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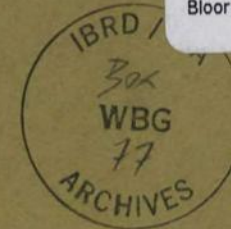
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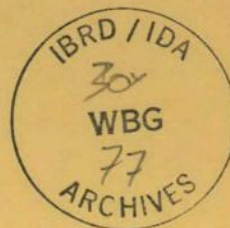
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BLOOR



To be presented at
Annual Meeting of
American Society of Civil Engineers
ENGINEERING AND THE WORLD BANK

by

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New York

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The World Bank is, of course, primarily a financial institution. But since most of its lending is for heavy construction, it relies on the engineering profession, and especially the Civil Engineers, for sound planning, sound design, and adequate and economical construction. I will try in this presentation to point out a few problems which, in the experience of the Bank, sometimes arise in the Bank's relationships with engineers. This is in no sense a critique of engineering practices but rather an effort to acquaint you with some of the goals which the Bank strives to achieve with its borrowers and to suggest some ways in which the engineering profession can help toward these goals.

Since the Bank does none of its lending in the United States, I will take a few minutes, at the risk of boring some of you, to describe what the Bank is and what it tries to do.

In the first place its proper name is the International Bank for Reconstruction and Development. It began operations in 1946, having been established at the Bretton Woods Conference of 44 nations. As its title implies, post-war reconstruction was an urgent part of its function and for this the first loans were made in Europe before Marshall Plan aid from the United States had become available. Its other function which has occupied all of its attention for some years is making long-term loans for economic development in its member countries. These member countries now

number 71 and they comprise practically the entire so-called free world and include one communist country - Yugoslavia. None of its members is behind the Iron Curtain.

The Bank's original capital came from subscriptions of its member nations, of which only a small part was actually paid in. Borrowing operations started about the same time as lending operations on the strength of the pledged but unpaid subscriptions. Over the years some 290 loans totaling nearly 5 3/4 billion dollars have been made to 57 member countries and territories for over 600 individual projects. The types of development projects financed can be broken down roughly into the following major use categories, although some of the projects serve multiple uses:

Power,	\$1 3/4 billion
Industry,	\$1 billion
Railroads,	\$1 billion
Waterways, Ports and Flood Control	\$1/2 billion
Agriculture,	\$1/2 billion
Roads,	\$1/2 billion

Much smaller amounts have been loaned for communications, aircraft, and ships. About 38% of the total went to Asia and the Middle East, 23% to Latin America, 18% to Europe, 15% to Africa and 6% to Australia. Lending operations have been running at a rate of almost \$700 million per year since 1957 and since the loans normally cover only the foreign exchange requirements of the projects, as distinguished from local currency requirements, the value of the work contributed to is over 2 billion dollars per year.

Considering the fact that loans are made to nations with greatly differing levels of development, it probably goes without saying that no complete set of rules can be established to govern all lending. But there are some rigid requirements. The Bank conducts its operations with a view to making a profit on its investments, feeling that such a policy is essential to the soundness of the operations. Loans are made only after the Bank has assured itself of the ability of the borrower to repay and the amount of a loan or the total amount of several loans in one nation is limited by this consideration. Loans may be made to private interests or government agencies, but they must all be guaranteed by the member nation. Loans must be for productive purposes and the projects they finance must be economically justified. International competitive bidding is required for the purchase of imported materials which is the part of the cost normally covered by the loan. The Bank must assure itself that local currency costs can be met locally. And of particular interest to engineers, the projects must be soundly planned. As regards this last requirement the Bank employs no considerable engineering staff of its own but it will insist that competent engineers have been employed in the planning of a project and will be available during its construction and operation, and it will use its own engineers to carefully check these facts. I think by these requirements the Bank establishes itself as one of the greatest friends of the consulting engineering profession in the world.

Now for some problems.

I suppose any Civil Engineer more than a year or so out of college could guess one of them after a moment's thought. I refer, of course, to

cost estimates. The Bank's experience with engineering cost estimates is much like that of everyone else -- they are often not accurate and they are usually too low. This has an especially critical effect on the Bank's operations because of the extremely limited resources in some of the borrowing nations. My experience with United States Government spending taught me that you can get a terrific roasting from a Congressional Appropriations Committee when your estimates are proved low, but that the resources are there and will be committed to make up for your errors. In an underdeveloped country, however, with low incomes and rates of savings even a small over-run in cost may be very difficult to finance. It is realized that making cost estimates for projects in these countries involves peculiar difficulties. Often the work to be done is unprecedented in that location and there are no historic costs available. Often the productivity of local labor is difficult to assess. There will be cases where job training will have to start slowly and patiently from the very fundamentals. There will be cases where programs of adequate feeding will be necessary to secure a physical condition which can maintain a sustained output of work. Sometimes the climate will be enervating to imported skilled labor. Sometimes the access to the project site will be so difficult as to seriously limit the investigations needed for accurate planning. So what do we do about all these and other difficulties? I suggest that we first try to enumerate them all for each specific project, assess their effect as accurately as possible and then add some sizeable contingency allowances to the estimates. I see no reason why contingency allowances for foreign construction should not normally be

higher than for construction in the United States and under especially difficult circumstances they should be several times as high. Please don't be embarrassed, so far as the Bank is concerned, if your contingencies are a substantial part of your total cost estimate.

Now I would like to say something about the nature and size of projects. To explain how these things may become Bank problems I will need to say first how the Bank may become interested in a project. One way is to be asked by a prospective borrowing nation to come into the country, study its needs and creditworthiness, and to suggest projects for economic development. By this method projects are selected not only after some engineering study but also after careful study by trained economists and financial people. However, this procedure is not a pre-requisite to lending. Often a nation selects a project and employs engineering consultants to study and plan it or employs the engineers for both selection and planning. In some cases projects are selected, planned, and partly built before the Bank is called upon for a loan and sometimes the Bank finds it difficult to adjust the project to what it thinks the country needs and can pay for. Therefore, I want to suggest that if neither the Bank nor any other expert economic or financial institution in or out of the country has given the project any attention, it devolves upon the engineer to give these matters some attention himself.

This sort of thing may very well be new to United States engineers. I think it is easiest understood by realizing that in many of the underdeveloped nations there is a lack of sophistication to apply

to development programs. There may be a strong feeling of national pride in a new nation and this may lead to a desire for a project bigger than the next-door-neighbor nation. But at the same time there will be very few college graduates in the country and for some reason these will be lawyers more often than not. People to judge accurately the economic needs and the ability to pay will often not be available locally.

In this atmosphere the professional duty of the engineer to serve the best interests of his client may require efforts beyond anything normally done in the United States. Without impugning anyone's professional ethics, it may be stated as a fact that engineers in the United States are conditioned by clients whose first reaction to an engineering plan is likely to be that its cost is 30% more than they can afford and it will have to be reduced. It is a fact too that engineers are influenced and guided, and properly so, by an informed public and press. Not only will these things be lacking in underdeveloped countries, but there is likely to be a feeling on the part of local government officials that since a foreign engineer who knows practically everything has been hired under a contract to secure the right answer, it follows automatically that the answer he produces cannot be questioned by anybody.

How is an engineer to go about accepting these rather unusual responsibilities? I think he should defer for a time the practice of his skills in determining, for instance, the optimum engineering development of a dam site, or the lowest possible cost of producing a kwh in a hydroelectric development. Before he does these things he should know what the country needs most and what it can afford and his engineering

plans should be set in this framework. It often is not difficult to secure a proper understanding because the economies of underdeveloped nations usually are not complex and in many cases the Bank or other institutions will have made basic studies.

The influence of what I have just said will exert itself principally on the nature and size of projects selected. The Bank restricts its loans to productive projects and it greatly prefers to loan to projects which promise to set off a chain reaction of productivity. Partly for this reason 1/3 of its loans have been for power. It is interesting to note too that the demand for power increases maintains itself through many levels of productivity and there are many areas in the world today where capacities can be doubled every five or six years with good rates of return on investments. Many of the nations which need help are those which depend substantially on agricultural production and it is not sufficient in these cases simply to increase production 10 or 20 per cent so that the people get a bit more to eat, even though they may very well need it. The goal may more likely be to double or triple agricultural production. To this end irrigation projects may be desirable and transportation in the form of waterways, roads or railroads will be needed. Increased industrial and natural resource production is, of course, essential to development and there will be accompanying demands for transportation including ports. The effect of projects on the export-import balance is important. Most projects will require substantial imports and the long term Bank loans serve to spread these effects over many years. On the other hand, the project itself becomes more desirable if it promises eventually to reduce imports or increase exports.

In considering what sorts of projects may be less desirable I find it helpful to consider what stages the United States has come through in its rise to its present productive level. Some of you can remember the United States roads of 1920. There are underdeveloped countries where traffic is even less than 1920 United States traffic and the establishment of a high type road system cannot possibly be justified at present, even though minimum type of all-weather roads may be very badly needed. Flood control on a large scale did not start in the United States until the 1930's, although there had been many devastating floods before that. The reason was partly because the concentrations of population and property did not justify it and partly, I suspect, because we simply could not afford it. For many years in many countries there will be less justification for flood control projects than in the United States in 1930. There are, of course, some notable exceptions where floods take terrible tolls of human life and when flood control can be combined with other productive purposes. Reflect also on port development in the United States and its heavy mechanization as traffic became denser and wages of labor became higher. Contrast this with an underdeveloped nation with a few thousand tons of bananas to export and wages still at subsistence levels. We do, of course, hope to improve these conditions but it may take many years as it did in the United States and the countries cannot afford such investments looking far into the future. There are many other parallels which could be drawn but it is perhaps enough to simply suggest this point of view as a basis for questioning high levels of project development which we are inclined to take for granted. I suggest that there are

good reasons why many underdeveloped countries could not and should not adopt certain types of projects and especially high levels of project development such as we are used to.

One of the most difficult problems, especially in connection with river development projects, is the determination of the proper size of the project. We have learned to abhor the partial development of a dam site in a manner which precludes further development. We have learned to prefer one large dam in preference to several small ones. We have learned since the 1930's that it is quite difficult to develop too much power anywhere in the United States. We may forget that many of our inland waterway projects have been enlarged several times since their inception. I think it is safe to say some underplanned projects, by present standards, which were built in the United States were mistakes, but on the other hand, more of them were the most we could absorb and afford at the time. The difference in the power installations at Bonneville and the Dalles is notable, although they are adjacent projects on the Columbia River. The question in the minds of the designers of Bonneville during the 30's was what will we do with all the power, whereas in the 50's we wanted to squeeze out every kwh in the river at the Dalles. And who can say we should have over-installed at Bonneville and waited 10 to 20 years for a load even if the power demand could have been foreseen. In underdeveloped countries these conditions are intensified. Electrical load prediction is almost impossible where nobody has used electricity before. The utilization of irrigation projects is slow where land tenures are unsatisfactory on the basis of centuries of tradition and where cultivation up to now has been done with a bent stick.

So here are two somewhat irreconcilable points of view which in the past have given rise to heated controversy in the United States, as witness T.V.A. and the Snake River, and may be expected to pose problems for the engineer in underdeveloped countries. It is here that the ingenuity of the engineer may well come to the fore. It is easy, and much more spectacular, to plan a damsite for its maximum possible development. It is much more difficult, and there is an unpleasant aspect of niggardliness, to plan it in stages to be built as needed, but the latter plan will often be much more suited to an underdeveloped country and in fact may very well be essential to any development at all.

In conclusion, I hope my remarks have not conveyed the impression that the Bank takes a reactionary view of modern engineering practices. Indeed, where the circumstances are right, the Bank has proved itself ready to finance very large projects embodying all the latest techniques of large scale engineering. I hope I have demonstrated that the facts of life in underdeveloped countries impose some increased responsibilities on engineers and sometimes impose some limitations on engineering techniques which are generally accepted in the United States. If I have been able to develop some increased acceptance of this point of view, I will feel grateful.

Thank you for your attention.