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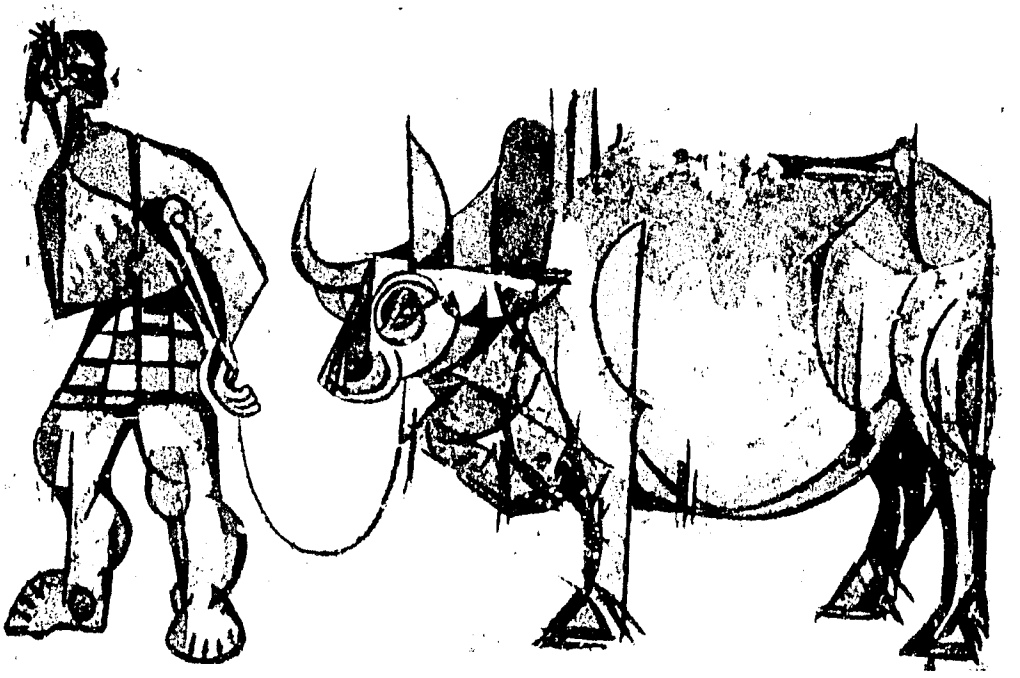

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Local Institutional Development for Rural Infrastructure

by

Gregory Schmidt
Norman Uphoff

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SPECIAL SERIES ON LOCAL INSTITUTIONAL DEVELOPMENT -- No. 3

LOCAL INSTITUTIONAL DEVELOPMENT FOR RURAL INFRASTRUCTURE

A report prepared by Gregory Schmidt and Norman Uphoff
for the Rural Development Committee, Cornell University,
with support from the Office of Rural and Institutional
Development, Bureau of Science and Technology,
U. S. Agency for International Development

October 1984

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PREFACE TO SPECIAL SERIES ON LOCAL INSTITUTIONAL DEVELOPMENT

This series of reports presents the findings of a year-long study by our working group on Local Institutional Development (LID). It was sponsored by the Rural Development Committee at Cornell University and was funded by the Office of Rural and Institutional Development in USAID's Bureau of Science and Technology.

Our initial concern was whether local institutional development could be adequately provided for by approaching it on a sector-by-sector basis, or whether it represents something needing and warranting attention across sectors. As with most "either-or" questions, there turned out to be some merit in both views. Certain issues and provisions are particularly relevant for developing local institutional capacity for certain sectors. At the same time, individual sector-specific initiatives are likely to lead to neglect of more broadly-based capacities, which themselves are important for sector-specific kinds of LID.

Our analysis offers a firmer conceptual base for the often but ambiguously used terms "local" and "institution." It analyzes what kinds of LID are likely to be most appropriate for the different activities frequently initiated in rural areas. Finally, it examines how local institutional capacity can be strengthened by national and donor agency efforts.

Throughout the analysis, we draw on the experiences with LID which emerged from a review of the literature. Cases which proved particularly instructive are reported in annexes at the end of the reports. Not all readers will be interested in all the activity areas covered by our study, so we have organized the presentation of findings accordingly.

Five of the eight reports (Numbers 2 through 6) are sector-specific, and readers may have particular interest in just one or two of them. We trust that all readers will find the introductory report (Number 1) useful, as well as the observations and suggestions contained in the concluding reports (Numbers 7 and 8) which are relevant across sectors. The full series is listed on page ix.

In condensing our observations and conclusions into these reports, we have not been able to include all of the case material and literature references which were covered in our study. We now know how broad and complex is the subject of local institutional development. Our discussions in this series present only what appear to be the most tenable and salient conclusions. We plan to integrate these analyses into a

book-length presentation of the subject for readers wishing a single continuous treatment of LID.

Though this project involved an extensive literature search and review on our part, it must still be considered more exploratory than definitive. Few of the available materials addressed LID issues analytically or even very explicitly. We thus cannot and do not attempt to provide "recipes" for local institutional development. This is an initial mapping of some important terrain not previously surveyed systematically. We welcome any and all efforts by others to contribute to the understanding and practice of local institutional development by adding to a more through knowledge base.

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Rebecca Miles Doan, Gregory Schmidt and Norman Uphoff

LOCAL INSTITUTIONAL DEVELOPMENT FOR RURAL INFRASTRUCTURE

1.0 INFRASTRUCTURE AND RURAL DEVELOPMENT

The productivity, well-being and security of rural people is greatly affected by the adequacy of the infrastructure that exists in their communities and that links them to district, provincial and national centers of administration and commerce. "Infrastructure" includes all physical facilities which provide services to agriculture or non-agricultural enterprise or which benefit the population directly. Transportation, power, water supply, and communication facilities are valuable for both categories, while other infrastructure such as post offices or recreation facilities will provide general benefits. Certain facilities support specific tasks of natural resource management (e.g. irrigation and drainage structures) while others aid human resource development (e.g. schools and health clinics).

Five categories of rural infrastructure can be provided through some combination of public and private institutions at various levels. Not all are of equal relevance to local institutions, but we list them to indicate the boundaries of the topic.

1. Transportation for moving persons and materials quickly, cheaply and reliably.

   a. There are basically three modes of transportation: by land, water and air. The first is by far the most important for rural development, through the others may be crucial for remote or mountainous areas.

   b. In each mode, basic investment is in structures that permit or facilitate (speed, cheapen) movement of persons and goods, with secondary investment in the vehicles or other transport means to utilize the structures.

2. Power from inanimate sources for agricultural production activities such as operation of pumps for irrigation, for non-agricultural enterprises, and for improved quality of life in rural areas.

   a. The most versatile is electricity, which can be generated in various ways. For ecological as well as other reasons, biogas is of increasing interest in rural development (the residue can provide fertilizer for agricultural production).

b. Whether power is generated in a centralized or a decentralized way affects which if any local institutions are relevant. Moreover, local institutions may be more useful in the distribution of power than in its generation, as was the case in the U.S. with rural electrification cooperatives.

3. Water supply.

a. The use for which the supply is created affects what local institutions will be most relevant, as does the technology employed for obtaining it and the distribution system involved. This is clearly documented in a study from Botswana (Roe and Fortmann, 1982).

b. Domestic water supply (potable water) has greater local institutional requirements than water for livestock, for example, in that water quality is more important. Water used only for irrigation presents simpler tasks for local management, suitable for membership organizations of users, than do multiple use situations where many different and conflicting interests must be reconciled, necessitating a role for local government or possibly representatives of the national government.

4. Communication. While there is a great deal of communication at the local level, there is relatively little infrastructure that is strictly "local." Radio transmitters, television relays, telephone or telegraph wires are almost always part of national systems. The local institutional development implications of communication infrastructure are therefore fewer. An exception would be the use of local listening groups to make radio more effective in rural areas (Berrigan, 1979; Crowley et al., 1981).

5. Service and Other Facilities are often dependent on local institutions for provision and/or maintenance: schools, clinics, community centers, libraries, postoffices, marketplaces, sanitation facilities, etc. Housing also can be provided through one or more local institutional channels.

For practical reasons, this report concentrates on several types of rural infrastructure -- roads and bridges, electrification, and domestic water supply, bearing in mind for the latter that water has multiple uses. Local institutional development (LID) implications of the irrigation aspects of water supply have been considered in Report No. 2 on natural resource management.

The services provided by physical infrastructure are commonly, but not always, classifiable as "public goods," as discussed in section 3.0. This means that for some combination of physical, financial or social reasons, it is impossible, uneconomic, or undesirable for the services in question to be provided only to certain persons individually on a market-price basis. When this situation applies, the institutional options reviewed in section 2.0 are narrowed because private channels of service

provision are not viable. Some kinds of membership organizations may be effective where public goods are involved, but such possibilities need to be assessed carefully.

2.0 ALTERNATIVE LOCAL INSTITUTIONAL CHANNELS

Many of the goods and services provided by infrastructure can be created by individuals and households, who can construct a path or dig a well, or even install a diesel electric generator provided they have sufficient resources. Such a generator may be quite uneconomic, however; the well may not provide as much water or be as reliable as if a deeper one were installed with more investment; and many home-made paths do not add up to an all-weather road which is suitable for movement of many goods and persons. So while individuals and households can provide for themselves some of the benefits of infrastructure, collective action to create and maintain them is needed for substantial development.

Many kinds of infrastructure have been created by traditional local institutions -- irrigation systems as reported in Report No. 2 as well as roads, wells, capped springs, etc. What we are concerned with here are the more extensive and technologically-advanced forms of infrastructure that may be established and maintained by local or national institutions. The principal local institutional alternatives are:

* local administration (LA) which can build and operate facilities on a free, subsidized, or fee-for-service basis. Typical LA would be the local staff of a Public Works department or of an electricity parastatal corporation.

* local government (LG) which can function in the same way as LA but which is accountable to a local constituency rather than to bureaucratic superiors. Village councils, panchayats and municipalidades would be examples of LG.

* local organizations (LOs) made up of members who join together to provide and maintain certain facilities for members. We would distinguish three kinds:

* membership organizations (MOs) are often known as user groups in that the organization has been established to benefit its members.

* cooperatives are a special kind of membership organization where members have pooled economic resources and share risks together (Esman and Uphoff, 1984).

* service organizations (SOs) include charitable and religious associations such as Red Cross societies, local fire companies, or service clubs like Lions or

Jaycees. Members may benefit from SOs' activities but these are essentially intended for others rather than being a manifestation of self-help as with MOs.

private enterprises which invest in the provision of goods such as water or power, or of services such as telecommunications, and which sell these for profit.

Because infrastructure is essentially area-based and provides mostly what are known as "public goods," LA or LG have some inherent advantage compared to LOs or private enterprises. Both of the latter channels lack the authoritative basis for requiring users to pay for goods or services received. Nevertheless, as indicated in the following discussion, LOs and private enterprises may make important contributions to certain kinds or phases of infrastructure development. Moreover, although we speak analytically of institutional "alternatives," in practice "combinations" of institutions may be more important.

Where infrastructure provides public goods from which users cannot be excluded, or for which they cannot be made to pay, private businesses have difficulty operating profitably, and thus cease to be viable. Some infrastructure, however, such as rural electrification, has products that can be marketed so private enterprises have some basis for operation. Further, private providers may be part of the mix of local institutions involved with rural infrastructure by meeting specific needs such as making spare parts for water supply equipment (USAID, 1979).

Most of the infrastructure in rural areas can be attributed to the operation of national government agencies, so despite its many weaknesses and inefficiencies, one should not discount the role of local administration. LA contribution to design and construction, as discussed below, is often vital even if other institutions take over responsibilities for operation and maintenance. Agency staff can be found working under very difficult conditions to get roads, wells and other facilities established. Like other local institutions, LA is better at creating infrastructure than at maintaining it, for a variety of reasons.2/

While it has limitations, local government appears usually the most promising base for developing and maintaining rural infrastructure, especially if it can be supplemented

2/ A study of Kenyan rural water supply experience, for example, found LA not equipped to operate and maintain the systems due to the large areas to be covered, the lack of transportation to visit these areas, and unreliable supplies of fuel and parts. Also, often the engineers were expatriates with short-term tenure who were not prepared for close collaboration with communities (Dworkin, 1980a).

by some form of local organization. To meet particular local needs, LG can engage specialized staff if needed to ensure performance of routine operations. This has been done traditionally for irrigation, where overseer roles have been created to supervise the operation and management (O&M) of distribution systems. Such roles have been incorporated by local governments for current O&M of irrigation systems under LG responsibility.3/

Membership organizations or cooperatives can do the same, though it appears that local government with its legal authority and its usually more assured (if not fully adequate) financial base, has a comparative advantage for continuous activities. As a rule, membership organizations appear relatively better at one-time activities where resources of money or labor are mobilized for a specific task. Handling funds and supervising personnel for operation and maintenance require day-in, day-out effort plus great responsibility. LGs can fluctuate in their capability according to the commitment and skill of their officers and personnel, but membership organizations are likely to have still greater variation. There may be highly effective leadership for some time, but it is hard to sustain this for long periods. Certain membership organizations have in numerous situations discharged O&M tasks quite satisfactorily, but this does not change our generalization about the comparative advantage of local government.4/

One of the conditions for an effective LG role in infrastructure is that it have a predictable resource base. The amount of financial resources available will affect LG decision-making on construction, but their stability will be crucial for operation and maintenance, which are essential for deriving benefits from any infrastructure. Garzon (1981) stresses this in his comparative analysis of rural public works experience. The

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3/ Examples of such traditional watermaster roles now serving more "modern" functions would be the ulu-ulu in Indonesia (Duewel, 1984) and the chowkidar in Pakistan (Bhatty, 1979).

4/ We have learned of a truly remarkable example in the area of irrigation infrastructure in the Terai region of Nepal. There 4,000 farmers living in 54 villages in a locality known as Chattis Mauja operate and maintain an irrigation system that is 150 years old and serves 7,500 acres through a complex membership organization. Each village has its own elected management committee, and the villages are grouped into nine area committees for management at the next higher level. These committees are in turn each represented on an executive committee for the whole organization. It has a chairman and secretary who are directly elected by members at an annual meeting. The organization hires its own technical supervisors (usually ex-servicemen) to oversee the operation and maintenance work. About 60,000 man-days of labor are mobilized annually for maintenance work. All this is done by a largely illiterate membership without inputs from government (LA), so one can see the possibilities for local management of even fairly complex tasks if the incentive and responsibility are clear (Pradhan, 1983).

performance of Local Development Associations in North Yemen, which receive an assured portion of the zaqat tax, contrasts favorably with that of local governments in Tunisia and Pakistan which built infrastructure with temporary Food for Work funds.

The local institutions with the most variable role are membership organizations and cooperatives, being subject to the constraints which "free-riding" presents. Where the benefits that members produce by their resource contributions can be enjoyed by others who contribute nothing, this may be a deterrent to the organization's providing the service. This, however, is a conditional, not an absolute statement, since the net benefits to members may be sufficient to justify their effort even if other gain "unfairly." 1/

We have found more of a role for MOs and cooperatives in rural infrastructure than would be predicted on the basis of what some social scientists consider "the logic of collective action" (Olson, 1964). Even if such organizations do not create the infrastructure themselves, they may be enlisted to assess, collect and account for fees, as reported in Tanzania and Tunisia (Dworkin, 1980b; Bigelow and Chiles, 1980). In Bolivia, Tendler (1983) found that cooperatives established for other purposes also undertook some rural infrastructure investments which benefited the whole community, not just members.

We did not find "alternative organizations" (Leonard and Marshall, 1982), those composed only of poorer members of the community, frequently involved in infrastructure. There are some examples such as an organization of untouchables in an Indian village who collected funds and built and maintained a well. To the extent that the membership covered the whole community, their organization would however no longer be operating as an "alternative organization" but would constitute a local organization or local government.

Local service organizations as a special category for providing rural infrastructure were not very common in our reading of the case literature. This may reflect our concentration on roads, electrification and water supply. We know there are private service organizations that invest in public facilities such as community centers and market stalls, and local religious organizations often provide amenities like drinking water or resthouses for travellers.

These examples underscore our observation above that while different institutional channels have certain comparative advantages, it is likely that some

1/ These questions and some of the relevant literature have been considered in section 7.0 of Report No. 1 and in section 4.0 of Report No. 2.

combination will contribute to more effective provision of even a single form of infrastructure like bridges or potable water. It is also important to see how institutions operating at different local levels can fit together.5/ In the Baglung bridge case, the overall planning, based on proposals emanating from the village panchayats below it. Actual construction once a bridge was approved was assigned to a special committee (a group) made up of persons who had the keenest interest in having a safe, reliable crossing at the particular point. The Malawi self-help water scheme, given the nature of decision-making and operation for the supply and distribution system, had to have committees at several levels working with the Department of Community Development staff (Liebenow, 1981).

The preferred local institutional arrangement appears to be a combination of local government and local organizations. Imboden's review (1977) of rural drinking water projects concludes that: "A water committee and strong local authority facilitate the execution of water projects." This is seen in the water supply cases from Peru and India reported in the Annexes (pages 00-00), though in the Malawi case also reported there, it was a combination of LA and LO that accomplished a remarkably quick and inexpensive spread of water facilities. The similarly impressive case of bridge building in the above mentioned Baglung district of Nepal relied on LOs with LG (panchayat) sponsorship and minimal but crucial inputs from government (Pradhan, 1980).

3.0 CONSIDERATIONS ON "PUBLIC GOODS"

Rural infrastructure activities differ from those in other areas of rural development because generally the services of infrastructure are "public goods." This makes their provision through private sector channels impossible or at least less feasible. Membership organizations are confronted by what is described as the "free

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5/ Our discussion here of "levels" follows the analytical distinctions made in Report No. 1. We identified three different "local" levels -- the locality which is a set of communities having some tradition of cooperation, perhaps because they all have had some economic, social and other interaction focused on a market town; the community which is a residential entity made up of households living in close proximity; and the group which is made up of households or individuals cooperating at a level "below" the community. Above the "local" level, one can have sub-district and district levels which are defined essentially in administrative terms. These are not units of actual or potential collective action by rural people, and thus are not regarded as "local" in our analysis of local institutions.

rider" problem when undertaking to provide public goods. This inhibition can be overcome through the exercise of authority -- by local governments or local administration requiring all beneficiaries (and sometimes also non-beneficiaries) to pay a share of the cost of providing services.

Their ability to deal with the free rider problem appears to give LG and LA an advantage over both membership organizations and private enterprises for undertaking with rural infrastructure. Equating "public goods" with "public sector" channels of provision, however, is too simple. The services of infrastructure should not be categorized as all public goods. Rather one should examine to what extent and in what ways the goods and services produced are "public," to get a better idea of what are indeed the best institutional options.

The two main characteristics of "public goods" are excludability and jointness of use or consumption (Ostrom and Ostrom, 1977). To the extent that goods are indivisible or users cannot be kept from using them, and to the extent that one person's use of them does not diminish or preclude another's use, they are "public." But these are often matters of degree, and excludability and jointness are not simple characteristics. Each has physical, economic and social aspects which establish different kinds and degrees of "publicness" observed in the examples of rural infrastructure considered here. These differences in turn have implications for local institutional development.

Inability to exclude potential users who have not paid for creating infrastructural services or to require them to pay at least a share of direct operating costs can arise in physical terms if the good is indivisible, like a weather forecast, and anyone can enjoy it. It can arise in economic terms if the cost and difficulty of collecting are so great that the benefits of collection are negligible, even if physically possible. Or it can arise in social terms if there are moral or practical reasons for making the good available to all. Norms may make exclusion socially unacceptable on equity or other grounds, or externalities may make exclusion undesirable, such as when spraying homes and gardens to control mosquitoes.

Jointness also has these three aspects. Physically, a good may be "consumed" by many persons and not be diminished by others' use. (This makes "exclusion" more difficult because once the facility exists, there does not appear to be any cost to others from some individuals' free-riding.) Economically, creation of the facility may require such a large aggregation of resources that it will not come into being without many people contributing. Possibly not everyone needs to contribute, but enough persons

must contribute to surpass some threshold for the good to exist.6/ And socially, one's own benefits may depend at least in part on others enjoying them too, as with raising the literacy level of a community or reducing communicable diseases.

These variables can be summarized simply in a set of questions. First, regarding "excludability" --

** Is exclusion physically possible? Is there divisibility in the good itself so it can be given or withheld?

** Is exclusion economically efficient? Is it cost-effective to collect payment from all users?

** Is exclusion socially desirable or even possible? Are there ethical or practical considerations which would restrict scope for exclusion?

The less excludability there is on one or more of these grounds, the less basis there is for private enterprise to undertake the investment in particular infrastructure.

Regarding "jointness" of consumption or use, one can ask --

** Is there physical jointness? Does the good exhibit qualities of non-subtractibility?

** Is there economic jointness? Are there externalities that make others' benefit from the good add to one's own benefit from it?

** Is there social jointness? Are there externalities that make others' benefit from the good add to one's own benefit from it?

The more jointness that exists, the more "public" is the good and the more reason there is for LA or LG to be responsible for the infrastructure providing it.

We note these characteristics to be able to point out differences among the kinds of infrastructure we are considering in this analysis. Roads, for example, are generally rather low in excludability while high in jointness. People could be required to pay a user fee, but monitoring use is difficult, and the net revenue, when costs of collection are deducted, may be small. The amount of capital (or invested labor) required to build

6/ This is analogous on the "production" side of public goods to indivisibility on the "consumption" side of public goods.

a road is very great relative to the individual's benefit, so collective investment is almost always necessary to create it.

Roads are rarely constructed by private enterprises (unless they have a plantation or mining operation that justifies this financially). Usually roads are built by governments, local or national, with local organizations occasionally assisting with road-building activities where their membership is fairly inclusive and the need for roads is great.

Bridges differ somewhat from roads in that excludability is somewhat greater. Use is more easily monitored and denominated (in terms of crossings) and thus collection is much easier. The capital costs of construction are usually less than for any significant length of road. Except where technical requirements are very high, bridges are suitable to local government or even local organizations. Private bridges are not very common, though private ferries (which serve the same function) are.[7/]

Electricity, in contrast, ranks high on excludability and less high on jointness. Specific amounts of power can be provided and charged for, and only those hooked up to the distribution system can have access, making collection fairly easy.[8/] What may keep electricity infrastructure from being privately provided is the large initial capital cost required, especially if an extensive distribution network must be built.

Often the law restricts electricity generation and/or distribution to public bodies, on the ground that private business should not "profiteer" from what is regarded as a "public utility." It is regulated so that a wider service can be provided than would result from profit-maximizing investment decisions. If the most lucrative service is "creamed off" by private investors, even government agencies might find it financially infeasible to extend service to more marginal areas.

What is important for LID considerations is that rural electrification can be undertaken more readily than other forms of infrastructure by <u>any</u> of the alternative channels. Businesses are well-suited to provide electrical power, possibly subject to some public sector regulation. In the United States, cooperatives have been important

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7/ The main difference is in the amount of capital required. The two components of transport infrastructure cost are <u>structures</u> and the <u>vehicles</u> to use them (section 1.0). Ferries are relatively cheap in that there are no structures needed apart from docks, and most of the cost is in the vehicles.

8/ To be sure, unauthorized "taps" can be made and may be difficult to control or remove. Contrary to expectations, public agencies often find it difficult to collect from all users because of political considerations, whereas private providers can more easily cut off free-riders.

local institutions for rural electrification, having brought power to about 90 percent of American farm families in the two decades after 1935.

Domestic water supply shares the characteristic of excludability with electrical power, and charging for water is physically and economically possible. (Actually, the unit-value of water, except in situations of scarcity, is such that costs of collection may be cut into profit potentials.) Community norms and expectations come into play, however, modifying the relevance of the physical and fiscal features otherwise used to define "public goods." It is often regarded as unethical to charge for water, though private providers in scarcity situations (often persons from outside the community) may sell water, possibly at a high price. Where this occurs, non-private local institutions are likely to invest in facilities to make water more widely available at lower cost.

Jointness is unlikely to be as great with water as with roads, but more than for electricity. This plus the preceding contrasts with electricity suggests why domestic water supply is commonly provided through LA or particularly LG. LOs or co-ops, as in the case of roads, will undertake this responsibility if LA or LG do not, and if their members can agree on the need for meeting such a need. Which institutions can appropriately undertake to provide water often depends on the technical possibilities and economic cost of acquiring and distributing it. The lower the threshold of investment, the more likely membership or private institutions will invest in this infrastructure, and if the cost becomes low enough, water will be secured by household or individual investments in small-scale infrastructure.

This discussion demonstrates how the characteristics of excludability and jointness are important concepts but not neatly deterministic ones for identifying which are "public" goods and which are not, and accordingly, which are more appropriately provided through public sector rather than other institutions.

Ostrom and Ostrom (1977) have delineated four kinds of "goods" according to the feasibility or infeasibility of exclusion, and whether use (or consumption) is joint or not.

Private goods: exclusion feasible, use not joint, e.g. automobiles, haircuts, books, shoes, bread, etc.

Common pool resources: exclusion infeasible, use not joint, e.g. common pasture for grazing, fish in ocean, water pumped from groundwater basin (such resources are the subject of LID analysis in Report No. 2).

Toll goods: exclusion feasible, joint use, e.g., theatres, telephone service, toll roads, electric power, etc.

Public goods: exclusion infeasible, joint use, e.g. peace and security, mosquito abatement, air pollution control, etc.

To some extent all infrastructure by definition presents some jointness of consumption or use. However, excludability is more a continuum than a category, and just because excludability is technically possible does not mean it is economically efficient or socially desirable. Such considerations point to the need to look upon the whole continuum of local institutions as possible channels for rural infrastructure development with some institutional modes more commonly suitable than others for providing certain kinds of infrastructure.

4.0 PHASES OF RURAL INFRASTRUCTURE DEVELOPMENT

The different kinds of infrastructure have in common a set of activities which each have somewhat different local institutional requirements:

** design of facilities and supporting activities;
** their construction;
** their operation, and
** their maintenance.

These are generally conceived as constituting a fixed sequence in infrastructure development, though in practice one finds, for example, maintenance concurrent with operation, and redesign, rehabilitation or repair occurring whenever they are needed. For simplicity's sake, we will discuss these four activities as phases of infrastructure development, recognizing that they do not present themselves so discreetly or sequentially in the real world. Our concern is with the comparative advantage which local or national institutions may have in each phase, and which if any local institutions would seem to have some comparative advantage.

4.1 DESIGN

Design is regarded usually as highly technical process in which local people are not likely to play much of a role. To the extent that the technology involved is quite

complex, this may be true, for example, with installation of a large hydroelectric generating facility or an advanced telecommunications network. Highly-trained staff from national agencies might work with their local technical counterparts (LA) in design (and construction) activities for such cases, but not with other local institutions.

One should not underestimate the technical understanding of at least some rural residents, however, and at least consultation on designs may be appropriate if properly organized through LG or LOs. We know of three documented cases -- in the Philippines, in Nepal and in Mexico -- where farmers told engineers planning dams across rivers reaching high seasonal crests, that the designs being drawn for that location, or the location itself, would not be suitable.

In all three cases, the engineers insisted that their calculations were correct and the designs adequate, and in all three cases the dams washed out (Korten, 1980; Shrestha, 1980; Cernea, 1983). If farmers can be correct about such straightforward "technical" matters as dam design, they may have useful things to say about other kinds of projects. In Peru, the location and design of spring-fed gravity water supply systems being built by CARE was facilitated by local people's knowledge of hydrological conditions contributed through their local institutions (Haratani et al., 1981). The fact that simple technology was used, so that systems were inexpensive to build and required no expenditure on fuel, made them more comprehensible and more attractive to rural residents. The kind and complexity of technology employed in rural infrastructure is itself often a variable with some choices of technology making local involvement in design more feasible and useful.

In the design process there is a danger of overspecification when laying out the projects. Moving into rural areas with fully standardized designs, which may not address the perceived needs of the intended beneficiaries and which will thus not enlist their commitment and resources needed for operation and maintenance, is a recipe for failure. This was seen in a Tunisian rural water supply project where no significant local participation in design (or in implementation, operation or maintenance) was provided for. At the time of evaluation, three-fourths of the systems were not producing potable water as designed (Bigelow and Chiles, 1980).

On the other hand, a basic design may be successful if presented through a process of consultation which enlists active participation in all stages, as seen in the case of the Malawi self-help water supply program. Ultimate responsibility for designs remained with the Department of Community Development but special committees (functionally-specific local organizations) operating under the aegis of traditional chiefs (indigenous

LA) mobilized both managerial talent and local labor (see Annex, pages 36-37). Only when local institutions are quite advanced, with their own technical staff, can full responsibility for design be delegated to them. Such a capacity is reported for some local governments in Brazil, which have taken over design and other functions in connection with a World Bank project for construction of rural roads (Beenhakker et al., 1984).

4.2 CONSTRUCTION

The role of local institutions in construction is affected by the technological requirements of the task. Building infrastructure which is large-scale and complex is not particularly suited to LG or LOs or even to LA. Farm-to-market roads are more readily undertaken by local institutions than are inter-city highways as the former have less exacting standards and can draw on techniques already known by rural people. Any errors in construction or alignment are less serious and more easily corrected. The same would be true of installing a diesel generator for electricity compared to building a large hydroelectric dam. To be sure, the larger and more highly technical infrastructure is also less likely to be of predominant benefit to the rural community where it is located (or passes through), so this consideration also tilts the assignment of infrastructure responsibilities toward regional or national institutions.

In some less-developed nations, where major infrastructure investments remain to be made, such as completing a national road network or setting up an inter-city electricity grid, local institutions may have less substantial roles.

In countries where major infrastructure is already in place, on the other hand, building feeder roads or making extensions of the electricity grid to communities is the order of the day, and this is more suited to local institutions. A countervailing consideration, however, is that where the budgets and personnel of national institutions are preoccupied with large-scale investments, the only way localities and communities will get the smaller-scale transportation, water, power, communication and other infrastructure they need will be through self-help investments. Some modicum of technical assistance to local institutions for establishing such infrastructure should be very cost-effective if the demand from below for new services is great.

When undertaking construction, local institutions and particularly LOs and co-ops can more readily take responsibility to the extent the work can be done on an

incremental basis rather than having to be done all at once. If there is a tight construction schedule that cannot adjust to the peaks and troughs of labor demand in the agricultural sector, local institutions will be hard-pressed to carry out their obligations.

The subsidi desa (village subsidy) program in Indonesia was organized to plan and construct local infrastructure in a decentralized manner through local governments. But unfortunately the disbursement of central funds was often delayed. Money which could only be used productively during the slack agricultural season frequently did not reach the villages in time, which greatly hampered the pace and extent of construction (Prabowo, 1973; see Annex, pages 39-40).

We found a more productive approach to working with local institutions in Nepal, with the Chinese-aided construction of a highway from Kathmandu to Pokhara. Though this was a major national infrastructure project, much of the work was broken into small tasks which local organizations, even informal traditional groups, could do on contract. The minimum size of contract was 25,000 rupees, compared with 250,000 rupees minimum for most other donor-assisted highway projects.[9/] What could have been viewed by villagers as an "alien" public works project became a "local" project. Moreover, capability for doing maintenance and repairs was created if the government chose to utilize it. That this highway was completed ahead of schedule (unlike most in Nepal) and is one of the best in technical terms (CEDA, 1973) indicates that this method of disaggregating and delegating construction to local groups need not be slower or substandard.

To the extent that construction relies on local materials and familiar technologies, the role of local government, private enterprises and other local institutions can be greater. The staff of local administration can more easily have access to government resources and personnel, though local contractors can also tap expertise and technology from outside the locality.

In favor of the local alternatives is the finding of Imboden (1977) in his study of rural drinking water projects that those using local materials and skills, rather than

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9/ The methodology of construction differed in many ways from the standard approach. Rather than hire individuals paid daily wages as members of amorphous labor gangs, payment was made to community groups on a piece-rate basis according to a contract negotiated in advance. Payment was made in public to minimize anybody extorting "commissions" from workers. There was one supervisor for every two kilometers rather than one for every seven or eight as on other projects, so technical advice was easily available. Supervisors spent most of their time walking on foot rather than riding in vehicles, to be more accessible.

imported ones, have a greater chance of success measured in number of persons served, percent of schemes actually operating, extent of breakdowns, and nature and use of the facilities. Experience in Peru supports this with the observation that: "Imported materials tend to become the limiting element in development projects and produce rigidities in project design and implementation" (Haratani et al., 1981).

One of the reasons for the success of the remarkable bridge building in Baglung district of Nepal was the use of local materials and techniques. Within four years 62 bridges, some as long as 300 feet, were built by local committees, much more quickly than the government could have done and costing as little as one-eighth of what the government would have spent (Pradhan, 1980).

Masons were enlisted to construct bridgeheads of traditional rockwork rather than rely on costly and scarce cement. Blacksmiths used their indigenous techniques for forging connecting rods. If any broke, they could be easily replaced. Yet it should be noted that the construction technology was made feasible by the government's contribution of steel cables, which were much superior to any local materials. This example indicates the kind of local capacity for infrastructure construction which may be enlisted through organizations like the Baglung bridge committees (see Annex, page 32).[10/] Similar abilities were shown through the self-help water supply committees in Malawi (Annex, pages 00-00).

4.3 OPERATION

The tasks of operation and maintenance are not the same, though they are usually grouped together -- as "O&M" -- in thought and practice. We will focus on operation in this section, though some references to maintenance will be appropriate here. The latter will receive separate consideration in the following section. O&M tasks are often conceded by central government agencies to be "suited" to local institutions and are

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10/ We refer to these committees as "organizations" rather than "institutions" because they have not continued in existence. Although there were plans eventually to construct again as many bridges, once these priority bridges were finished, the push behind this program dissipated. We do not know whether the bridges have continued to be adequately maintained by local effort. This would be a good test of the proposition that local participation in planning and construction leads to better maintenance. The village panchayats (LG) which acted as sponsors of the committees and which are to some extent "institutions" should be able to carry out maintenance as needed.

even often made local responsibilities whether or not such institutions have the needed financial base and personnel.

Such delegation is done partly in recognition of the great limitations which central agencies have in staffing and supervising activities in a great number of dispersed locations. Keeping roads and bridges in repair, combating impurities in village water supply systems, and keeping diesel generators in working condition and operating, are commonly recognized as difficult tasks for any institutions, national or local, working in rural areas.

The central government attitude is also motivated partly by a desire to get rural communities to take responsibility for recurrent costs, which are increasingly a burden on national budgets. So there is not as much reluctance at the center to have operation (and maintenance) handled by locals as to share design and construction tasks with them.

It must be said, however, that one of the literature's most frequent conclusions (e.g., World Bank, 1975) is that the extent of willingness and ability of local institutions to discharge O&M responsibilities depends in large part on their having been involved in design and construction activities. So the idea of simply "handing over" responsibility to local institutions, as in a "turnkey project," is not very promising.

For operation, as well as maintenance, local government may have some advantages over LOs and co-ops because of the nature of the task. The latter as membership organizations are often better at episodic activity in response to definitely felt needs than at routine efforts day-in, day-out. A more professionalized or bureaucratic capacity is needed for tasks like O&M. On the other hand, if the activity is valued enough by members, they can arrange to carry it out, often by hiring persons to act on their behalf. This is common in traditional irrigation systems as noted above (see footnote 3) and can be done under contemporary leadership as need arises.[11/]

11/ Wade (1982) describes how two Indian villages not getting enough water for their crops from the main irrigation system formed an organization to operate and maintain their portion of the command area. To distribute all available water fairly and to patrol upstream channels to be sure members would get as much water as they were legally entitled to, the organization hired several dozen water guards (at twice the minimum agricultural wage). All members were charged a set fee (100 rupees) per acre, and there was a surcharge to form a contingency fund for bribing officials if water supply was threatened. Significantly, one of these villages had long been riven by extreme factionalism. But it was agreed the disputes within either village would be referred to the headman of the other village for arbitration. Such institutional innovation was prompted by the need for water.

To the extent that operation (or maintenance) is a solitary rather than a collective activity, "free-riding" may be more common. Any absence from work groups or any unsatisfactory level of effort is fairly visible and easy to control when the whole community is involved. Various requirements or penalties can be imposed to discourage free-riding.12/ Many operation (and maintenance) activities, on the other hand, are of a different sort. It is difficult, for example, to get members of a co-op to check regularly to see that the drains under a road are clear, so that water does not back up and overflow the road, and damage it. If this is everybody's responsibility it is likely to be nobody's. As a rule, one can say that membership organizations are less likely than LA or LG to handle O&M activities effectively, even if national governments might welcome such organizations' assumption of responsibility.

Actually, the critical variable appears to be how much the community understands and values the benefits provided by the infrastructure in question. This is why local participation in design and construction is important, first in ensuring that the infrastructure is needed and supported, and second in giving people a sense of ownership and responsibility for the facility (Coward, 1983). In Nepal, one can find quite sophisticated membership organizations operating and maintaining irrigation systems in the mountains (Martin and Yoder, 1983), and in the Philippines, the zanjera have carried out extensive O&M responsibilities (in addition to design and construction) for many years (Siy, 1982). In Honduras, we also find a case where agricultural cooperatives have done a good job of maintaining access roads in their areas (Hamilton et al., 1981).

In this last example, members depend on the roads for sale of the crops they produce. Thus as in the other cases noted, members can see evident payoffs from good operation and maintenance. Also there are no other good alternatives to local management of infrastructure. National institutions are not effective at this local level, so people know that if they do not handle O&M, nobody else will. The central government could take over these responsibilities, and with enough expenditure it might discharge them better. But when resources are limited, one seeks to optimize, not maximize performance. The principle of comparative advantage proposes that all

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12/ The zanjera in the Philippines have strict and regular attendance checks during work sessions, with specified fines set for absences or delinquencies (Siy, 1982:49-52). For cleaning and repairing channels in a community irrigation system in northern Thailand, a careful system of supervision and control is used. Identification cards are given out to all group members at the beginning of the day and collected at the end of the day to check who has completed his share of the work (Ayutthaya, 1979).

parties concentrate on doing what they can do best, in order to create the greatest total benefit. Central government operation of infrastructure facilities at the local level seldom uses scarce financial and management resources to best advantage.

4.4 MAINTENANCE

A number of the considerations affecting local institutions' role in maintenance are similar to (and have been discussed with reference to) those for construction. However, some factors bearing on maintenance deserve separate discussion. Maintenance ranges from continuous (routine) activities, to periodic (ad hoc or planned) ones. The former are often undertaken as "preventive maintenance" which is important but commonly neglected.[13/] The latter may involve repair, rehabilitation or, if the deterioration is substantial, reconstruction.[14/]

Some kinds of infrastructure, such as water supply, electricity and bridges, need fairly continuous attention because any failures disrupt the working of the system and its provision of a crucial good or service. Other kinds, like roads and irrigation systems, are more subject to gradual deterioration and thus more amenable to periodic maintenance. Those infrastructures tending to need routine servicing need a larger role for whatever institutions, national or local, can provide this.

Three conditions appear to govern how well institutions of any kind will carry out maintenance responsibilities, ranging from preventive maintenance to repair: (a) how perceptible is the deterioration of function and the need for restoring or preserving adequate service: (b) how clearly is responsibility fixed for dealing with deterioration; and (c) how empowered are those affected by the deterioration. We can contrast roads and rural electricity supply in these regards, with bridges and electricity supply falling in between on the several continuua.

Road deterioration is usually quite incremental, compared to interruption or reduction of electricity supply. Reductions or fluctuations in the latter damage vehicles. Moreover, vehicles can still usually operate on a deteriorated road, whereas refrigerators or lights stop when electricity is cut off.

13/ Preventive maintenance is a problem for all kinds of institutions. A UNICEF study (1982) suggests that the lack of preventive maintenance is the major cause of failure of water supply systems in LDCs.

14/ Rehabilitation of irrigation systems is increasingly being regarded as "deferred maintenance."

Responsibility for a road may rest with a highway or public works department, but maintenance delays can be blamed on different people at different levels. When an electricity generator fails, responsibility is more easily pinned on one person, the supervising engineer or technician, as the problem comes down to usually a single piece of equipment.

Further, it is likely that the persons served by electricity are on the average more influential than those using a road (unless it happens to be a thoroughfare used frequently by a cabinet minister or other high official). If businessmen find their equipment stopped or damaged by a power failure, they are in a better position than are road users as a rule to demand quick repair or to penalize the person who let this happen.

If the need for maintenance is easily measured or specified, if responsibility can be fixed on one person or a few persons, and if those inconvenienced or injured by the lack of maintenance are influential, it is more likely that local institutions can be charged with maintenance responsibilities. This is not to say that national institutions handle such tasks well when it is hard to show precise maintenance needs, when responsibility is diffused or when the persons affected are politically weak.

Bureaucratic norms and structures are not notoriously good at overcoming ambiguity and inertia. But local institutions are more likely to default on maintenance responsibilities when they are faced with such situations. One compensating consideration is that when infrastructure deteriorates, those most directly affected by this are better able to report on it and make demands for maintenance or repair if the institution responsible for improvement is local.

It would be convenient if we could report from the literature that local institutions are ideally suited to carry out maintenance activities. Unfortunately, the record on maintenance is quite unsatisfactory for all institutions, national as well as local. A key factor governing how well local institutions -- LA, LG, LOs or private enterprises -- can discharge maintenance responsibilities is the intensity of demand for the benefits of the particular infrastructure. As with the examples given above from local operation of irrigation systems, if the services of infrastructure are quite salient to local users, they can usually find ways to make one or more local institutions manage maintenance functions effectively.

5.0 USER CHARACTERISTICS

Whether local institutions have a comparative advantage in infrastructure development, and which kinds of institutions if any may be more appropriate, will depend not only on the phase of infrastructure development being tackled, but on the people concerned, their incentives and characteristics. The literature is not very specific or systematic on these questions, but some conclusions can abe drawn from experience so far.

5.1 BENEFITS

Unless it is clear that rural residents derive recognizable benefit from the infrastructure in question, assigning local institutions a role in its creation and maintenance is not particularly advisable. Comparing a national trunk highway with farm-to-market roads, for example, it is clear that quite apart from any differences in the technical expertise and material investment involved, local institutions should be more willing as well as able to assume various responsibilities for the latter.

Which local institutions might best be responsible also depends on the benefits which people can derive from the infrastructure. If its operation can be made profitable, private businesses are possible channels for infrastructure development. Since the benefits of infrastructure tend to be indivisible or non-excludable, as just discussed, this works against using private for-profit institutional channels. Local service organizations may be feasible, though they tend to be involved more often in community facilities like market stalls, libraries or recreation fields, than in the kind of infrastructure considered here.

Membership organizations and co-ops cannot effectively manage infrastructure unless its operation is crucial to their performance, e.g., feeder roads for marketing agricultural produce or piped water supply to free up members' labor for more productive activities. If everyone does not have a perceived stake (or an equal stake) in the infrastructure, local responsibility is more likely to be effective if given to LG or LA, which can draw on their authority to mobilize resources or regulate behavior. Even where such authority exists formally, for it to be effective there must be sufficient general appreciation of the infrastructure on the part of the public to sustain ongoing local responsibility. If such appreciation is lacking, responsibility for the infrastructure is better vested at higher levels.

This factor of "benefit" is well illustrated with regard to domestic water supply. While water is needed by the whole community, women in particular are most engaged in drawing and carrying water when no convenient source is available.15/ The intensity of their involvement in water activities means that water development through local institutions is more feasible so long as women have an active role in those institutions, whether local government, membership organizations or whatever. An experiment in Angola found a decrease in breakdowns and repair time for village water supply sytems when women were involved in their maintenance and repair (FAO, 1983). Similarly, an AID study in Peru concluded that it was particularly important to garner the support and cooperation of women in local institutions they are the most direct beneficiaries of water projects (Haratani, et al., 1981). Who is participating actively in local institutions will affect how well these can carry out infrastructure tasks.

5.2 COMMUNITY NEED

It could be argued that local responsibilities for investment and management are likely to be performed better where the communities are more advanced in terms of economic development and education. While having a larger pool of economic resources and trained personnel to draw from is an advantage, it also apears that there are offsetting factors in less advanced communities to the extent that infrastructure facilities are more needed there.

An analysis of water supply experience cross-nationally concluded that villages chosen according to criteria of greatest need (a "worst-first" strategy) have no less chance of success than ones chosen on the basis of evident material and personnel capacities to install and maintain facilities (Imboden, 1977).

An evaluation of an AID-supported water supply project in Tunisia found that community participation was "greatest in the driest area, Kairouan, where the need for water is most critical" (Bigelow and Chles, 1980:9). The government had installed pumps without providing for fuel to operate them, so users themselves set up local organizations to collect fees to cover costs of fuel supply and maintenance. But this is not to say that local organizations would emerge in all such cases or that this is a preferred method of operation for outside agencies.

15/ One FAO study (1983) estimates that in Africa, women contribute 90 percent of the hours devoted to procuring water.

A comparative study of patterns of investment in 54 villages in Thailand found a negative correlation between level of economic development and extent of community action to create community facilities (AIR, 1973). This is not surprising once one considers the circumstances. The more advanced communities already had most of the basic infrastructure needed, and resources were accordingly invested in creating private rather than public goods. The relevant implication for our analysis is that the less advanced communities were able and willing to mobilize resources for infrastructure and other common investments.

One might argue that local institutional development for rural infrastructure would be more likely to succeed where the need for common facilities was greatest. But this would be restating the converse of Say's law that "supply creates its own demand." We would not say that demand necessarily creates its own supply. Rather we are satisfied to note that there does not seem to be a comparative advantage for infrastructure LID where economic and educational conditions are more advanced. The factor of need can countervail the greater sufficiency of resources.16/

5.3 HOMOGENEITY

One of the concerns often raised in opposition to devolving responsibility for rural development to local institutions is that the burdens and benefits will not be fairly shared. Unless there is relative homogeneity within a community, local elites can monopolize benefits for themselves and impose costs on others.17/ Since socio-economic heterogeneity is the rule rather than the exception, this would suggest not developing rural infrastructure through local institutions, at least not if one is concerned with equitable outcomes.

16/ In our systematic analysis of performance by 150 local organizations worldwide, not analyzing performance in creating and maintaining rural infrastructure by itself because the number of relevant cases was too small for statistical treatment, we found that LO performance was not necessarily higher with higher levels of per capita income and literacy (Esman and Uphoff, 1984). Our review of literature for this LID analysis did not produce evidence contradicting that finding.

17/ A study of an AID-supported water project in Ethiopia found that not only did the rural poor contribute most of the labor to dig the trenches and lay the pipe, but once it was finished they had to pay for water which they had previously gotten elsewhere free. The new water supply was cleaner and more convenient but the out-of-pocket costs were a real burden on the poor (Uphoff, Cohen and Goldsmith, 1979:274).

In his study of rural works in Bangladesh, Garzon says that the local labor requirement there had the regressive effect of taxing the poor for projects that may

There are measures that can be taken to reduce the biasing effects of stratification on infrastructure provided through local institutions. Rural electrification projects in Ecuador which emphasized forward linkages to agricultural processing and non-agricultural enterprises generated employment for the poorer sections of the communities whereas parallel projects in the Philippines which promoted household connections did not have this effect (Tendler, 1979). Electrification projects in Bolivia some years later included a credit component which enabled poorer households to hook up to the new systems. This would have been impossible without a loan to pay the connection charge. Such a provision also kept the benefits of the infrastructure from being monopolized.

One way in which local elites commonly gain at the expense of non-elites is by cutting back on the quantity of benefits produced in order to increase their quality. If project design can curtail such revisions, the effects of stratification can be reduced (Leonard, 1982). It is interesting to note current thinking about rural water supply which concludes that public health as well as other benefits are greater simply by insuring a larger quantity of water to households without extreme regard for quality.18/

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not even have benefited them. "Under the conditions of inequality, 'voluntary' labor is in fact usually forced, and produces only alienation and even subversion" (1981:18-19).

The bias in LG expenditure patterns when rural elites are in control can be seen from a study in Nepal, where all household heads in Budhbare panchayat (locality) were interviewed. The actual expenditures clearly reflected landlord rather than tenant priorities.

	Tenants	Landlords	Expenditure
Irrigation	58%	33%	8%
Road & transportation	31	41	50
Education	6	18	28
Health	3	7	10
Administration	-	-	10

Tenants wanted more irrigation as it would increase employment, whereas large landowners already had their land irrigated. Roads would benefit the latter relatively more (Sainju, et al., 1973:72, 86).

18/ Recent studies such as USAID (1980) have shown that even if water quality is achieved at source, the chances of contamination in carrying and storage containers are such that purity cannot be maintained in most rural households. On the other hand simply having a convenient and large volume of water increases the washing of hands, clothes, food and utensils which makes a direct contribution to health. Usually, the more effort that goes into water quality, the less is the quantity reaching households.

To the extent that quantity is more important than quality, relevant infrastructure is more feasible for local institutional agents to manage. This is not only because elite diversion of benefits may be less, but because less exacting standards may be applied. Where heterogeneity is a major problem it appears that service organizations dedicated to serving the poor will be more effective than local government or cooperatives.

"Alternative organizations," homogeneous membership organizations made up from poorer sections of the community (Leonard, 1982), could in principle provide infrastructure services for members, but in practice we seldom find them doing so. The capital costs are usually substantial and the benefits tend to be indivisible or non-excludable, as we know. So this kind of "private" provision of infrastructure makes little sense unless it is small-scale as with a tubewell for drinking water, not a road or bridge or electrical distribution system.19/ Although there is the risk that local government will be dominated by elite groups in heterogeneous communities, it remains the most often promising channel for rural infrastructure development. Where heterogeneity makes distortion of benefits easier, LID efforts should proceed with knowledge of this danger and seek to promote LG accountability to all sections of the community.20/

6.0 IMPLEMENTATION PROCESS

While some major rural infrastructure can be developed directly by national institutions, creating and maintaining a thorough and adequate network of roads, bridges, water and electricity supply, communication, and community facilities in rural areas requires a similar network of local institutions. Which institutions are most

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19/ In her study of Bolivian cooperatives, Tendler (1983) found instances where co-ops in relatively heterogeneous environments engaged in some rural infrastructure creation that benefited most of the community. So one should not rule out this possibility.

20/ Some methods for controlling financial abuses or leadership domination have been discussed in Esman and Uphoff (1984: Ch. 7).

appropriate for which kinds of infrastructure will vary according to the kind of considerations discussed already. Our main conclusion is that a mix of public, private and voluntary institutions is to be sought, rather than assign responsibility to just one channel for each activity.

Establishing rural infrastructure thus should go hand in hand with creating or strengthening local institutions to build and manage the infrastructure. Local knowledge and resources are important for the design and construction phases just as local inputs and commitment are needed for operation and maintenance. The alternative of centrally operated and maintained infrastructure can apply at most to core infrastructure like trunk highways and hydroelectric generation. Given the growing "fiscal crisis" in developing countries, preserving, let alone extending, infrastructure networks will be possible only if localities, communities and groups accept increased responsibility.

It is beyond our scope and competence to formulate strategies of infrastructure development for LDCs, but we have considered LID strategies which would support such development. We would emphasize that how such development is undertaken conditions the chances of success in getting sustained benefits from infrastructure in rural areas.

Decentralization of responsibility is a first condition, as local institutions cannot be expected to take root and thrive unless they have both tasks to perform and matching powers to carry out those tasks. This subject is discussed more generally in the concluding report in this LID series, but we note it here because it is so essential for rural infrastructure development.

Central government policy is important in this regard. In the case of rural electrification, for example, the Philippine government has limited its own role to power generation, leaving institutional "space" for local governments, cooperatives and private enterprises to engage in electricity distribution. Some Latin American countries, on the other hand, have passed laws restricting distribution to central government agencies. Just recently, the Indian government being faced with severe power shortages in rural areas has lifted its ban on the private sale of electricity. (Companies could generate electricity for themselves if they did not want to depend on the state power grid but they could not sell any surplus.) This shift in policy should permit the development of various local institutions, particularly private, for spreading the benefits of electrification.

There is a view in many LDCs that only the state can provide public utilities efficiently and fairly. But this is not supported by the evidence. One of the few

systematic evaluations of the consequences of devolving responsiblity for rural electrification to local bodies in the Indian state of Rajasthan has been done by Hadden (1974). When authority for deciding which villages would be hooked up to the state grid was devloved from the state electricity board to panchayats, the board's own criteria of productivity and efficiency standards were somewhat better met, and illegitimate influence by politicians was reduced (see Annex, pages 33-34).

Decentralization is certainly open to abuses and inefficiencies, but central institutions are at least as vulnerable, often on a grander scale. Corrupt practices can be more easily covered up from superiors, who seldom get to the field, than from persons "on the ground" who live with the consequences of malfeasance or mistakes. Where local institutions are empowered to take action against misconduct, the chances of getting proper performance are increased. If local institutions are made responsible for decisions and operations it is clear that they too can benefit from some oversight at higher levels. This can serve to reduce temptations for misusing positions of trust. Hence, decentralization does not imply complete abrogation of responsibility to local institutions.

It is sometimes objected that a decentralized approach will affect the speed of implementation, as less technically-competent persons are involved and more persons' concurrence must be gained. In fact, the pace of implementation through central institutions is usually quite slow for rural infrastructure, given bottlenecks of personnel and decision-making. The worst situation is to have nominal decentralization, with approval of design, expenditure, staff assignments, etc. still retained at the center.

If a reasonable degree of effective decentralization can be provided, there is no reason why the pace of work cannot be brisk. The Basic Village Services project in Egypt supported by USAID was designed to provide funds to local councils for improving water supply, roads, sewerage, etc. It was feared that this would be a slow-moving project because 480 local governments (of the country's 869) would be involved. In fact, the rate of work and fund disbursement have been so satisfactory that this is one of the few projects in Egypt to exceed its implementation schedule, disbursing over $200 million in three years for rural infrastructure (see Annex, page 38).

This project has been implemented, it should be stressed, in many disaggregated increments. One requirement for decentralized planning and management of rurai infrastructure is that the size of tasks be kept manageable at the local level. This does not mean that the amount of investment is small. A larger number of smaller undertakings can match in scale a few large ones, and will have better distributional

effects. The inclination of donors to "move money" in large chunks can be quite disruptive of local institutional development as seen in the case of the Provincial Development Administration Project in the Philippines. This USAID-supported project with some difficulty developed decentralized capacity for planning, constructing and maintaining rural roads, but was undermined by another donor's project which overtaxed the capacity of the local institutions.

The scale of program which can be supported through local institutions needs to be determined experimentally. This is one of the principles of a "learning process" approach to development which has been formulated by Korten (1980). Though his examples were not taken from this activity area, the concepts are equally applicable to infrastructure.

One of the most instructive current efforts to develop infrastructure, particularly sewerage, for the peri-urban poor if not exactly the rural poor, is found in Pakistan with the Orangi Pilot Project. This project, directed by Akhter Hameed Khan who pioneered the participatory rural development work at Comilla (Raper, 1970), applies a "learning process" approach quite explicitly (though it started before Korten's article appeared). By experimentation which included some false starts and failures, the project has been abel to develop technical and organizational methodologies that permit construction of sanitation facilities at 25 percent of the government's cost. As important, the people benefited are willing and able to cover all capital and maintenance costs themselves (see Annex, page 39).

National programs which evolve with appropriate experimentation such as the Malawi self-help water scheme can indeed reach large numbers of people at low cost once appropriate technical and organizational strategies have been devised. The Malawi scheme has in ten year's time brought permanent piped water to over 400,000 persons in rural areas at a cost of about $4 per person (see Annex, pages 36-37). The subsidi desa program in Indonesia has also had a significant impact on rural infrastructure though it has probably not been as efficient in the use of resources.

When considering local institutional development for rural infrastructure, it should be kept in mind that the allocation of responsibilities may shift over time. In the case of rural electrification, for instance, cooperatives may often be appropriate in the first stages where autogeneration from diesel generators is involved, however once the distribution networks are linked to a regional grid, the co-ops may be much less viable. That a particular institution's functions might diminish is not in itself undesirable, as a

local agency of government could be more effective and efficient in managing this form of infrastructure once the system develops beyond scattered local generation points.

Similarly, local governments which undertake road construction may at some point reasonably hand over maintenance responsibilities to the local division of the public works ministry if the latter has equipment and staff that can do the work more reliably and efficiently. Conversely, roads built by a public works ministry might be turned over to local governments for maintenance if the latter have been helped to develop appropriate capacities. Such responsibilities should not be shifted by decisions at higher levels without consulting the local institutions concerned. This can cause confusion and lead to poor performance, as happened with rural water supply in Kenya (Tiffen, 1983). To the extent possible, changes should proceed experimentally, in increments and in manageable geographic areas, to build experience which informs and directs subsequent policy.

Local institutional development for rural infrastructure has "phases" that parallel the development of infrastructure itself: design, establishment, operation and maintenance. One does not exactly "build" human institutions like local government or user associations. The appropriate metaphor may be more biological than mechanical, refering to "planting" and "nurturing" in the early stages, realizing that there are bound to be spurts of growth and, possibly, periods of drought.

The essential point, suggested at the beginning of this section, is that the infrastructure not be conceived and created independently of the institutions, national or local, that will be responsible for the different stages -- particularly the continuing ones of O&M. Previously, concerns with infrastructure focused mostly on its inadequacy in terms of quantity. As the amount has gradually increased, attention is shifting to quality, especially when the deterioration of much infrastructure for lack of central capacity and motivation becomes more evident.

In introducing the subject of local institutional development in the first report, we cited the example of water supply as an area where experts had documented that local institutions were critical for utilization and maintenance, yet those institutions were considered only in passing. We expect that with the kind of attention now being focused on the subject, local institutional development for rural infrastructure will receive greater priority in the planning and investment of national governments and donor agencies.

ANNEX

To share with readers some of the most instructive LID experiences that we found in our review of the literature, we are presenting in these annexes some capsule descriptions of such experience, positive and negative. Readers are referred to the cited sources for fuller details.

ROADS AND BRIDGES

COLOMBIA: Pick and Shovel Rural Roads Project

This Small Farmer Market Access Project, more commonly known as Pico y Pala (Pick and Shovel) signifying its labor-intensive construction, began in 1970. It undertook to build more than 50 all-weather unpaved mountain roads averaging five miles in length. Most of the work was done by small farmers and landless rural laborers under the direction of a Colombian government agency, Caminos Vecinales (CV), a semi-autonomous agency under the Ministry of Public Works.

An evaluation in 1979 found that there were already tangible economic improvements, as transportation costs had been dramatically reduced, resulting in better prices for agricultural produce, more varied products and improved farming practices. (The agricultural extension system (LA) had not been strengthened at the time of evaluation to support and accelerate these changes, however.) There were improvements also in access to health services.

Applications for roads were received from informal village organizations, Juntas de Accion Communal, which also organized the construction work. So the extent of participation in planning and implementation was impressive. However, maintenance was lagging behind, because the resources allocated to it in the state's highway department maintenance budget were meager. The evaluation report states:

> We were told by CV personnel that the communities that participated in the building of the Pico y Pala roads will maintain them to the best of their abilities. The team did, in fact, observe several instances of campesinos working without pay (at the request of their leaders) to clear landslides, and we accept the fact that campesinos can and will clear their roads whenever possible. The system breaks down, however, when the nature and extent of the damage exceeds the campesinos' physical resources.
>
> In practice, communities have in such cases sought and obtained help wherever they could get it -- from CV, the state and national highway departments, and from the Federation of Coffee Growers. Such assistance is, however, ad hoc; no reliable mechanism exists through which major maintenance can be undertaken. The problem of preventive maintenance also persists. On only one of the roads visited had farmers kept the drainage ditches clear of growth and debris. (Elsewhere) it

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is only a matter of time before the water rediscovers that the shortest way downhill is across the road surface." (van Raalte et al., 1979:12)

LESSONS: The potential for activating such local organization is substantial in this kind of project where there is a great need and demand for transportation facilities. The project itself has serious limitations for lack of local institutional development, however. Responsibility for major maintenance was not established as the national government had not allocated adequate funds, and no mechanisms for communities to raise funds had been established. No institutionalized linkages had been developed between communities and the Ministry of Public Works to get assistance to deal with major landslides. The project was scheduled to end in 1981 in spite of impressive accomplishments, because CV had failed to build support for its work among Colombian officials. Since the program was very popular in the communities it served, various local organizations could have provided a better base of support for CV if LID had been stronger and more closely associated with the project.

NEPAL: Baglung District Bridge Program

In the mountainous Baglung district of Nepal, where most paths between villages are made difficult by steep ravines and by rivers that become dangerous during the rainy season, one of the leaders in the district panchayat got the idea for a self-help bridge program. All villages were invited to submit requests through their panchayat for assistance to build needed bridges. Whether their request would receive priority depended on its justification in terms of travel time saved, increased safety and promises of local labor and materials to carry out the project.

The district panchayat sponsored the program and gave some modest funding. The central government's Local Development Department contributed steel cables, which would make the bridges stronger and more permanent and which are difficult to obtain in the hills. Villages had to mobilize labor to carry the cables many miles from the nearest road to the building site.

The project relied otherwise on local technology and materials. Masons were enlisted to build the bridgeheads with traditional rockwork instead of using cement, which is costly and difficult to transport. Blacksmiths made connecting rods in their own forges, and villagers provided the unpaid labor for gathering rock, cutting boards and putting up the bridge.

All work was done under the direction of bridge construction committees set up under the aegis of their Village Panchayats (LG). Within four years, 62 bridges had been built, some as long as 300 feet in length. They were put up in much less time than it would have taken the government, and their coat was as little as one-quarter what it would have cost the government to build them.

LESSONS: The combination of a membership organization working in conjunction with the local government observed here has been effective in a number of other successful programs also. Reliance on local technology and materials was crucial for the communities' being able to take responsibility for planning and construction. The amount of outside assistance was limited, but was of critical importance because the strength of the cable was an incentive for local efforts to put up a permanent bridge. Because the amount of actual cash handled was small, there were fewer opportunities for corruption and disaffection with the program on that basis.

MEXICO: PIDER Rural Development Program

The Integrated Rural Development Program Known as Pider found in its first evaluation that probably its most successful component was the building of rural roads with community organization and participation. This increased the road network in the project area from 25,000 to 100,000 kilometers in six years.

A special office within the Ministry of Works, a Directorate of Labor-Intensive Roads (Direccion de Caminos de Mano de Obra, DCMO), was assigned responsibility for construction. Since it had little heavy road-building equipment meeting construction targets was dependent on labor contributions from communities. These were represented by Road Committees, which would not agree to provide labor unless they were satisfied that the proposed road would be worth their effort.

According to a World Bank report, "the success of the local level committees for the labor-intensive rural road construction program suggests that an organizational structure at the local level can be established and can facilitate the execution and operation of the program." (Cernea, 1979:70)

LESSONS: The fact that the government agency was dependent on the communities for achieving its bureaucratic goals meant that it had to work in a cooperative, non-authoritarian manner. The communities responded positively through their local organizations to support the program of rural road building when given a voice in determining what would be built where, when and how. Linkage between the local unit of administration (LA) and membership organizations proved mutually beneficial.

RURAL ELECTRIFICATION

INDIA: Rajasthan State Decentralization of Electrification

Only about 2 percent of Rajasthan's villages could be hooked up in any one year to the state electricity board's grid given existing budget constraints. Prior to 1969, all decisions about which villages would be connected were made by board personnel. The criteria were to be potential for increased production (indicated by the presence of groundwater which could be pumped for irrigating agriculture), and investment efficiency (proximity to the grid, so the cost of connecting a village would be minimized).

In the only systematic and quantitative analysis we have found of the consequences of decentralization, Hadden (1974) found that when village and district panchayats were involved in determining which communities best met these criteria, the productivity and efficiency standards were more often met than when decisions were made bureaucratically by the board. Administrative decision processes were less open to public scrutiny and thus more vulnerable to unwarranted political intervention. When all applicants for connections were publicly listed and assessed there was better adherence to objective criteria.

LESSONS: Contrary to common thinking, political interference and corruption may be less with devolution of responsibility to lower levels of decision-making. Resources can be used more productively and efficiently in a decentralized system, because people with knowledge of the real conditions on the ground are able to voice this in decision processes, to which they have access in a decentralized mode. Such decentralization does not occur "without strings." Because of policy concerns, the government sets criteria to be followed in awarding connections and the locality can apply them better than higher level bureaucrats.

BOLIVIA: Rural Electrification

Under a $29.5 million project initiated in 1973 and financed primarily by USAID, seven rural electricity systems were constructed in six of Bolivia's nine departments (provinces). The national parastatal corporation was to generate electricity, which would be distributed through separate grids operated in each department. Five of the new rural systems were connected up to existing municipal systems in departmental capitals; the other two were laid out to be exclusively rural.

Providing light to poor households was the primary objective of the program, though it was hoped that small rural producers would be encouraged to invest in new enterprise by having 24-hour electrical service available from the large central system which was relied on rather than having smaller, dispersed generating plants, which would have been under local control. This hope was not generally realized.

The design of the systems themselves was not well thought out because the municipal organizations which were to be responsible for distribution had no input to the design. Foreign consultants with a construction orientation and little concern for how the system would be operated did all the design work. Many potential hookups were overlooked in the design, as the planners were satisfied with outdated information. Inaccurate predictions were made of household usage. Much of the system was overdesigned and too expensive, being built to standards that would have been rejected if there had been consideration of repayment capacity based on expected revenue.

LESSONS: An evaluation by Tendler (1980) concluded that the institutional arrangement had some redistributive effects. By serving both urban and rural consumers and charging both the same rates, even though the unit cost of supplying electricity to the latter was 3-4 times greater than in market towns, the systems made power more accessible to poorer areas.

In designing the project, however, many opportunities for a more efficient system were overlooked because local institutions which were to have O&M responsibility were not involved. This led to major shortcomings in the project as described above. Moreover, the design consultants overlooked possibilities for fostering forward-linkages by working with or promoting organizations that could contribute to the secondary but important objective of increasing economic activity through electrification. Small farmer groups in the Cochabamba area, as Tendler notes, "had been quite capable of forming informal organizations for obtaining and managing pump-irrigation systems, and of contributing financially to the undertaking." (1980:26-27) If such organizations had been formed (which Tendler says are "compatible with traditions of intra-community cooperation among Bolivian peasants"), the objective of promoting productive use of electricity could have been furthered.

ECUADOR: Rural Electrification

Between 1964 and 1976, two cooperatives and six private companies operating on a regional basis were assisted under three USAID loans totaling $5.6 million. Although USAID initially emphasized the cooperative model of organization, it gave responsibility for establishing cooperatives to the National Electricity Institute (INECEL), an agency opposed to cooperativization.

One of the cooperatives was dissolved after its distribution system was connected to that of a major city, Guayaquil. The remaining co-op survived because it was in a frontier area and had been formed by local businessmen and agricultural colonists during the early 1960s when INECEL was a fledgling organization. It retained the support of local commercial, industrial and agricultural interests, though only a small minority of members attend annual cooperative meetings.

In contrast to the Bolivian systems discussed above which emphasized rural electrification as such, the programs in Ecuador were designed to serve primarily the market towns. Electrification made major contributions to the development of agro-centers. Although the projects were not aimed at benefiting the poor, increased access to employment, income, agro-processing facilities and some social services produced definite benefits. Furthermore, rate structures and surcharges on industrial users provided modest income transfers from urban to rural areas. (Kessler et al., 1981).1/

LESSONS: Under favorable conditions, private enterprises can take root and provide a spread of benefits as seen from the growth of productive activity in the market towns once electricity was available. The institutional channel for distributing electricity could be either private or cooperative, as there was no evidence that either was more effective than the other.

When it comes to promoting cooperative forms of local institutional development through a national agency, its orientation is understandably crucial. It can discourage and spur the demise of co-ops by its action or indifference, though we also see in this case that where a cooperative has a strong local base of support, it may be able to resist even bureaucratic opposition. Several of the private companies had been conceived as cooperatives but were implemented as private enterprises to avoid problems with INECEL.

1/ It should be stated that the extent of benefits depended heavily on a huge subsidization by the government (approximately two-thirds) of the price of diesel used to generate electricity. This was possible because the government was itself producing and exporting petroleum. But the resources forgone through this policy might have been used more productively. Arguments to justify the subsidy in the name of helping the poor are weakened by the fact that the poor were not the principal beneficiaries of the subsidy.

DOMESTIC WATER SUPPLY

MALAWI: Community Self-Help Water Program

This impressive rural infrastructure program is one which has in ten years' time laid 900 miles of piping to serve 2,000 village taps and over 400,000 persons in rural areas at a cost of about $4 per person. The program, evolved in a "learning process" mode (Korten, 1980) through the Department of Community Development, is now being further expanded with donor assistance.

Malawi has springs and streams in the hills which can feed gravity-flow water systems in the plains. The Department devised a method of approaching communities through their traditional chiefs and elders to propose cooperation (Robertson, 1978; Glennie, 1982). The message conveyed is essentially as follows:

> "This is to be your project, not the government's. If you want to have better water, the government is prepared to work with you to get it. But the responsibility is yours, to manage as well as to build." (Liebenow, 1982)

The government offers to supply pipes, materials and training if the people will provide labor to dig trenches and lay the pipe. They should also select someone from their community to be trained as a para-technician, to supervise the work and to oversee maintenance of standpipes and water lines afterwards.

A Main Committee is formed for each service area, supported by Section Committees established in each village within the area, to organize the self-help labor, to arrange work schedules and allocate work among the villages. Sixteen branch line systems operate for each storage tank along the main line, with each branch line committee responsible for maintenance of its own branch. This complex structure works quite well in a decentralized manner under the supervision of what is now the Ministry of Community Development (Robertson, 1978; Glennie, 1982; Liebenow, 1982).

LESSONS: This program is similar in many respects to the Baglung bridge program in Nepal, though it is instigated by the government rather than from the locality. Its committees have also become institutionalized as was not achieved in Baglung. The philosophy of self-help in both is similar and the reliance on local managerial talents has produced impressive results.

The recruitment, training and use of paraprofessional technicians is one of the most important parts of this scheme, as these roles give the community an opportunity for management, not just participation. (This distinction is aptly made by Williamson, 1983.) Another important element appears to be that following construction work each day, the water is allowed to run through the recently installed sections of pipe. Thus benefits are not delayed.

Working through "traditional" leaders is fairly unusual but clearly effective. It may be that chiefs and elders in other countries are less respected and thus less able to provide leadership or at least legitimation than in Malawi. In any case, the potential for such a constructive role should be explored.

The "reticulated" structure of local organizations, paralleling the structure of the water distribution system, provides a logical and concrete matrix for decentralizing responsibility downwards, and for aggregating labor and other resource inputs upwards. If sections fail to mobilize the resources necessary for construction or maintenance, they are the ones who suffer the consequences.

TUNISIA: Rural Water Supply Project

An AID-supported water supply project introduced motorized pumps that required fuel which the government was not prepared to provide on a permanent basis. It had provided for "guardians," local persons hired to look after the wells, but they had not been authorized to collect user fees.

At three of the five project sites, users took collective action to establish fees assessed on a household basis, ranging from $1.25 per month to nothing for those households too poor to pay. In one community a local organization grew out of its quarterly clan meetings and provided basic types of assessment, collection and accounting of water use fees. In Kairouan, the driest area, users were the most ready to assure that their critical water supply continued to function by levying a fee on themselves to cover costs of fuel supply and maintenance.

At the other two sites, guardians were resented because they imposed a fee system without community agreement. In one instance, the community forced the guardian's removal. Whether these two communities, having gotten off to a bad start due to the matter of fee imposition, would follow the good example of the other three was not known at the time of evaluation (Bigelow and Chiles, 1980).

LESSONS: The prospects for a community to organize themselves for achieving important objectives like water supply are not hindered by material well-being or formal education. Relying on the communities' own methods of organization and decision-making is important, however, as imposition from outside can deflect community energies from constructive efforts.

INDIA: Banki Water Supply Project Committees

One of the best documented cases of LID for water supply and improved health conditions is from the Banki area of Uttar Pradesh state in India. There the Planning, Research and Action Institute of Lucknow began in 1962 to work with the heads of seven village panchayats (LG) to develop a piped water supply which the people would own and manage to improve health as well as provide water.

There was initial resistance to changing water habits but this was overcome through house-to-house visits to identify health problems that could be resolved by having cleaner water, and through "evening sittings" where misconceptions about costs and water quality as well as health benefits could be dealt with in small public gatherings.

A Waterworks Executive Committee was set up in consultation with the panchayats, consisting of one member from each village. This committee evolved into a body recognized by the government, appointed by the people, with full responsibility for the operation of the system.

By 1973, 40 percent of the 836 families had piped water and the rest obtained water from 42 public standpipes. Dramatic health improvements were documented, with diarhheal diseases greatly reduced and cholera eliminated in the population. Through user fees the system became self-sufficient and the outside actors withdrew. (Misra, 1975)

LESSONS: As noted above, the combination of LG and LO seems quite advantageous for such undertakings. The program proceeded through persuasion rather than trying to impose new activities through state government or local government authority. The principle of self-financing of the scheme's operation was made clear from the start, though some initial capital funding was secured from UNICEF and WHO. Outside resources were provided in a way which did not create a "dependency" complex.

COMMUNITY SERVICES

EGYPT: Basic Village Services Project

This massive project, providing more than $200 million, has funded construction of roads, water supply, sewerage and other facilities through local councils. Even in relatively homogeneous governorates, there can be great diversity in the capability of local councils with which the project was to work. Both the government and USAID were anxious to expedite the work in order that villages would receive the anticipated effects on income and employment as soon as possible. Although uncertain of the outcome, the project proceeded to reject the conventional which proposed that undertaking such expenditures in a highly decentralized way would slow progress in construction.

Since that initial decision was made, the rate of work and disbursement of funds through local councils has been more than satisfactory. Local councils have generally been able to select, plan and carry out rural infrastructure activities in a timely manner once loans were available and the government adopted procedures that reduced the immensely complicated bureaucratic requirements previously inhibiting local councils (Mayfield, 1984). A recent evaluation which examined a substantial number of the 869 participating localities found that with few exceptions local personnel are sufficiently competent to design and construct the types of subprojects funded under the project (Chetwynd and Samaan, 1984).

LESSONS: A system of support for local institutions can add up to a very large program if the volume of small activities is great, as in this project. The project has made a major investment in training to upgrade the management capability of local councils, directly training 5,000 Egyptian project managers and 20,000 indirectly, and this has surely contributed to project performance (Odell, 1982, and personal communication). The project has been supported by a small (only 260 employees) but active national institution, the Organization for Reconstruction of Egyptian Villages (ORDEV). It operates in a manner which is more supportive of local councils than would be found with most other national agencies. This is also an important factor.

PAKISTAN: Orangi Pilot Project

Orangi is a squatter town outside Karachi with a population approaching one million. It is not exactly "rural" but the LID implications of the pilot project deserve consideration. The project is directed by Akhter Hameed Khan who pioneered LID work while director of the Academy for Rural Development at Comilla in Bangladesh (East Pakistan). Khan first visited Orangi in 1980, and after a month of observation and discussion launched the pilot project in a collaboration with the All-Orangi United Federation (OUF), a collection of more than 30 member organizations in this slum area with nearly a decade of experience.

The Orangi Pilot Project (OPP) hired three "social organizers" to work full time with community groups and shared an office with the OUF to strengthen collaboration. Efforts made to support OUF over the first half year included assistance with gaining legal recognition, starting a newsletter, and organizing various social events. During this time OUF lobbying efforts with government agencies to improve physical conditions gradually turned toward more direct action.

At first the neighborhood (mohalla) was the unit of organization, but this was replaced by the lane (tanzeem) which grouped 20-30 households that were a more solidary social unit. These groups, brought together by the organizers, were asked to cooperate with OPP engineers in devising appropriate waste disposal systems, which had earlier been found to be of great interest to residents.

After considerable experimentation and a number of technical failures, appropriate designs and materials were arrived at which could install sewerage failures at a low enough cost for the slum residents to finance the improvements themselves, by providing labor and about $25 per household. Experiments to provide drinking water proved less amenable to technical-organizational breakthroughs. A wide variety of other activities, outside the infrastructure area, were also undertaken with different degrees of success.

LESSONS: The experimental approach taken by the OPP under Dr. Khan's leadership has produced some very promising socio-technical methodologies for providing low-cost, maintainable sanitation infrastructure. His quarterly reports (Khan, 1983) show a continually self-critical inductive approach to developing local institutional capacity which is essential for achieving this goal which is regarded as ultimately more important even than improved sanitation per se.

The use of "social organizers" for forming local organizations was an important part of the strategy for local institutional development. Such use of "catalysts" is being increasingly recognized as a valuable component of LID strategy in other kinds of rural development work (Uphoff, 1984).

INDONESIA: Subsidi Desa (Village Subsidy) Program

This broad national program was instituted in 1969 to create rural infrastructure through block grants to local governments. Beginning with subsidies of $250 for each project, the amount was raised to $750 by 1975. Funds have been used to purchase construction materials for irrigation facilities, roads, markets, etc. As might be expected with a program of this magnitude, there have been many shortcomings in the program's administration but it has provided considerable infrastructure at relatively low cost (see for example, Patten, Dapice and Falcon, 1973; and de Wit, 1973).

One detailed case study of developing irrigation infrastructure through this program (Hafid and Hayami, 1976) found it to be quite cost-effective where there was good local leadership. In some of the cases analyzed, activities were organized by the lurah (village headman), whereas in others, responsibilities were devolved to unofficial community organizations, operating much like the bridge committees in the Baglung district of Nepal.

Although the program intended to mobilize village labor during periods of reduced agricultural demand, government budget allocations did not always reach the villages in a timely manner, thereby slowing or halting construction plans. For instance, funding for work scheduled in the first quarter of the year, when much village labor is otherwise unemployed, often did not arrive until the second, third or fourth quarter, and in some cases not until the following year (Prabowo, 1973).

LESSONS: The program has not had a strategy or even objective of strengthening local institutional capacities to handle the subsidies most efficiently. Quality of output depends very much on the talent and commitment of the lurah and on the leadership of the bupati (head of the district administration), as documented by Hafid and Hayami (1976). The selection of activities has not always been democratic, so the more advantaged minority tends to get its preferred projects such as roads built more often than does the poorer majority, which usually favors improving irrigation and drainage to provide more production and employment. (This is similar to the results of a survey in rural Nepal reported in footnote 17.) The program seems to get more enthusiastic participation from villagers when subprojects which generate employment are undertaken (personal communication from Don Emmerson, based on field observations). The funds expended would probably have had a more lasting effect if there had been an explicit LID strategy, including training (as in the Egyptian BVS project described above) and if there had been a more concerted effort to strengthen networks of local institutions that can complement the role of the local government (the lurah and other local officials).

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