

to be reached. Because equipment is such an important item in all but the most basic routine maintenance operations, indicators of equipment performance, carefully interpreted, can in fact be one of the best summary indicators of the trend in highway maintenance performance in general. They merit more emphasis than they have been given in the past.

## Chapter 7: The Institutional Dimension

As is true of other functions in the economy, a country's institutional arrangements for highway maintenance—the allocation and distribution of responsibilities between the public and private sectors, among different levels of government, and within the central government—must evolve with development and with changes in the broader sociopolitical structure of the country. The institutional issue is thus above all a matter of moving in the right direction, toward an organizational structure through which the available resources will be applied most effectively to the tasks to be accomplished. The World Bank has traditionally given considerable attention to the structures of government institutions for handling national highway maintenance. Many of the changes it has supported have come about, although often after delays of several years, and the results seen generally to have been positive except in those instances when the structures proposed proved to be more elaborate than the countries could staff effectively.

The first institutional question for countries to ask themselves, one that has probably not often been answered thoroughly enough, is how much of the work on its highways it is desirable to do in-house, by force account, rather than by contract. The answer to this question deeply affects the nature and size of the government organizational structure that will be required. Many maintenance forces find themselves heavily diverted in practice to construction and improvement that might better be left to contractors.

Several Bank-supported maintenance projects in the past would probably have been much more successful if they had followed the example of the first maintenance project in Niger, where it was specifically agreed that in the first stage not only new construction but also periodic maintenance would be left to private contractors. Some other countries have changed policies in the course of a project, deciding, for example, as did Chile and Pakistan, to contract out most equipment maintenance rather than rely on the workshops supplied or planned under the project. The use of contractors can reduce the burden on scarce government staff and can also reduce costs, as a result of competitive pressures to efficiency that are difficult to duplicate under civil-service arrangements. An even flow of relatively small jobs, such as regraveling and resealing, moreover, is an ideal way of fostering a nascent domestic contracting industry.

These periodic maintenance tasks can be specified and described in contractual terms fairly readily and are, in fact, normally contracted

out in many of the more-advanced developing countries and the industrial countries. The same is true of certain easily measurable goods and services, such as the supply of crushed stone and premixed asphaltic composition or the transport of materials.

Routine maintenance in general is much less frequently contracted out, but a number of countries are moving in that direction. In Yugoslavia, state enterprises that specialize in maintenance works have long been used for all types of maintenance and, in Brazil, private contractors under cost-plus type of contracts have been used extensively for ten years, but these are now being converted to unit-price types of contracts, which appear to be most cost-effective. Argentina, Colombia, and Nigeria are also initiating such a system. Ways are being found to write a fair and acceptable contract, even for routine maintenance; essentially it consists of evaluating and specifying the aggregate amount of work in each category to be done per kilometer a year on each given section of road, with emergency repairs to be paid for at tabulated unit prices.

While the requisite size of central and field staffs of maintenance departments will depend heavily on the proportion of work given out to contractors, the primary considerations in securing an effective allocation of internal responsibilities are, on the whole, constant: first, delegation of specific responsibilities as far as is compatible with the availability of trained staff and the minimum feasible size of unit and, second, development of a good system of communication and inspection. The large majority of Bank-promoted institutional changes have in fact been made in order to pin responsibilities more precisely—by setting up a separate roads department within a ministry of public works, for example, or a separate maintenance division within a roads department—or, less frequently, to pool related responsibilities—such as responsibility for mechanized maintenance in several districts—in units of minimum efficient size.

The development of inspection systems, which is mainly a matter of the training of inspectors and to a lesser extent of regular written reporting, has also received some attention, but it has taken longer to achieve. One particularly interesting and promising attempt to develop systems of delegation and inspection appropriate to local circumstances—and on a very large scale—is the highly decentralized “autonomous brigade” form of organization used in Zaïre since 1975, under which the engineers in charge of each brigade have considerable freedom of action though they are under the general supervision, which includes field visits, of a special headquarters department.

Something separate from the issue of road maintenance proper—actual work on the roads themselves—is that of responsibility for the equipment used in maintenance. This responsibility, including procurement of equipment, parts, and supplies and maintenance of equipment, is often in the hands of a separate equipment division or mechanical branch within the highways department, with its own agents distributed among the field subdivisions or with a separate network of regional workshops, for which considerations of scale require greater geographical concentration. Since flexibility of opera-

tion in matters such as regional allocation of equipment and purchase of spare parts and tight costing and controls are critical to the effective use of the large amounts of capital tied up in equipment, many developing countries are moving in the direction of endowing such divisions with autonomous budgets and charging rentals to field subdivisions and other users. This requires the availability of adequate resources of accounting and management. One of the few developing countries in which such a system is already functioning effectively is Malawi.

At the opposite end of the technological spectrum, labor-intensive methods can often be used economically for routine maintenance, particularly in densely populated areas where laborers who live near the road can be employed without the necessity of providing costly transport. Kenya, for example, is redeveloping the system of the local lengthman, who is responsible for routine maintenance of one or two kilometers of road with the aid of tools and materials provided by the roads department and is remunerated at a rate somewhat lower than the normal official minimum wage but in excess of what he would otherwise be able to earn. Similar systems, known as *cantonage*, are still being applied in many of the more densely populated francophone countries, such as Rwanda and Burundi. These labor-intensive methods have the advantage that they depend mostly on local resources; thus they generate useful employment that can be part-time and can be phased to complement agricultural activities; they generate savings in foreign exchange; and they also reduce vulnerability to work stoppages or slowdowns that are caused by the absence of a single unobtainable input, such as a trained mechanic, fuel, or spare parts. Only limited training is required, but effective functioning is critically dependent on the provision of adequate incentives for efficiency and on good supervision through frequent field inspections. By financing the same amount where labor-intensive methods are used as where equipment-intensive methods are used—meaning a higher proportion of local costs—the Bank can avoid biasing the choice of technology.

For paved roads, especially the trunk network, another institutional responsibility that must be clearly provided for is axle-load control. The setting of axle-load limits is generally the responsibility of the ministry of transport or some similar body, while enforcement and operation of vehicle-weighting stations may be in the hands of its officials or of the regular police force. But what the experience of extensive failures and difficulties of enforcement of local limits shows above all is that the establishment and introduction of appropriate limits need to be done in close cooperation with associations of truckers and within the broader framework of regulation of the trucking industry. Technical innovations, such as automatic weighing stations, can help considerably, but even they cannot be effective if the truckers feel that the treatment afforded them is unfair—for example, because rates are kept at a level at which truckers have to overload in order to break even. Thus load control became more effective in Honduras and Kenya recently when rate increases were allowed.

Among these institutional issues there is little doubt that the most important, which the Bank may need to raise more often than it has in the past, is the trend in the division of maintenance work between the public and private sectors. Many countries appear to be trying to do more within the highway department than is in the best interests of their socioeconomic objectives. The financial and technical assistance for the development of the domestic construction industry that is being included even more frequently in various types of lending by the Bank should widen the scope for choice.

## Chapter 8: The Role of Consultants

Traditional consultant functions, such as preparation of bid documents, evaluation of bids, and contract supervision, are only a minor part of the contribution needed from consultants in most maintenance programs. Layout of alternative organizational arrangements and implementation of the client's chosen arrangement, advice on procedures and systems, training on the job and in courses and seminars, preparation of manuals—in a word, institution building in the broadest sense—are the main jobs for which consultants are called upon in maintenance. The task is the more complex because human considerations are often more important than technical ones.

Foreign consultants and technical assistance, under increasingly precise terms of reference, have been heavily involved in preparation and execution of almost all the significant efforts to improve maintenance that have been undertaken with assistance from the World Bank. While consultants have often been overoptimistic about what they would be able to accomplish, they have generally made a vital contribution to what was done, a contribution recognized by both the borrower and the Bank in the form of the contract extensions that have characterized the large majority of maintenance projects. The most common problem has been simply that for a great variety of reasons, such as insufficiently precise terms of reference or guidance, difficulties in coordinating consultants' timing with that of other project elements, and serious and widespread lack of counterparts, part of their expensive time was sometimes wasted.

One of the most difficult problems in guiding and managing consultants is to set the right balance in their work between preparation of manuals and systems—for accounting, estimating, counting traffic, and so on—and actual training of personnel. Systems leave something tangible, perhaps lasting, at the end; personnel may leave. Yet there is little doubt that in many instances too much attention was given to preparation of systems and insufficient attention to training and human contact. Some teams of consultants had too much management expertise and insufficient field experience, and most had too little training expertise. It has become increasingly clear that teams should include some individuals with principal experience in, and primary responsibility for, training and that these trainers themselves need to be guided away from overemphasizing the development of training systems and toward the development of living programs that will continue with local teachers after the departure of the consultants.

Foreign technical assistance needs to be neither accepted too readily nor resisted too strongly. There are instances in which the authorities regret, in retrospect, that the foreigners were not given executive responsibilities initially and others in which change was greatly slowed or was stopped by abrupt reduction of the assistance accepted from expatriates. There are also instances in which foreigners have been used too long as a general prop, particularly in the relatively dull field that maintenance is considered to be. A few projects supported by the Bank were started with more technical assistance than could be used effectively, given the scarcity of counterparts and local staff. The absorptive capacity of a maintenance program for technical assistance can increase in time, as the size of the local staff increases and any initial reluctance to take advantage of the assistance of expatriates is overcome.

While the consultants and technical assistance used in Bank-supported maintenance programs have come from a wide variety of countries, firms, and sources, extremely little of such assistance has come from other developing countries, whose people might sometimes be in the best position to help, given the importance of attitudes and cultural factors. Strong private consulting groups with high-ways expertise have developed in some of the more advanced developing countries, partly because of outdated salary ceilings in direct government service. But, for the same reason, they are often heavily booked within their own countries. Some of these countries are even considering contracting out the management of maintenance to consultants.

Even European consultants new to working with the World Bank, in several instances, have caused serious delays in the procurement of maintenance equipment through their unfamiliarity with procurement procedures of the Bank. A special effort to acquaint borrowers' consultants who are new to Bank projects with such procedures could help to broaden the sources of consultants for maintenance projects and perhaps introduce some groups with important potential advantages in that their cultural and linguistic background is similar to that of the borrowers.

## Chapter 9: Rural Roads: Some Special Considerations

While increasing efforts have been made to improve maintenance of the national highways, maintenance of low-volume rural roads is only now beginning to receive serious attention in most countries, attention that corresponds to the recent emphasis on rural development. Maintenance of rural roads typically suffers to a magnified degree from the institutional, financial, and human-resource constraints that attend the maintenance of main highways.

To be economical, these roads, most of which will serve fewer than fifty vehicles a day, must be built to low standards initially, and upgrading takes place only as needs are clearly demonstrated. For volumes of traffic so small, only a minimal roadway formation with minor drainage structures is justified; the choice with respect to surface is normally between an earth or—more nearly all-weather—gravel standard, for the cheapest bituminous surface would normally be much too expensive. Trouble points that can be eliminated by spot improvements will appear as the road is used. Such roads consequently require relatively high levels of maintenance if they are to be kept open to traffic, and it is often hard to distinguish the maintenance element from minor capital improvements.

Institutional arrangements for maintenance of rural roads vary greatly among countries, from total decentralization into the hands of county authorities, with little outside help, to full inclusion with the national network under the responsibility of the central highway department. But whatever the arrangements, they seldom work effectively; in many countries, publicly maintained rural roads have barely been maintained at all in the past. To the central highway department rural roads are usually peripheral concerns, which would divert already overextended men and equipment from more important highways, while local government, to which these roads are of direct concern, is even harder pressed for organization and resources.

One of the most hopeful approaches to this problem is to give greatest responsibility for maintenance of the roads to those who benefit directly, so as to reduce the cost of maintenance and secure greater local contributions. Where agriculture is organized commercially, the agricultural companies themselves have often undertaken maintenance of the essential roads and, in some instances, parastatal producers or marketing boards have taken on similar functions. Their direct involvement in the local economy ensures timelier, better-informed decisionmaking concerning priorities and knowl-

edge of the local resources available to do what needs to be done in the least expensive way. More generally, in subsistence or smallholder agricultural economies, the local populations may contribute significantly to the maintenance of rural-access roads by labor-intensive methods, sometimes with partial financial and technical assistance from the central government, as was done in Kenya and Mexico. In Mexico, an enormous variety of systems is used, depending on what fits best with local traditions, but in many areas agreements (*convencios*) are made between the central roads authority and specially formed local road-maintenance associations under which the latter agree to provide certain amounts of labor each year at rates below the normal minimum wage to help keep their roads in good condition.

Such imaginative means of reducing the costs of maintenance and securing local contributions to it will be essential if the vast, and so far largely untouched, problem of maintaining rural roads is to be solved. In a number of countries, the World Bank has provided technical and financial assistance in pilot rural-road maintenance-improvement programs for eventual replication nationally, and efforts of this sort will be expanded rapidly in the future. Care must be taken that the availability of foreign financing, which in any case can carry only a minor part of the total financial burden, does not bias the choice of technology in favor of imported, equipment-intensive technologies.

## Conclusions

The road-maintenance problem has so far resisted efforts by the World Bank to help countries deal with it, whether by including general covenants in loan agreements for road construction or by financing projects specifically addressed to the problem. The vigilance of the Bank about observance of maintenance covenants is of some help, as is clarity with regard to the size of the future maintenance burden that is being built up with the development of a road network. But the obstacles to fulfillment are often too deep-seated to be overcome by a loan covenant alone. This has indeed been demonstrated by the Bank's own experience with projects aimed specifically at the improvement of maintenance. In such projects, difficulties have frequently been encountered in coordinating all the component elements—people, organizations, money, equipment, and materials—and, even more, in developing structures and mechanisms to sustain such coordination.

The evidence is that the large majority of developing countries would earn high enough returns from additional efforts to expand maintenance, or to make it more efficient, that such efforts should have high priority in their own budgets, and that more and more countries are recognizing this. But the difficulty is in carrying such efforts through.

The obstacles are many—public attitudes, staff capacities, budgeting and planning procedures, and techniques of organization. Developing the necessary institutional capacities is a great deal more difficult than building networks of roads. The effort must be concerted and sustained. The evidence is abundant that satisfactory basic systems can seldom be established in less than fifteen or twenty years and that help may still be needed thereafter to deal with expansions of the maintenance workload and to avoid retrogression.

While a central function of the World Bank is to analyze the economic priorities and balance among maintenance programs to be assisted, the justification for financing of maintenance by the Bank is not so much the expected physical impact of the hardware covered as the contribution that such lending, and related arrangements, can make to development of the institutional framework for adequate, continuous maintenance. For this purpose, broad programs designed to make headway against each of the interrelated obstacles and constraints to their successful accomplishment are essential. Steady concentration over a period of many years is needed.

The Bank will therefore continue to expand its emphasis on road maintenance, and the practical expression of this emphasis will be in

action plans, training programs, development of financial mechanisms, and the like. To strengthen this effort further, some specific suggestions emerge from this review. Some are reemphases of practices that have been used in the past; others are minor modifications. They can be briefly summarized as follows:

- The prime criterion of eligibility of maintenance expenditures for coverage out of a loan or credit should be consistency with capacity-building objectives, including the development of regular domestic funding mechanisms to sustain maintenance over the long term. Thus, in cases where country financial constraints are very severe and yet development of routine maintenance capacity is a top priority, the Bank will be prepared to participate, on a declining basis, in the incremental recurrent costs of routine maintenance while changes in budgetary priorities are being effected and new domestic financing mechanisms are developed.
- The trend of amounts (in real terms) for each of the upcoming four or five years that should be spent on routine maintenance, periodic maintenance, and maintenance and renewal of equipment, and the proportion of the sum of these amounts to be covered out of local resources will be closely analyzed in highway loan appraisals. The local share will be expected to rise gradually as countries develop. Except in cases where maintenance funding has been no problem, loan documents for all types of highway projects will include agreed-upon targets. Such targets must be realistic—recognizing the time required to overcome prevailing constraints—and thoroughly understood.
- In order to avoid the danger of biasing choice of technology in maintenance projects where labor-based techniques are to be preferred from the socioeconomic viewpoint, the Bank will be ready, where necessary, to lend up to the same amount as it would were equipment-intensive techniques to be used.
- The Bank will pay close, continuing attention to the borrowers' fulfillment of maintenance covenants. To help expedite decisions already accepted in principle, the Bank will not hesitate to apply remedies available under ongoing loans or to hold up new construction loans when compliance is inadequate.
- The Bank will actively assist the more effective operation of separate autonomous funds, with commercial inter-charges and accounting, for maintenance and renewal of equipment. It will support measures that contribute to this objective. One such measure would be government lending of loan or credit proceeds devoted to equipment at shorter commercial terms, with transfer of exchange risk. Another would be phasing of equipment procurement over several years to avoid excessive bunching of equipment maintenance and renewal need. Particular attention will be given to arrangements to enable maintenance of spare parts inventories at an economically efficient level—about 15 percent of total value of equipment park in countries far from main supply lines.
- All loans for projects with maintenance components will normally include an agreed action plan of steps to achieve the im-

provements in performance sought. Such plans will often relate to availability and utilization of equipment and may require experienced mechanical engineering input into their formulation. Loan documents will list selected key targets summarizing the expected outcome of this action plan and corresponding to quantities whose actual values will be generated by the borrower's management information system.

- Careful attention will be given to the merits of using private contractors, as opposed to departmental forces, whether for whole categories of work, such as regreaveling, or for particular tasks, such as supply of asphalt or transport of materials. Measures will be developed, wherever needed and appropriate, to assist private contractors to develop capacity to handle such jobs.
- In the case of low-volume rural roads, particular attention will be paid to mechanisms, such as agricultural producers/cooperators or community self-help schemes, that evoke maximum participation in maintenance from those who directly benefit.
- Feasibility studies for maintenance programs and projects will normally be required to consider explicitly the economic loss that would result from cutting annual expenditures 20 percent below the recommended level and the economic gain that would result from a 20 percent increase. Such analysis can contribute substantially to demonstrating the potential value of incremental expenditures on maintenance and to improving maintenance programs.
- The Bank will try, in cases where highway department staffing is a major constraint, to have full personnel inventories undertaken at the same time as essential engineering preparation work is done, that is, before a loan for a project is approved. This area needs more attention because the whole pace at which maintenance programs in general, and training components in particular, can be carried out depends critically on numbers of personnel and the abilities of staff.
- Considerably greater importance will be attached to achieving continuity in maintenance development efforts and especially in related training programs. Where new loans or credits, which would include funds for necessary extension of training programs, may be delayed and financing from other sources is not already confirmed, the Bank will be ready to lend the small amounts necessary to prevent an ongoing program from lapsing. The necessary financing for an interim period could be provided either through the Bank's existing Project Preparation Facility or another similarly flexible arrangement.
- The Bank will encourage publicity efforts by highway departments and the formation of road user associations. It will promote a concern with the problems of road maintenance among public-interest groups. Such support, for instance, by provision of appropriate documentary material, could help significantly to build up public support for increased maintenance efforts by government.
- When a borrower selects for a maintenance project a consultant firm that has not previously worked with Bank or IDA projects, the Bank will give special attention to familiarizing the team with its

experience on topics such as management systems and training. It will make sure they are fully aware of Bank or IDA procedures on matters such as procurement.

- The Bank will arrange a meeting of foreign assistance agencies active in the highways field to discuss these recommendations. The purpose of such a meeting would be to minimize recurrence of cases where foreign lenders have worked at cross purposes with regard to highway maintenance and to assist the development of a shared approach to the matter.

Part Two  
International Assistance  
for Road Maintenance

## Participants

1. On February 25-26, 1980, there took place at the offices of the World Bank in Paris a meeting of development aid agencies on the problem of highway maintenance in the developing countries. The meeting was attended by representatives of the following eighteen aid-donor Governments and international organizations:

- Abu Dhabi Fund
  - Asian Development Bank (ADB)
  - Australian Government
  - Belgian Government
  - Danish International Development Agency (DANIDA)
  - European Development Fund (EDF)
  - Finnish International Development Agency (FINNIDA)
  - German Government and Kreditanstalt für Wiederaufbau (KfW)
  - Inter-American Development Bank (IDB)
  - Islamic Development Bank
  - Kuwait Fund
  - Netherlands Government
  - Norwegian Government
  - OECD (Subcommittee on Road Maintenance)
  - Saudi Fund for Development
  - United Kingdom Government
  - United States Government
  - World Bank (IBRD)
- The World Bank provided the Chairman and Secretariat.

## Summary of the Consensus

2. The purpose of the meeting was to exchange views on the difficulties faced by developing countries and develop consensus aid agencies in the field of highway maintenance, and to seek consensus wherever appropriate, on ways to overcome these difficulties. The discussions took as their starting point an earlier version of the World Bank document, "The Road Maintenance Problem," which had been circulated prior to the meeting. As a gathering of financial assistance agencies, the meeting focused on financial assistance policies, where a wide degree of agreement was reached on desirable principles.
3. There was agreement that maintenance presented a considerable problem in the large majority of developing countries, of increased importance now that basic road networks had been completed in many of them while more attention was being given to rural roads and government budgets were under increasingly severe pressures. Maintenance needed priority attention from both developing country governments and aid agencies in the current context of development. There were opportunities in many countries for very high return projects in strengthening maintenance capacity. Convening of the meeting was welcomed as timely, and the World Bank paper was commended as a most useful review of the maintenance problem; extension of the scope of the paper from highways to roads more generally, by addition of a separate chapter on maintenance of rural roads, was suggested, and this has now been done.
4. Building of maintenance capacity has proved much more difficult than building of highways in the experience of all aid agencies which have dealt with the matter. The problem is complex, involving public attitudes and political will as much as financial stringencies, human resource constraints, and cumbersome procedures of public administration. These difficulties have, however, sometimes been exacerbated by the policies of the aid agencies, e.g., excessive reluctance to provide recurrent cost financing, too-easy availability of financing for equipment which may have contributed to poor utilization of equipment fleets and excessive emphasis on equipment-intensive methods, failure to sustain support for training efforts, and the tendency sometimes to prefer more centralized organizational forms which may run counter to effective administration of widely dispersed maintenance activities.
5. The problem is above all an institutional one. Most developing countries have not previously focused sufficient attention or resources to developing effective institutions for road maintenance, and

the primary issue is how best to develop that domestic capacity. The task previously taken by some aid agencies to focus efforts for improved maintenance only on the road(s) which they themselves are financing is now seen as too limited, being neither an efficient way to organize maintenance nor adequate to the broader needs (although sometimes used effectively in pilot demonstration zones to develop workable models for wider application). Approaches which work well in some countries will fare poorly in other countries and institutional forms will, of course, have to be adapted to the needs and constraints of the individual country, but certain key factors are common to all, including adequate and stable sources of finance, sufficient numbers of skilled and motivated staff and an organizational form that provides potent incentives for efficient performance and is strong in the field.

6. The aid agencies had previously followed considerably differing practices with respect to financial involvement in maintenance activities. In general there had been some reluctance on the part of many aid agencies to get directly involved, because of the complexity and substantial amount of technical assistance required—maintenance projects require much donor staff time for low volumes of financing—so that they have preferred to take the view that maintenance is a responsibility best shouldered by the Government. Increasingly, however, many aid agencies have felt compelled to get involved more deeply.

7. The various aid agencies have been experimenting with various new approaches. For example, the IDB has recently undertaken a broader, deeper commitment to assist in the development of all aspects of road maintenance capacities, both financially and through more direct involvement in technical assistance. The British ODA has evolved broader roles for Training Production Units which it has financed, giving training efforts more practical orientation while demonstrating the effects of improved financing and methods of work organization. Similarly the ODA has supported the use of plant hire schemes which incorporate strong incentives for efficient utilization of equipment while providing an effective vehicle for financing the maintenance and renewal of equipment. Other agencies, particularly FED and the IBRD, have experimented with the use of contractors to relieve the burden on governmental work forces; a mixture of government performing routine maintenance and contractors performing periodic maintenance and strengthening has worked reasonably well in many countries, and further experimentation with an expanding role for contractors, including routine maintenance, is being encouraged. This would also aid development of the domestic contracting industry.

8. Coordination among aid agencies in the past has not always been as effective as might have been desired. For example, instances were cited in which one aid agency had learned of another agency's proposed maintenance project only after its own appraisal mission had returned from the country concerned. A degree of commonality of approach is also needed within any given country as training pro-

grants have to be geared at the national level, and a uniform code of maintenance practices is necessary; efforts such as those now underway by the Economic Commission for Africa, in collaboration with the United Kingdom, Federal Republic of Germany and France, to produce a practical field manual for road maintenance foremen (for publication in 1981) were thus to be welcomed. If the assistance of an aid agency is directed only at individual roads or maintenance districts, it should at least be conceived in such a way as to be replicable on a national level and compatible with the evolving nationwide organization for maintenance. Thus, although the content of any aid agency's or donor government's program of assistance is, of course, a matter to be determined by that agency or donor government and the recipient government on the basis of the latter's proposals, better coordination among aid agencies and donor and recipient governments would also be desirable. This could be achieved generally through closer, more-or-less continual informal contacts and sometimes through the more formal channels of consultative group discussions. In some cases the IBRD has transport sector papers that have been discussed with the government concerned and can provide useful background for consultations with other aid agencies on maintenance needs.

9. Findings of recent research on maintenance were discussed. Research in Kenya, Brazil and the Caribbean has demonstrated that the benefits accruing to road users in the form of reduced vehicle operating costs from reduced road roughness are even larger than the benefits to the road authority in the form of asset preservation. Consequently the average economic returns for efficiently-executed maintenance programs would therefore normally be well in excess of 100 percent per annum, and marginal returns to further expenditure would decrease to the returns typical of new investments only after standards of maintenance well in excess of those normally observed in developing countries have been achieved. Results of recent trials with simple low-cost, labor-intensive methods of maintenance were also described. Attention was drawn to the need for better information on the costs and effectiveness of different maintenance methods in different environments. Such data could readily be collected from some foreign-assisted maintenance projects, but to be most useful the data categories and procedures used in connection need to fit in a common framework agreed among participating agencies. Attention was also drawn to the efforts of the OECD Road Research Programme to broaden research efforts in developing countries, in addition to the continuing stable efforts of the Overseas Unit of the U.K. Transport and Road Research Laboratory (TRRL). The OECD had already expanded the IRRD information system to provide better exchange of information to and from developing countries; the Overseas Unit of TRRL would also continue to assist in dissemination of research findings.

10. Particular attention was focussed on eight key issues of financial policy as discussed below.

*Issue 1. Periodic Maintenance: What cost items in periodic maintenance is it appropriate to finance by loans?*

11. Periodic maintenance, consisting primarily of regravelling of gravel roads, resealing of paved roads and associated activities, normally has a life of five to ten years and is thus properly viewed as a short-term capital item similar to equipment. As a capital item the IBRD is prepared to finance all foreign exchange costs and, where justified on country grounds, a portion of local costs, including equipment, spare parts, fuel, materials and labor; although some agencies have not engaged in financing of periodic maintenance, the policies of ADB and IDB are essentially the same as those of the IBRD. A consensus was reached that periodic maintenance should be eligible for financing on a similar basis as new road construction, although the less-poor countries should normally be able to meet periodic maintenance needs without recourse to international financing.

*Issue 2. Recurrent Costs of Routine Maintenance: Under what circumstances, if any, is it appropriate to finance recurrent costs through long-term loans?*

12. Most aid agencies up till now have felt it inappropriate to finance these recurrent costs, taking the view that foreign aid should be focussed on capital items while recurrent costs would be the responsibility of the recipient government. Thus the capital assets needed in the performance of routine maintenance (including equipment, workshops, initial stocks of spare parts and materials, and training programs) have normally been considered eligible for financing by most aid agencies, while recurrent costs (labor, fuel, and annual consumption of spare parts and materials), which have a life of one year or less, have normally been considered unsuitable for financing through long-term loans. However, as convincingly argued by a number of participants, the preference of aid agencies to finance capital rather than recurrent costs had sometimes introduced a bias against maintenance, as recipient governments sought to use their limited funds in new construction or other capital projects where they would attract the maximum foreign financial participation. Moreover it was now clear that institutional capacity to carry out effective maintenance was the crucial capital asset, so that foreign contributions which helped to build it most effectively, whether they were for labor and spare parts or for equipment, could be seen as investments with long-run pay-off.

13. As a consequence, many aid agencies are modifying their policies. Member governments of the Development Assistance Committee (DAC) had recently adopted new Guidelines on Local and Recurrent Cost Financing which implied, for the case of road maintenance, a policy very similar to recent IBRD policy, i.e. that under certain conditions the aid agencies would finance a proportion, declining over time, of recurrent costs for an expanding maintenance effort in the poorest countries. Representatives of the United Kingdom and the Federal Republic of Germany explained that their respective

governments were prepared to finance recurrent costs on a grant basis, but considered it inappropriate to do so on a loan basis.

14. While there was general agreement that the burden of maintenance must be borne primarily by the developing countries themselves, there was also wide agreement that the capital-only financing policies of most aid agencies in the past had often had the perverse effect of undermining maintenance efforts by the countries themselves, particularly in the poorest countries. Thus there was consensus that the recent policy statements by the IBRD and DAC member governments defining circumstances under which recurrent costs could be financed were helpful, and other agencies which had not yet taken similar steps were encouraged to do so.

*Item 3. Spare Parts: How can foreign financing arrangements help to ensure the steady and reliable availability of spare parts that is so much required?*

15. Typically most aid agencies include in the financing of equipment purchases an extra allowance of 10 to 15 percent for an initial stock of spare parts. A problem commonly arises after one or two years that these stocks have not been replenished, due in some cases to a lack of financial resources, particularly foreign exchange, and in other cases to procurement procedures or other problems. The IBRD and other aid agencies have taken the view that, unlike the initial stock, which can be seen as an investment in inventories and thus eligible for financing as a capital item, the replenishment of stocks is a recurrent expenditure and therefore not normally eligible for financing.

16. The net result constitutes possibly the single most important problem in maintenance management in many countries, as the efficiency of maintenance operations is devastated when expensive equipment and personnel are idled for the want of a few spare parts. The problem cannot be solved simply by purchasing larger initial inventories; aside from the costs of investing in and storing redundant inventories, it is difficult to predict precisely what spares will be most needed in a given case. Moreover, the problem is complicated by the fact that equipment manufacturers do not always recommend the most suitable composition of spares inventories, and occasionally have sold outdated stocks of slow moving items to an unwitting buyer; thus developing country road authorities may need independent, expert advice in determining the composition and scale of spare inventories. The problem may be further complicated where restricted procurement policies tie original purchases of equipment to the particular donor country with the effect of proliferating different manufacturers' brands of equipment and unnecessarily multiplying spare part inventory requirements.

17. There was a consensus that the spare parts issue is critical in many countries and needs more attention, particularly with regard to domestic arrangements for replenishing initial stocks provided under loans/grants for highway building, maintenance or other programs. Since foreign financing operations occur at irregular intervals, and in any case the absolute amounts of finance involved are small, major emphasis must be placed on development of local capacities and

financial mechanisms to deal with this problem, such as plant hire schemes, which would generate the necessary funds, as well as revolving funds and simplified procurement procedures.

*Item 4. Equipment: Are there limits to the extent of foreign loan financing that is appropriate, at any one time or for replacements?*

18. Whereas in the case of recurrent costs the inadequacy of funding is a problem, in the case of equipment the opposite is often the case. Financing for equipment is so easy to obtain that, coupled with the sales promotion efforts of the manufacturers, there has been a tendency in some cases to provide more equipment than the countries can usefully employ, given constraints in the availability of complementary resources, or equipment which is unsuitable. The too easy availability of new equipment has tended to diminish incentives for efficient utilization of existing equipment fleets, which is often appallingly low. There has sometimes been a regrettable tendency to buy new equipment where existing equipment could be salvaged at much lower cost, a problem at least partly related to the disparity in aid agencies' policies with respect to the financing of spare parts and new equipment. Furthermore, there is an excessive tendency for equipment to supplant labor-intensive methods, which in many cases can be less costly as well as socially beneficial in generating employment.

19. It was generally agreed that the division of equipment loans into tranches spread over time, as is now becoming more common, was helpful in balancing the size of equipment deliveries with the absorptive capacity of the roads department, and also in alleviating the problem of bunching both in aging of the fleet and replacement financing needs. Ideally, plant hire schemes operating on commercial principles, which would promote more efficient utilization of equipment, would also generate annual depreciation charges to be used to replace a portion of the fleet every year so that, at least in the less-poor countries, the need for international financing for equipment replacements might be eliminated over time.

*Item 5. Training: What should be the role of different types of financing sources, and how does one ensure the necessary continuity of training efforts?*

20. Training is vital to the ultimate solution of the maintenance problem. Although it has only recently begun to receive the necessary attention, training activities are generally eligible for international financing. The World Bank, like most agencies, is prepared to finance any training activities needed to strengthen road maintenance, but since it can only offer loan financing, prefers where feasible to defer to the UNDP and other agencies which can provide grant funding. But the development of adequate local institutions may require many years of technical assistance, and a problem has sometimes arisen in the past with the continuity of ongoing efforts. Training efforts which have taken several years to build up have been lost overnight when funding for continued technical assistance was not available because of slippage in follow-up projects or in expected alternate sources of finance. Because of this problem, the World Bank has used the Project Preparation Facility to provide stop-gap financing of training efforts;

however, this facility is limited to those cases where the Bank has firm expectation of making a new project loan in the near future.

21. There was some discussion of the difficulties of obtaining competent technical assistance in the training field. One agency reported that it had had best experience with individual consultants and advisers, while another preferred consultant firms due to the difficulties of properly coordinating teams of individuals. Some consulting firms with experience in the highways field are increasingly developing specialized experience in training activities. But experience generally underlines the importance of clearly specifying training responsibilities in consultants' terms of reference and the advantage of including in technical assistance teams people with specific expertise in training.

22. It was agreed that training was of the greatest importance, that different ways of providing training and technical assistance were appropriate under different circumstances and that all aid agencies should give priority attention to measures to ensure continuity of training efforts, preferably on a grant rather than a loan basis.

*Item 6. Reconstruction: Under what circumstances is it appropriate for an agency to finance reconstruction or overlays on a road for which it had earlier financed the original construction?*

23. While portions of a roadway have an indefinite life, the road pavement and structures have a finite life and even with optimal maintenance will ultimately wear out. Normally, the most cost-effective form of pavement renewal (and enhancement) is some form of strengthening, such as bituminous overlays, but this must be done before the road is badly deteriorated; otherwise a much more costly rehabilitation or reconstruction will be required. Strengthening programs are therefore the preferred measure for capital renewal and should be eligible for international financing. However, if the recipient road authorities perceive that finance is readily available for financing rehabilitation or reconstruction, their incentives for properly maintaining and strengthening the road network will be diminished. It is desirable, therefore, for the agencies to follow, and make known, a discriminating policy that favors financing of timely strengthening programs, but that would normally finance the rehabilitation or reconstruction of roads only where reasonable preventive maintenance and strengthening efforts had been demonstrated.

*Item 7. Maintenance in New Construction: How far should financing agencies go in encouraging countries to further develop maintenance capabilities rather than to build new roads?*

24. All participants recognized that continuing to finance new infrastructure where existing infrastructure is not being maintained will often be harmful by increasing the maintenance burden while reducing resources available to meet it. Some went further to argue that in the case of countries which consistently ignore maintenance needs (despite covenants to the contrary in their agreements with the aid agencies) the agencies should refuse to finance further new construction.

tion. Others pointed out that the appropriate action depended on the nature of the problem: where the maintenance problem stemmed merely or largely from a lack of will, then a hard line by the aid agencies in refusing to finance new construction could be helpful, but in other cases where, for example, the financial resources were simply not available, other responses would be more helpful.

25. There was universal agreement on the need to examine closely and early in the preparation of any new construction project the capacity to maintain it, including adapting the design of the road to anticipated maintenance capabilities. Aid agencies should also use the opportunity of any new construction loan or grant to reexamine the adequacy of maintenance in the entire network and foster improvements as needed, both by financing appropriate components and by encouraging increased maintenance efforts by the recipient government. Efforts of the different aid agencies should be closely coordinated to ensure complementarity of efforts.

*Item 8. Private Contractors: How can financial assistance best be channelled to private contractors in cases where it is desired to strengthen their capacity to contribute to fulfilling the maintenance task?*

26. Some representatives saw excellent potentials for developing the domestic contracting industries in the developing countries to assist in routine as well as periodic maintenance, although actual experience with this approach is limited primarily to periodic maintenance, with the notable exceptions of Yugoslavia and Brazil. Experimentation is currently underway in Brazil to develop (i) tendering and contracting procedures which provide maximum incentives for efficiency and (ii) the capacity of the roads authorities to supervise contractors for routine as well as periodic maintenance. To assist in the development of local contractors there is often a need for technical assistance in such areas as cost estimating, tendering procedures and management of contracting enterprises as well as for financial assistance for procurement of equipment and set up of site operations, etc.; highway department contracting and disbursement procedures also sometimes need adjustment to provide better opportunities to different classes of local contractors.

27. It was agreed that local contractors did have an important potential for carrying out parts of the maintenance task in many developing countries, and that maintenance work, with proper supervision, was a good means to help develop the experience and capacity of civil contractors. Experimentation such as that in Brazil should be encouraged in other countries which may be interested to assess the potential of contract maintenance and develop procedures suitable to their own circumstances. Aid agencies should have suitable mechanisms for channeling assistance to contractors, whether through highway authorities or through local development banks, or both.



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