groundwater for Irrigation

Pumps have been bored for use with electric pumps, enabling the use of abundant groundwater for irrigation in place of rainwater or water from irrigation watercourses.

(viii) Increased Public Order and Safety

The installation of lights has reduced thefts of livestock and household goods. People can move about even late at night without fear or thieves, dogs, snakes or other dangers.

By reducing the burden of housework and increasing work from home, the project has had some effect in increasing the economic strength of women. In some of the villages, women are extremely active in cottage industries. In rural Pakistani society, women are generally put in very low positions in society, but the increase in their economic power due to electrification is reported to have expanded their authority to speak out about matters in the home. However, even when a village is electrified, some households remain without their own connections to the supply, and in some villages conditions

are not ready for the expansion of economic activity, even with electricity. The poor who cannot afford the cost of electrical connection works or pay electricity bills, and some villages that lack natural advantages and have limited access to markets are not benefitted from the project.

3 Lessons Learned

(1) The conditions for realizing the effects of electrification projects (economics, infrastructure and natural conditions etc.) should be clarified and the village selection process should reflect those conditions as far as possible.

Realization of the benefits of electrification appears to depend in part on conditions in the electrified villages, such as economic, infrastructure and natural conditions. For this project the only criteria were population and distance from electrical trunk lines. If the various factors which influence the realization of benefits could be clarified and reflected in the criteria for selecting villages to receive electrification, the project effects and impacts could be strengthened. However, these factors can be expected to be very diverse, and therefore the process of defining them should use the same participatory survey methods (such as the PRA method) used in the impact assessment survey to gather and analyze a wide range of data. The findings should be used to examine what selection criteria should be applied and what would be the fastest and most realistic procedure for applying them.

(2) Synergistic effects can be gained by combining electrification with other projects to build infrastructure for rural life.

Access to roads is an important factor in carrying projects and fully realizing their benefits. During the implementation of the project, it was extremely difficult to transport equipment and materials to villages with no access to roads. Conversely, even in villages which were relatively poor, electrification was recognized to yield benefits if the village in question was connected to a road. If electrification is combined with other ODA loan projects (such as rural promotion road construction projects and poverty alleviation projects) from the building stage, synergistic effects can be expected.

(3) Where the ability of the executing agency has not been proven by experience, or where the executing agency has no experience of similar projects, its ability to carry out the procedures and mechanisms of project implementation must be examined carefully at the time of the appraisal to make sure the plan devised is feasible.

The main reason for the delays in this project was that the procedures for selecting villages included political processes, and therefore took longer than anticipated. At the same time, the executing agency, WAPDA itself, had some experience of ODA loan projects, but the WAPDA offices in charge (the Rural Electrification Office) had no such experience. Neither did they have the ability to efficiently manage multiple sub-projects, and their shortcomings were a further factor behind the delays. Countermeasures that could be taken at the appraisal stage include the following:

(i) All the organizations which could contribute to the implementation of the project should be listed in detail, and the specific details of implementation procedures should be closely examined.

(ii) The examination of implementation ability should go into quantitative details of technical, financial and systematic aspects, as well as processing capacity (i.e. how many villages the executing agency would be able to deal with in one year).

(iii) If it is judged that the executing agency lacks the ability, an effective implementation system should be constructed with the use of technical assistance and other aid, as necessary.

PAKISTAN

Rural Electrification Project

National Rural Support Programme
Ghazi Barotha Taraqiati Idara

1. Survey Summary

As part of its ex-post evaluation work, JBIC Pakistan Representative Office commissioned a survey of the impact of the electrification of eight villages which were electrified between 1992 and 1995. The survey was conducted by NGOs with experience in anti-poverty measures in Pakistan (National Rural Support Programme: NRSP and Ghazi Barotha Taraqiati Idara: GBTI). The surveyed villages were two in each of four provinces covered by the project. In each village the PRA (Participatory Rural Appraisal) method was used to efficiently gather a wide range of information, and evaluate it from the point of view of the beneficiaries. The project effects and impacts were analyzed through comparison with villages that had not been electrified. The main findings of the survey are summarized below.

2. Household Electrification Rate

Even if a village is electrified, it does not necessarily follow that all households in it will be electrified. Bringing the electricity supply into each house requires expensive construction work (approximately Rs4~5,000, equivalent to approximately ¥20,000). Therefore there is a strong tendency in each village for electrification rates to be higher in the more prosperous households. Households too poor to afford the wiring work cannot bring electricity into their homes. One alternative is to bring in cables from a neighbor with electricity and pay them for the amount used, which cuts down initial costs. In the villages surveyed, 70% of households had electricity supplies, but 11% of those obtained their electricity from neighbors.There were major differences in electrification rates among villages. Of the eight villages, two had household electrification rates of 30% or less, while two reached 100% household electrification. Both the 100% electrified villages are newer and relatively small, but they are not necessarily more prosperous than the other villages. More detailed investigation is required to reach general conclusions on the factors which control household electrification rates.

3. Usage of Electricity

Electricity is used in the ways described below in the surveyed villages.

(1) Home life: The range of electrical appliances used in the surveyed homes has increased with the economic level of the household. The most basic applications are lighting, fans and radio cassette players, which are used in almost all electrified houses. Irons and televisions are used in around half of households. Refrigerators, water pumps, washing machines, heaters, food processors and other such appliances are only used in wealthier households.

(2) Commercial objectives: Besides illumination and refrigeration in shops, electricity is also used in mills, welding workshops, bicycle repair workshops, electrical repair shops, building materials shops and sewing workshops.

(3) Agricultural objectives : Tube wells for irrigation, animal feed cutters, chicken farms etc.

(4) Social facilities : Illumination and fans for schools, illumination for medical facilities, refrigeration for drug depositories etc.

In general, wealthier households with more financial resources can own more electrical appliances and can afford to pay larger electricity bills. Therefore they derive more benefit from electrification. Comparing electricity usage among households with electricity between those which are poor and those which are wealthy, there is a threefold or fourfold gap in the amount of power used, and a fivefold or sixfold gap in the amount of electricity charges paid (the electricity billing scheme is organized so that those who use more pay higher unit rates).

4. Benefits and Impacts

Electrification yields the kinds of impacts and benefits listed below in the surveyed villages.

(1) Increased living convenience and comfort

According to the villagers, the things that brought the biggest changes in their home lives were electric light and fans. Electric lights, in place of lanterns, give more light and more convenience. Families can spend the evenings together, or attend to household chores, work at home or get together with neighbors. Also, in the time before electric fans, the air had to be constantly fanned manually until the children went to sleep, to guard against heat and mosquitoes. That was a task for the women. In hot seasons it was almost impossible for them to sleep at night. Now all the family can sleep soundly at the same time. In addition, television and radio provide people with entertainment.

(2) Reduction of women's household labor

The introduction of household electrical appliances has greatly reduced the amount of work women must do in the home. The labor of fanning the children while putting them to bed, ironing with coal heating, laundering, water collection, cooking and so on has been made much easier by electric fans, electric irons, washing machines, water pumps, food processors and other devices. The amount of time spent on housework in homes with electricity is reported to have been reduced by between one and five hours, depending on the types and number of appliances used.

(3) Propagation of information and raising of awareness due to access to the mass media

Electrification has allowed access to television. The television diffusion rate was 46% in the eight villages surveyed. Besides providing entertainment, television delivers important information on world news, social life and economic activities. Through television and radio, many of the villagers came to realize the importance of matters such as education, medical treatment, maternal health and family planning, as well as learning about environment, health and clean water. Agriculture-related programming raised interest in ideas such as the use of fertilizers and insecticides.

(4) Improvement in hygiene

In half of the villages surveyed, the use of fans was reported to protect the residents from mosquito stings, reducing the incidence of malaria. In five villages electric pumps made it easier to use water, resulting in reported improvements in hygiene. In three of these villages, the use of flush toilets increased. The causal relationships between electrification and disease and health have not been proven, but there is no doubt that the electrification of these villages encouraged improvements in hygiene.

(5) Improvement of educational environment

Among the eight villages, five has elementary schools and one has a junior high school. Electrification enabled these schools to use fans and electric light. The changes in enrolment rates are unclear, but the villagers are satisfied with the facilities of the electrified schools, and this appears likely to have a positive effect on enrolment. The use of electric light in homes is thought to increase the time children can spend studying at home.

(6) Expanded and more efficient economic activity

Electrification has increased the number of hours villagers can spend on economic activity. Firstly, the use of electric light and fans allows shops and workplaces to operate for between two and four hours longer than before. Also women spend less time on housework than they did before, increasing the time they can spend on work from home, in jobs such as sewing and

embroidery. In one village, which was favored by a good market, the women threw themselves into cottage industry, operating it skillfully with the time saved from household chores.The installation of refrigeration in stores made it possible to sell foodstuffs which require refrigeration. New types of business appeared which were only made possible by electrification, such as electrical repair shops. Also, equipment driven by electricity, such as motorized sewing machines and animal feed cutters, made it possible to work more efficiently.In five of the eight villages, the numbers of shops and small businesses had increased substantially, although this cannot be credited solely to electrification. In the four to six years since electrification, the number of shops in these five villages had gone from ten to 37, and the number of small businesses from two to nearly 20. These increases expanded the number of jobs available in the villages.

(7) Improvement of irrigation

Four of the eight villages built tube wells with electric pumps which enabled them to irrigate a total of 950 acres with groundwater. This was land previously dependent on rainfall or on irrigation from water channels. In one village it was confirmed that irrigation from tube wells had increased productivity.

(8) Population stabilization

In four of the eight villages, population outflow reduced after electrification and population inflow increased. In the other four villages, there were no major movements of population. However, once again it is impossible to attribute this phenomenon entirely to electrification, as it appears to be a composite impact in combination with other factors such as the construction of roads and water. In one village, the increase in population is reported to have resulted in a major increase in land prices.

(9) Safety and public order

In five of the eight villages, the installation of street lighting is reported to have reduced the incidence of theft of livestock and goods. Lighting is also thought to allow people to return home safely late at night, without fear of thieves, dogs, snakes and other hazards.

It is important to note that not all of the villages enjoyed all of the above benefits. For example, in the two villages where household electrification rates were low, only the more wealthy households, amounting to less than 30%, enjoyed the benefits of electrification. In three of the villages, where there was almost no economic activity such as shops and businesses, there was no increase in economic activity after electrification. The three villages which do not have elementary schools did not benefit from any improvement in their educational environments.In short, whether or not benefits such as those listed above are realized in a given village depends on whether the preconditions for such benefits are in place. These preconditions include economic conditions (whether households have enough income to buy electrical appliances, whether the market, skills and capital are adequate for the establishment of shops and small businesses), infrastructure conditions (accessibility of the village, existence of educational facilities etc.), and natural conditions (hydrological conditions, productivity of the land etc.).

Negative impacts of the program include some erosion of traditional values among villagers due to the arrival of television, and the pressure placed on household budgets by electricity bills. Also, in some densely populated areas, and particularly in the province of Baluchistan, the pumping of groundwater had an adverse effect on the level of the water table. This problem arose because the billing system charges a flat rate, rather than charging for the amount of electricity used, encouraging pump owners to run their pumps constantly.

Tube Well operated by the Electricity.

Electric Fan in a Rural Household.