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THE ROLE OF ENGINEERS IN RESOURCE DEVELOPMENT

Discussion for the VIIIth Convencion de la
Union Panamericana de Asociaciones de Ingenieros
U.P.A.D.I.

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In the early literature of the U.S.A. there is a story about a dissolute fellow named Rip Van Winkle, who wandered into the mountains, encountered a band of friendly little men, drank unwisely at their insistence, fell asleep - and slept for twenty years. When he awakened he found everything changed; but the changes were those of aging - not of growth or development.

In every score of years since those of Rip, greater changes have occurred than in the preceding score. And most of the changes have been in the nature of progress resulting from technological developments. We have found how to do things easier, how to live better, how to extend our environments, and how to increase our communications. The one problem that we have not solved to the satisfaction of a majority of the world's people, is that of distribution. It is the problem that will demand more attention than any other in the years immediately ahead of us. It is both simple and complex. The obvious approach to its solution is to develop the areas within which people live to the point that each will yield not only the wherewithals for existence, but provide a sufficient margin in goods of trade to form a basis for economic independence. A prime difficulty is in obtaining the skills and capital necessary to undertake such enormous tasks in areas where neither is existent in abundance. It will be the purpose of this paper to identify some sources from which these tools for development may be obtained and to indicate appropriate means for their employment.

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In planning the development of any area, first consideration should be given the resources provided by nature. These include terrain features and everything that is contained beneath the ground surface. Minerals, fossil fuels, the soil itself, all are part of the inventory that must be made and evaluated. Climate and rainfall bear so closely upon the regional potential that it would be a mistake to rank them below the harder, material assets in importance; hence, they too, demand careful and exhaustive study.

The purpose of resource development is to provide better living for people. Human aspirations and desires should therefore be considered in addition to basic needs. Identification of these is not difficult, nor is their evaluation; problems arise, however, when it comes to determining economic feasibilities, to resolve which, both engineers and economists are needed: engineers to calculate the costs, and economists to estimate the benefits. In this connection it should be kept in mind that benefits - costs relationships as finally established are approximations at best. They can nearly always be shaded and softened by human considerations, for no one yet has determined with any accuracy the money value of a life or a suitable price for the alleviation of suffering.

Engineering, too, can affect economic determinations. The more skillfully it is applied, the greater will be the derived benefits of the project and the less its cost. Ingenuity may turn an apparently unfeasible proposal into one that can be readily justified. In any case the engineer and economist must work closely together, each taking information and guidance from the other as they strive for practicable solutions.

Conservation is a word used frequently when laymen talk of nature's resources. It has a good sound and implies careful husbandry, but the thought should be retained that the purpose of development is to make resources continually usable - not just to save them. If used wisely, each in conjunction with others, availability can be extended in the case of those which are nonreplenishable and multiplied without end for those replenishable.

There are two ways to approach a problem of resource development. One is to do immediately those things that appear first at hand. Power is needed and a river is there, so build a dam and install a powerhouse. Later, when other needs appear, raise the dam for greater storage or provide adjuncts to it. Project after project may be built, each serving its particular purpose, but the summation of results obtained will be less valuable than those derived from the alternate approach, which is by comprehensive planning. More will be said about this later; for the time being, let us consider some of the fundamental problems related to it.

Many elements are needed to sustain life and provide the wherewithals of growth and comfort. Substitutes are possible for some; not all are needed in large quantities. The one basic necessity, required in great and ever increasing volumes as civilization develops, is water. Fortunately, it is replenishable as a resource, for nature provides it on a continuing cycle. Without control by man, however, it will overwhelm or fail him.

Centers of population develop where water is available in abundance, sometimes on coastal areas fed by streams and often along the banks of great rivers. In either case, regions of economic interdependence become established within the defined areas of watersheds. This makes it necessary to treat them as complete entities in preparing plans for their development. Within each, the available resources must be considered mutually and with an eye to interrelationships of use.

The first step, therefore, is to prepare an inventory of all resources and list the means by which they may be utilized to gain the desired objectives. Human capabilities and special talents must be taken into account in this

connection, along with means for strengthening and adapting them to needs. Education and training may become vital elements in the comprehensive plan.

Basic in the planning process is the collection and compilation of data relating to water resources. Rainfall records; stream gage readings; information on flood heights and flood damages; facts relating to droughts and periods of low stream flow; all are important to the study that will follow.

The next step, generally, is to identify the needs for water over the entire area. If unusually dry summers occur frequently, there may be need for farm irrigation or for more adequate supply to communities. Stream pollution may present a problem. Summer floods may cause frequent damage to crops and prevent flood plains from being used most profitably. Severe winter floods may threaten populated areas and curtail industrial development. Possibilities for the generation of power and provision of navigation facilities must be assessed, and along with all these considerations there is the desirability of capturing recreation benefits as an extra dividend.

Alternate means for achieving the desired results should be weighed, each against the other, as planning proceeds. Flood threats may be lessened by channel enlargements, rectifications or diversions. Or, the damaging water may be contained, as between levees or behind dams. When choosing among such diverse methods, however, thought should be given to what any one of them can accomplish in addition to the original purpose. Dams will serve to store water during periods of excess runoff, thus making it available in reservoirs for power, irrigation, industry, commerce and domestic purposes. Proper regulation of the outflow will serve to reduce stream pollution and promote water-based recreation.

By appraising each plan on its merits, weighing the cost of each project against the benefits that may be expected to result from it, eliminating undesirable or uneconomical features, a single, most effective plan can be evolved for utilization of the water resources of the area. If the construction of a dam or system of dams should be indicated thereby, it will then be necessary to investigate foundation conditions and consider them in connection with all other pertinent factors, including hydrology, valley configuration, and materials available, in order to arrive at a determination of the proper type or types to be employed.

Planning proceeds usually through a number of stages, beginning with a preliminary investigation and ending with detailed design and scheduling of the separate parts comprising the program. Through each stage, the engineer must remain in control and maintain an open mind. He must not be afraid to change his course when facts indicate change to be necessary; but he must be firm to resist whimsical changes that would adversely affect the economics of the undertaking.

When a broad plan has been formulated and found feasible by the engineers, economists and other specialists brought together for the task, it is then appropriate to develop a program for its realization. This will throw

emphasis on the separate projects of the plan and serve to establish priorities among them. It is then a task for the engineer to prepare designs, specifications, cost estimates, bidding and contract documents; to evaluate bids received and recommend awards. During construction he must act as agent for the owner, doing all things necessary to insure that the best workmanship is put into the job and that all details of the specifications meet with compliance.

Everything to this point has emphasized the need for comprehensive planning on a basin wide basis; for this to be undertaken by engineers, assisted by economists and such other specialists as may be required to determine the feasibility, along with possible limitations, of an integrated program. Omitted entirely has been any reference to financing, yet money is of vital importance in getting any large scale development under way. Even though it may be wholly self-supporting and self-liquidating in the long run, as any worthwhile power project should be, a considerable period of time may elapse before returns can be expected. After that more years will be required to pay off the capital investment. Very seldom is it possible for a primitive or developing area to do more than sustain itself, much less to finance fully a large scale program even on a project to project basis. Funds must be obtained usually from some outside source, to be repaid later out of direct earnings or from an enhanced economy.

A notable example of impetus given to the comprehensive development of a specific region by a National Government is that of the Tennessee Valley in the United States. There, some thirty years ago, an authority was created to plan and instigate development of its water and land resources for agriculture, industry, and such other purposes as might be appropriate. A great construction program was embarked upon to create a navigable waterway, winding through a flood-free valley; agriculture was improved by the development of new fertilizers and improved farming practices; private ownership of forest areas was encouraged and scientific management was taught; and finally, a great electric power complex was developed. None of this, however, was designed to relieve the people of the valley from their fundamental responsibilities; rather, it was to provide them with the tools necessary for building a sound regional economy. Improvement of the river for navigation would serve no purpose if commerce and industry were not to be developed, power would be of no value if unused, farms and forests would fail to produce if not worked.

Except for the costs attributable to power development, all were to be carried as essential to the National welfare. The cost of power installations was to be repaid on a forty year basis without interest. Considerably later, it was decreed by law that all but a small residual of the power investments should be repaid with interest and that future developments should be self-financed. Having gained strength through a long period of able administration, the Authority could undertake to meet the additional obligation without fear of consequences or immediate raising of rates. Had it been required to do so at an earlier period of development, however, great difficulties would have been encountered, and rate increases would quite certainly have been necessary.

Since the developing countries of the world today are in much the same position as the Tennessee Valley thirty years ago, help must be found

by them from sources outside themselves. It is here that the International Bank for Reconstruction and Development finds its greatest usefulness. Not only is it in a position to make loans necessary to prosecute the projects that, together, result in integrated development programs, but it can also assist in evaluating the feasibility of various proposals. Finally, it can advise on the capability of consulting firms that may be selected by borrowers for their projects. The Bank does not undertake with its own staff to perform any engineering functions related to the design or prosecution of a sponsored project; its role is the more passive one of guiding, observing and advising as may be appropriate to insure ultimate success of the project.

After a consulting engineer satisfactory to the borrower and the Bank has been chosen, the Bank's primary interest is to see that responsibilities of the consultant are clearly set forth and that he will be fully utilized in carrying out those responsibilities. To achieve this it is often necessary to arrange meetings with the borrower and his proposed consulting engineer as means of ensuring not only that the consulting engineer understands the terms and conditions of employment, but that the borrower is aware of the responsibilities and authority which the consulting engineer will bear and exercise on his behalf.

Although consulting engineers are selected by borrowers with Bank approval for projects financed by Bank loans, the situation changes when work of a technical nature is to be undertaken for a country by the Bank, acting either for itself or for the United Nations Special Fund. In such cases the Bank selects the consultants with approval of the benefiting country.

Whether selection is by the Bank or by a borrower, however, the procedure is essentially the same, beginning with an invitation to a limited number of reputable firms to submit proposals. The invitation should be precise, defining the scope of activity required and outlining the duties and responsibilities anticipated.

Proposals should be evaluated, after due consideration of the plans submitted, by weighing the capabilities and experience of the personnel to be employed, along with the quality of supervision indicated and the amount of time to be devoted to the job by the firm's principals. The capability of the firm is also weighed with respect to the work it is currently handling, its ability to start the work quickly and carry it forward uninterruptedly to a successful conclusion. Often it is found desirable to engage consortiums of two or more firms in order to obtain a diversity of talents, particularly in connection with large multipurpose development projects. In such cases, firms from different countries may be brought together for the work in order to gain a wider experience.

While cost must play a part in the decision, it should have less influence than many of the other factors. Engineering costs constitute a very small percentage of the total cost of a project, but engineering errors or misjudgments can add hugely to it. Cheap engineering can be very expensive.

For this reason firms should never be asked to submit bids; nor, in fact, should price be even considered by an owner until he has decided upon the firm best qualified for the job. Then, and only then, should terms be

requested. If the terms appear reasonable, a contract may be signed, but there can never be objection to a frank discussion of the terms as submitted. The purpose of negotiation, however, should not be to obtain the lowest possible cost, but rather to obtain assurance of the reasonableness of the offer and the firm's ability to perform in consonance with it.

In the files of the World Bank are the names and experience records of some 1,750 engineering firms from 37 different countries of the world. Among these firms are large organizations whose names are known wherever engineering work is going on. There are also many smaller firms, organizations of thirty to forty men, and many more still smaller. Among those listed are a good many who offer services as individuals.

The Bank is interested in keeping its information on all these firms current and up-to-date. There is so much work to be done in all parts of the world that any firm of good repute may be called upon at any time for service, and the Bank must be ready to pass judgment on it.

In my position as Engineer Adviser, I come into daily contact with the representatives of many consulting engineering firms. Those who have not had work on Bank sponsored projects, or in fact, outside their own countries, find it almost hopelessly confusing when they first consider the problems involved. Beyond language differences are the difficulties presented by unknown and different environments, strange customs, unfamiliar laws, varying exchange rates, and climatic and meteorological conditions hitherto unknown.

These difficulties, however, though at first seemingly insuperable, fade rapidly as knowledge and experience are acquired. Affiliation with foreign firms provides an excellent means of developing good working relationships abroad and making profitable connections. Little by little, the professional organizations of the more sophisticated countries are drawing together to develop better bases of understanding and common codes of ethics. It is a responsibility of all the professional societies to assist in this by extending their horizons and encouraging participation by their members in international meetings and discussions. The officers of the Union Panamericana de Asociaciones de Ingenieros and the organizing committee of this VIIIth Convention, are to be congratulated on the success of their efforts in this direction.

BUILDING A NEW WORLD

Address by Brig. Gen. H. D. Vogel
Engineer Adviser World Bank

To Knoxville Technical Society
January 6, 1964

There were two principal concerns in the minds of those who participated in the United Nations Monetary and Financial Conference at Bretton Woods, New Hampshire in July 1944. First was the question of stabilizing world currencies and international monetary exchange; second, was the problem of finding money to rebuild the war-torn countries and develop the emerging ones. The International Monetary Fund was established in answer to the first enigma and the International Bank for Reconstruction and Development as a solution for the second. Each of these, as well as IDA and IFC, later affiliates of the Bank (popularly known as the World Bank), has the status of a Specialized Agency of the United Nations.

IDA stands for International Development Association, and IFC for International Finance Corporation. There will be more about them later, but for the moment let us consider the Bank itself, how it gets its money, how it puts it to work, and what it has been able to accomplish.

Although established in 1944, the Bank did not begin operations until 1946. It started with forty-one member countries subscribing for capital stock in the amount of $10 billion; there are now one hundred and one member countries and the subscribed capital is more than doubled. Of the total amount, however, only about 10% has been paid in cash of the realm. The remainder is in the form of notes subject to call in the unlikely event it were needed to meet the Bank's obligations.

Banks not only lend but borrow, and the World Bank is no exception to this. It borrows on the money markets of the world through the sale of bonds, just as TVA has done on Wall Street. The Bank enlists the support of private investors by selling parts of its loans and in this way has added $1,600 million to the funds available for development financing, which today is its principal purpose. The first loans, amounting to about $500 million in 1947, were for postwar reconstruction, but in 1948 emphasis turned to development and through those and the ensuing years 370 loans, totalling over $7,300 million, have been made to finance more than 800 projects in 68 countries or territories. Asia and the Middle East have received a lion's share, amounting to $2,445 million. Western Hemisphere is next with $1,855 million, closely followed by Europe with $1,685 million; while Africa and Australia trail with $925 million and $425 million respectively.

Approximately one third of these loans have been for electric power with another third for the improvement of transportation and aids thereto. The remaining third has been for agriculture (especially irrigation), for industry (especially steel production) and for general development purposes.

The term of a loan in any case is determined by the character of the project for which it is intended, the average being about 15 years. Interest charges are based on the rates which the Bank has to pay on its bonds, and includes a 1% annual commission charge which is allocated to a Special Reserve. During the past 5 years rates have varied between five and six and a quarter percent.

Net earnings of the Bank now amount to about $83 million a year, excluding the 1% commission charge, and its reserves have built up to about $850 million, all of which indicates that it conducts a conservative and profitable business under its international Board of Directors. There are nineteen of these, five being nominated by the largest stockholders: the United States, the United Kingdom, France, Germany and India. The remaining fourteen are elected among the other member countries, and represent generally blocs of adjoining interests. Voting powers of the executive directors is proportional to the capital subscriptions of the countries they represent and each has an alternate to serve in his absence. Powers exercised are delegated by a Board of Governors, on which each country has a member, and which meets once a year.

The Bank lends money to member countries, their agencies of government, and private enterprises. Loans generally apply only to the foreign exchange cost of a project. All loans must be guaranteed by Governments. There have been no defaults; terms have been hard and have been enforced.

There are, however, cases where special consideration is needed by countries unable to meet the strict terms of a Bank loan. Here the Bank has encountered conflict between its principles and its principal purpose. To create a means of financing worthwhile undertakings by countries whose need is greater than their ability to service conventional loans, IDA was established in 1960 as an affiliate within the Bank structure. Credits are extended only to Governments and are for terms of fifty years without interest. Repayment is due in foreign exchange and amortization begins after a ten-year period of grace. A service charge of 3/4 of 1% per annum, payable on the amounts withdrawn and outstanding, is made to meet IDA's administrative costs. Relaxation of pressure with respect to terms and rates, however, does not imply a similar relaxation as to project standards, which are the same as for Bank loans, and the beneficiary makes repayments to its sponsoring Government on standard Bank bases.

IFC, also a member of the World Bank group, was established in 1956, for the purpose of promoting industrial developments by private enterprise. It has been particularly active in the Americas, over two thirds of its investments having been made in this hemisphere. It does not invest in undertakings which are Government owned and operated, and its loans are not required to be guaranteed by Governments.

Whatever the loan or whatever the project financed by it, the Bank has an interest in seeing that both are justified by circumstances. For this, there is need of economists, lawyers, financiers and engineers. Specialists of other kinds are needed, too: geologists, hydrologists, meteorologists, agriculturists, agronomists and foresters, just to name a few.

Many of you will remember a visit by the Vice President of China to TVA in August 1961. At that time he expressed the opinion that many projects

undertaken in developing countries, being without justification, had led to disappointment and resentment against the would-be-friends who had financed them. He compared a sick country to a sick man, saying that treatment should be undertaken only after a thorough clinical diagnosis and study, and that experienced doctors should apply it. His Excellency, Chen Cheng, may well have had in mind the methods of the World Bank when he spoke, for his country has been a member for many years.

The Bank renders to its member Governments a wide variety of technical assistance, ranging from full-scale surveys designed to assess economic potentials and develop programs, to regional investigations of a limited scope. This is done by teams organized and constituted for the specific purposes, by individual consultants, and by consultant firms, acting either independently or as members of a consortium.

Once a program has been determined, its components are considered and projects are formulated. Loans are made on projects that give promise of fruitful return, either in the form of direct benefits or by contributing in a material sense to the economic base.

The technical staff of the Bank includes engineers, economists, educators, and others of the allied arts and sciences, who make visits to the sites of projects and confer with officials of the Borrower, both prior to the signing of the loan agreement and later. They advise on details, receive reports and render recommendations.

Engineers of the Bank, while not directly engaged in the design of projects, are nevertheless deeply concerned with the adequacy of design and performance capabilities. They must therefore determine that engineering consultants employed by Borrowers are properly qualified and experienced for their assignments, that the staffs of such firms are competent and adequate, and that the terms of reference under which they are employed are such as to insure exemplary execution of the project. As work progresses through its many stages, the technical staff remains in close contact with it.

The Bank takes the attitude, quite properly, that money borrowed for a project belongs to the Borrower. It should be for the Borrower, therefore, to select his consultants. But the Bank has an interest in being repaid and repayment may be affected by the way the project is designed and executed. It reserves the right therefore to approve the Borrower's choice.

When studies are financed by the Bank itself, or by the United Nations Special Fund, with the Bank serving as executing agency, the situation is, of course, different. For such assignments engineering consultants are selected by the Bank in cooperation with the Government or the particular agency of the Government concerned. Since the Bank is an international organization, it is also interested in assuring itself that consultants are selected on an international basis, and that specifications prepared by them will permit international competition among all member countries for the construction contracts and for the furnishing of equipment and supplies.

Some 1200 consulting firms from 36 member countries have indicated a desire to be considered for employment in connection with Bank projects. Nearly half of these are from the United States; the bulk of the remainder are from the United Kingdom, Canada, France and Germany, but Belgium and Holland are both well represented by competent firms.

The Bank has established complete files on all these firms in order to pass judgment on those chosen or proposed by member countries and to assist itself in its own selections. It does not, however, maintain a registry of qualified firms. As engineers you will realize that a firm may be qualified for one line of work and not qualified for another. Also, it may be qualified today and overburdened tomorrow. These are added reasons for the Bank to refuse to nominate consulting firms to its borrowers.

Since the Bank does not recommend consulting engineers for a project on which a loan is made, it is essential that a consultant interested in obtaining work abroad find out about the projects before they reach the stage of a negotiated loan. This is not an easy task. However, there are many sources of information to be probed, including Embassies of the underdeveloped countries, Commercial Counselors of U.S. Embassies abroad, press releases and reports of economic missions, and publications such as "International Commerce" of the U.S. Department of Commerce.

After a consulting engineer satisfactory to the borrower and the Bank has been chosen, the Bank's primary interest is to see that the responsibilities of the consulting engineer are clearly set out in his agreement with the borrower, and that he is to be fully utilized in carrying out those responsibilities. To achieve this, it will be necessary in most cases to have consultations with the borrower and the proposed consultant to agree on terms of reference for inclusion in the agreement, and to ensure not only that the consulting engineer is aware of the terms and conditions of his employment but, also, that the borrower is aware of the responsibilities and authority which the consulting engineer is going to bear on his behalf. During these discussions, the Bank will make clear to both the borrower and consulting engineer any requirements which the Bank may have, and satisfy itself that the borrower will give to the consulting engineers sufficient power and discretionary rights to exercise their responsibilities objectively and carry out efficiently the terms of their agreement.

In my position as Engineer Adviser, I come into daily contact with the representatives of many consulting engineering firms. Those who have not had work on Bank sponsored projects, or in fact, in the foreign field find it almost hopelessly confusing when they first consider the problems involved. Beyond language differences are the difficulties presented by unknown and different environments, climatic and meteorological variances hitherto inexperienced, and aggressive competition by consultants from other countries whose salary scales are lower and who in many cases are not ethically restricted from bidding for assignments.

These difficulties, however, though often seemingly insuperable, fade rapidly as knowledge and experience are acquired. Affiliation with foreign firms provides an excellent means of developing good working relationships abroad and making profitable connections. Little by little, the professional organizations of the more sophisticated countries are drawing together to develop better bases of understanding and common codes of ethics. It is a responsibility of all the professional societies to assist in this effort by extending their horizons and encouraging participation by their members in international meetings and discussions.

Individual engineers have the responsibility of keeping their societies mindful of the need for self-policing and the enforcement of ethical conduct by its members. They must also exercise self-discipline and be prepared to accept sacrifice for the preservation of principles.

There is no denying that in some countries of the world, just as in some localities of this country, engineering bargains still are sought and favors still are bought. But there is steady improvement all along the line, and the Bank is making strong effort on its part to establish in all areas the conviction that engineering service is better measured by experience and capability than by fees. Cheap engineering can be extremely costly in the long run and no country is rich enough to afford it. With engineers everywhere cooperating, the task of building a New World will be accomplished in less time than many will believe possible in even this age of engineering miracles.

Notes of speech at Harrisburg, Pennsylvania, by General H.D. Vogel to Engineers Society of Pennsylvania, April 15-1964

While engineering processes may be slow, they are also sure. When diligently pursued and intelligently applied, they lead to results that are not only reliable but economical. From the standpoint of the International Bank for Reconstruction and Development as well as its borrowers it is necessary, of course, that firms selected for consulting work shall have had satisfactory experience on comparable projects; that the staff to be assigned to the particular work is qualified and adequate, and that the terms of reference under which they are employed are such as to assure satisfactory execution of the project. The Bank, therefore, while leaving it to borrowers to select consultants, reserves to itself the right of approving the selections.

Consulting engineers are employed by the Bank, either as individuals or firms, to assist in project appraisals when special expertise is required or when the work load is greater than the regular staff can handle. Consultants, so employed, are required to abstain from any subsequent work for the borrowers that may be related to the project.

Consulting firms are used by the Bank or by governments on technical assistance projects financed by the Bank, and on projects of the United Nations Special Fund for which the Bank may be designated the executing agent. In such instances, the Bank selects the consultant in cooperation with the government of the country to be benefited.

These are special cases, however, for the employment of consultants, the more usual being in connection with projects financed by loans. Then the borrower, as previously indicated, selects the consultant with concurrence of the Bank.

In order that it may have current information on the capabilities and experience of firms whose services may be under consideration for projects, the Bank maintains an active file containing data on some 1500 organizations.

The fact that there are so many engineering firms in the United States, eager and able to perform services in the developing countries, should not be taken as an indication of this country's technical superiority. Quantity does not necessarily prove quality. There are excellent engineering firms in all of the industrialized countries and none can claim a considerable margin on any other.

Five years ago in a speech at the All Engineers' Dinner, The American Power Conference, I said, "My own contact with engineers and technicians from other parts of the world who come to visit T.V.A. and examine its facilities has dispelled any illusions I may have had as to their lack of ability to compete with us on equal terms. These men are learned in their professions, alert to their opportunities, and aware of the world-wide implications of their activities. In many fields they are beginning to regard us as a bit old-fashioned and too adherent to tried and proven methods of the past.

The Italian engineers who built the Kariba Dam experienced two record breaking floods in the course of their work, but they achieved success nevertheless. The Germans are making remarkable advances in the design and construction of lightweight "slender bridges."

Everything I have seen since joining the World Bank has served to confirm this view. The French take second place to none in the design of thin arch dams; the Italians and Swiss excell in the design of electrical facilities and equipment, while other Europeans stand ready to challenge their best achievements; the Dutch have outstanding skills in the design of harbor and land reclamation works; also dredges and everywhere there are experts in foundations treatment, tunnelling, roads, bridges, telecommunications and the building arts.

We tend to think of the Latin American countries as deficient in skills that are found here in abundance. But let us not be misled. There are, even in the smaller countries, engineers of marked ability, high intelligence and thorough education, now organized to compete with engineers of the north on an equal basis. If they have lacked anything in the past it has been the opportunity for experience, but this is being rapidly remedied. The engineers of this grouping, whom I have met, are young, keen, eager and obviously dedicated. Their integrity and capacity for leadership give new hope for the future of their countries.

Although "world engineering" is drawing more and more of the profession to its pursuit, only a small percentage of the total membership can find opportunities to so engage its skills and talents. To those of it who do, it provides an intriguing experience. After the initial frustrations of working in a strange environment against climatic conditions never before experienced, and conforming to local laws and customs which must be learned along with unfamiliar languages, there comes the satisfaction of being part of a larger society, the pleasure of extending the circle of professional friendship and of contributing not only to the betterment of other people's conditions, but to their knowledge and appreciation of the democratic processes.

THE CHALLENGE OF DISTANT HORNS

Address by Brig. Gen. H. D. Vogel
Engineer Adviser World Bank

To Institute for International Engineering
September 25, 1964

There is probably no profession that provides more healthy competition today than engineering. Industry pits the talents of technicians, one against another, as it seeks to produce better products or render greater service at lower cost; government agencies with growing responsibilities strive for higher efficiency through improved techniques; and consulting engineers have found it increasingly necessary to go out for business. The problem imposed, however, is not simple, for professional competition must be tempered by restraint. There can be no holding forth of bargains except by offerings and proofs of higher skills and better service.

In a free-enterprise society, competition is dulled by a sellers' market; correspondingly it is sharpened by a buyers' market. The large number of engineers offering services as consultants has created a buyers' market, not only in the United States but throughout the world. And the services offered are generally excellent in all quarters. It has been estimated that within the United States alone, there are more than 7,500 consulting engineering firms. How many engineers they employ is anybody's guess, but if they average 25 each - a figure which is not unreasonable - the total would run to near 20 thousand. If sub-professionals are included, the number will run more than twice that.

There can be no question in the mind of anyone - engineer or layman - but that we are living in a technical age - an age in which more scientific advances have been recorded than all the rest of history. Its forerunner was the golden age of discovery, running through early American years into the twentieth century, when such wonders as the steamboat and cotton gin appeared, followed by the telegraph, the telephone, the incandescent lamp, electricity to revolutionize industry and the internal combustion engine to change transportation habits.

All this led to the building of a fool's paradise. As Americans, we came to believe - not only in our technical superiority - but that Yankee ingenuity could solve any problem in the world. We bowed briefly to Archimedes, Newton, Watt, Lavoisier and other pathfinders of science and engineering, but our eyes were on Kettering, Steinmetz and a whole host of engineers in the automotive and electrical industries who were providing leadership toward mass production. Somewhat resentfully we accepted the fact that progress was occurring in other parts of the world. We would have been happier

if Marconi and Bleriot had been born in the United States instead of Italy and France. It would have kept the image that we wished for ourselves much tidier.

In any case, however, the image, and the illusion of technical superiority had become deeply rooted by the late twenties. At that time, the Chief of Engineers of the United States Army was shocked to find that one John R. Freeman had established a fund to create traveling fellowships for the study in Europe of hydraulic laboratory methods. American engineers, he told the Congress - which was then considering at the insistence of Mr. Freeman an appropriation of funds for a laboratory in the Bureau of Standards - American engineers are accepted leaders of their profession. He told how in the First World War they had built docks and railroads, warehouses and roads with bewildering speed, to be regarded as marvels of modern construction by the French and British. How could anyone in his right mind believe that there was anything to be learned from Europe!

With World War II, American engineers began to look more sharply at their own capabilities and limitations; they became more acutely aware of developments in other countries. Even though the power of the atom was unleashed on American soil, it had taken the joint efforts of many people from many countries to accomplish the feat. And British-invented Radar could not be ignored, nor the planes and tanks of the enemy.

Then with the Russian sputnik a great wave of apprehension swept our technical society. For the first time, outward fear was evidenced about a loss of leadership. The instantaneous reaction was not to ask how better engineers might be trained and educated, but how their numbers might be increased. The cry was for quantity and never mind the quality.

In response the universities began to build additions, engineers made speeches to high school classes and the technical classrooms were filled. Suddenly there were enough young engineers for every conceivable job, and a few to spare. With industries running over and government needs supplied, consulting firms began to multiply and each had to find activity for itself.

Something akin to this technological expansion has occurred in every industrialized country. Those which had suffered war damage were the first to mobilize their technical forces and get to work. Generally speaking, there was enough for these to do to keep them busy for several years. Meanwhile, the developing nations began to make known their needs and desires. Improved means of communication had brought them word of the wonderful things that had been taking place in the rest of the world and awareness had grown among them of the importance of developing their natural resources.

With means of financing made available by the International Bank for Reconstruction and Development, and similar institutions, as well as by governments of the more affluent countries, a demand grew for the services of engineering consultants. New firms appeared in response to the need, and old firms grew in size and scope. Branch offices were established in distant corners of the world to find jobs and establish contacts. Today there is

hardly an area of the world in which consulting engineers of the technically developed nations fail of representation.

And let it be known there is now no country of the world that can lay legitimate claim to an over-all engineering superiority. There are those that excel in special fields as, for instance, the French in the design of thin arch dams, the Dutch in land reclamation, and the Italians in electrical design, but none are without unrelenting competition. And in construction and production it is the same. Germans, English, Americans, Scandinavians, and many others, including the Japanese, have demonstrated marked ability in both general and specialized areas of activity. South American engineers are improving their skills apace, and have pioneered new bold architectural uses of cement concrete. Both India and Pakistan are moving ahead in the wide field of resource development.

In recent years there has been a decided trend toward the formation of international consortia. Partly because surveys and investigations have come to include larger and larger areas, partly because the need for comprehensive development of resources has become recognized, and partly because capabilities can be increased by combining talents and experiences - for all these reasons and perhaps others - engineers have learned to work together in spite of language barriers and similar difficulties.

Within countries, similar developments have been occurring. Small firms have been grouping together to form associations of considerable size, under responsible leadership, to challenge the larger organizations and get themselves into the foreign field. Some such associations, particularly in Europe, extend across several countries. The greater strength resulting from the pooling of resources has enabled these associations to make themselves known through representatives and elaborate brochures that otherwise they could hardly afford.

The professional attitude toward making known the availability of one's services has also been changing during the past few years. Realization has been spreading that work does not come to firms who hide their light under a bushel. Yielding to commercial methods of selling their services has come hard to the engineers of many countries. In Germany, particularly, associations were formed reluctantly from the independent consultants, many of whom are still unreconciled to being members of the larger group. In Australia, where brochures have been severely frowned upon, there is a gradual tendency to come forward with offers of services, but such actions are still regarded as not quite proper for professionals.

All of this relates directly to the position that the International Bank for Reconstruction and Development has seen fit to take with respect to the selection of consulting firms for projects financed by its loans. Responsibility of choice in such matters is passed to its borrowers, subject to approval by the Bank. Consultants, therefore, must find means of making themselves known to borrowers, yet at the same time must keep the Bank sufficiently supplied with information bearing upon their experience and capabilities that the Bank may be able to pass judgment on their qualifications for any specific assignment at any particular time.

In the case of special studies, the foreign exchange costs of which are financed gratuitously by itself or the United Nations, the Bank reverses the usual procedure and makes the selection of consultants, often joining those of several countries into a consortium. In such instances, approval of the choice is sought from the country which will benefit from the services and which will pay the local costs.

As a matter of general principle, the Bank refrains from providing lists of consultants to guide the choice of borrowers. It believes that it would be most difficult, if not impossible, to do this impartially and, however carefully it were attempted, many good firms would be excluded from further consideration.

Engineers of the twentieth century have seen many changes in their lifetimes, and the changes have been in many fields, in many forms. However they have been induced, by technological developments or by advances in science and engineering, it is true that attitudes have been affected, whether for better or worse. It has been found necessary to become competitive in a competitive world. This does not mean, however, that consulting engineers need to sacrifice their professionalism and resort to competitive bidding.

The World Bank has attempted by many means to discourage its borrowers from requesting bids of professional firms, pointing out that requests for proposals should be limited to a few firms in any instance, that final selections should be based on merit alone, and that financial negotiations should be left to the last. Repeatedly it has been told them that cheap engineering can be the most costly. But still solicitations go out in many instances to a large number of consultants with an invitation to submit money bids only thinly veiled.

In such cases it is for the ethical engineer to prepare the best possible proposal as to the methods he will employ, the personnel he will put on the job, and the attention that he himself will give to it. His competition should take the form of offering high performance, superior skills and a well conceived plan; not of holding forth a tempting price. In fact, if asked to name a fee he should restrict himself to stating how it will be computed, omitting any specific figure. If he should be selected as the one best qualified professionally for the job to be undertaken, there will then be plenty of opportunity for negotiation.

The role of the engineer is always to serve the needs of humanity, to aid in social progress, and make life easier for people everywhere. He cannot fit the part if he abandons his principles and becomes blind to the ethics of his profession. More than ever, as he is forced into competition in an aggressive world, he must learn to act with discretion in his business relations, with fairness and consideration to others of his profession, and with unremitting devotion to the interests of those he serves.

THE INFLUENCE OF ENGINEERS ON A CHANGING WORLD

Address by Brig. Gen. H. D. Vogel
Engineer Adviser World Bank

Annual Awards Luncheon
American Society of Civil Engineers
Statler-Hilton Hotel, New York
October 21, 1964

The middle years of this twentieth century may well shape up to engineers of the future as marking a period of two great pioneering movements. First, of course, in its appeal to the imagination, has been the exploration and exploitation of space, but close to it in significance has been the extension of engineering skills to distant corners of the world where the development of indigenous resources is under way. The relative importance to human progress of these two efforts, the one celestial, the other earthly, must await the evaluation of future judgments; for the present we may content ourselves with the thought that in each case engineers are continuing in their traditional role to change the course of history.

When I was extended the privilege of appearing before you at this meeting, where such distinguished engineers are being honored, I was asked to talk about the influence of American engineers abroad. The subject is an intriguing one, but the more I thought about it the more difficult it became to separate the influence of American engineers from that wielded by those of other countries. There are differences, of course, in the way engineers of different training approach a problem; there are differences in techniques, and differences in their uses of materials, plant and equipment. But, fundamentally, engineers are all of the fraternity. Those worthy the title, possess a deep sense of professional responsibility and ingrained integrity. Their code of honor is as unwavering as the mathematical principles that comprise their basic tool. They stand dedicated to progress and the service of humanity.

The International Bank for Reconstruction and Development, more familiarly known as the World Bank, has done more over nearly a score of years than simply provide financial means by which developing nations might improve their economic lot and attain higher living standards. In addition, it has given incentive to comprehensive planning and encouraged the full and efficient utilization of completed projects. Through the engineers of its own organization and those of consulting firms employed by it and its borrowers, cooperation has been achieved, new attitudes developed and warm friendships established.

International consortia are working together in many countries, oblivious to national and racial differences, concerned only about the problems at hand and the jobs to be done. In West Pakistan, for example, where the Bank has not only provided loans for many projects but is acting as administrator for the Indus Settlement Fund, the engineers of half a dozen countries are working together as advisers, consultants, and members of contractors' teams, taking lessons from the ages and adapting old methods to the use of new tools. I have seen huge grading machines smoothing the banks of conveyance canals that they may be paved by hand with hand-made bricks. The cost is less

than for concrete paving, and many people are permitted to earn a livelihood while gaining a sense of participation in important work. At another location, caissons for bridges are being sunk by their own weight on a cutting edge, while earth is removed in buckets from their interior by divers without equipment; the buckets being then hoisted by oxen and windlasses.

On other projects, including dams, barrages, and aggregate production, the largest and most modern of plant and equipment is employed with high efficiency. Bulldozers and shovels are skillfully operated in many instances by men trained for the job, who until recently had never driven anything more powerful than a bullock. Maintenance is carried out in modern repair shops, supplied by continuing "pipe-line" shipments from the western world.

At Mangla Dam one finds a modern construction town with pleasant, air-conditioned homes resting in a grassy compound. Schools and all facilities for comfortable living have been provided by the contractor, and include a shopping center complete with beauty parlor, hotel and restaurant. There is a business-like hospital with up-to-the-minute equipment and a top-flight staff of doctors and nurses. The contractor, faced with a ten-year job, has figured it is cheaper to keep good people on it than to bear the cost of constant replacement.

While the engineers on such large undertakings are making their impressions on those with whom they work, their wives, too, are exercising a notable influence. One has organized a nursery school, another has raised funds for a large new hospital and, thus inspired, local wives have set to work along similar lines. To cite a single instance, the wife of a Pakistani engineer organized a group of her friends some months ago to build a nursing home for the care of indigent oldsters, and the institution, though small, is now an operating success.

It would be good to report that the influence of the western wives ended on that happy note. Unfortunately, however, the lady got carried away to such an extent that she sat down one day and wrote an article for the local Sunday paper, bewailing the vicissitudes of an engineer's wife. It shocked her husband so that he would not go out socially for several days, but eventually he saw the humor of the situation and forgave her. The article in question was carried in condensed form in Civil Engineering a few months ago, and it may be presumed that many of you have read it.

It is a stimulating experience to sit in a conference with the engineers of a number of countries, all contributing to the solution of a knotty problem. It is equally stimulating to be with them in their lighter hours while they mingle with local engineers and their families, creating new friendships and broadening all attitudes including their own. The developing of communications may take many forms, and all lead in one way or another to better understanding.

Improvement of communications in the concrete sense, the building of railways, highways, waterways, harbors and port facilities, has accounted for about a third of the loans of the World Bank. Another third has been made for the expansion of electric power facilities, including the installation of nearly 20 million kilowatts of generating capacity. The final third has served to stimulate agriculture, industry and general development. All of these have

required, in one way or another, the expertise of engineers, and great care has been taken in each case to find the right ones for the job. When borrowers know that borrowings must be repaid with interest, and that the projects resulting from them must therefore yield benefits in excess of costs, it becomes important to them that the best engineering be employed in their prosecution.

Such engineering has many sources; no one country can claim superiority in any field for more than a passing moment at the rate changes occur today. It behooves all engineers, therefore, to keep alert and make the most of the opportunities afforded by international partnerships and contacts. With the exchange of knowledge, the broadening of understanding, and the search for truth that inevitably ensues, a strong and beneficial influence is brought to bear upon the course of history.

File - Speeches - Vogel
1930-1964

January 29, 1965

Mr. Shuji Suzuki
Executive Secretary
The Japan Dam Association
Daiwa Bank Building
2-Chome, Hihombashi-Horidome
Chuo-Ku
Tokyo, Japan

Dear Mr. Suzuki:

This replies to your letter to the International Bank for Reconstruction and Development which has been referred to my attention. I regret that I have never kept a complete list of articles and professional papers that I have prepared. Many of these have been of current interest only, or have established principles that, being accepted, are no longer consequential.

During the years 1930 to 1934, I wrote extensively on the subject of experimental hydraulics and river control and many of these articles appeared in The Military Engineer, Civil Engineering, and the Engineering News-Record. The copies of these articles that I preserved have now become a part of the "Herbert Vogel Manuscript Collection at Syracuse University." The Administrator of Manuscripts there can undoubtedly give you specific information as desired. The most notable paper of the 1930-1934 period is Paper No. 1894 of the American Society of Civil Engineers, entitled "Practical River Laboratory Hydraulics." This paper and comments upon it covered about 75 closely printed pages and has been widely cited in technical texts. A similar paper entitled "Hydraulic Models - Geometrical or Distorted" was published in 1940 in Proceedings of Hydraulics Conference, University of Iowa, Bulletin 20, Series 379.

Some other items are:

Dissertation zur erlangung der Würde eines Doktor - Ingeniers
der Technischen Hochschule zu Berlin, June 15, 1929,
"Der Einfluss der Entwaldung auf die Regelung der Flüsse."

Miscellaneous papers for the Permanent International Association of Navigation Congresses, including:

Paper S.I.-2 XXth International Navigation Congress,
"Navigation Engineering Problems in a System of Multiple Purpose Dams."

Proceedings, ASCE, January 1960,
"New Approach to Local Flood Problems."

Vol. XXI Proceedings of American Power Conference 1959,
"Engineers Must Do Better."

Public Utilities Fortnightly, June 19, 1955,
"Is TVA's Allocation of Costs Fair?"

Publication of Army War College 1948,
"Logistical Support of the Lingayen Operation."

The Military Engineer, March-April 1956,
"An Engineer's View of TVA."

Financial Analyst's Journal, March-April 1960,
"TVA Power Revenue Bonds to Finance Unprecedented Power Needs."

The Military Engineer, No. 347, May-June 1960,
Editorial: "Specifications for a Military Engineer."

Electrical World, March 4, 1957,
"What's Ahead for TVA?"

The Military Engineer No. 352, March-April 1961,
"Origin of the Waterways Experiment Station."

Electrical World, September 7, 1959,
Interview Article: "TVA's Vogel Airs His Views on Foreign Purchasing."

Journal of the Knoxville (Tenn.) Chamber of Commerce, January 1960,
"TVA - What Lies Ahead?"

American People's Encyclopedia, 1960,
"The Tennessee Valley Authority."

Civil Engineering, December 1959,
"A New Approach to Local Flood Problems."

The Black Diamond, August 1, 1959,
"The TVA Market for Coal."

Electrical World, November 6, 1961,
"Competition and Administered Prices."

Public Utilities Fortnightly, March 2, 1957,
"Role of TVA Explained."

In addition, there have been many speeches from prepared texts, of which 78 manuscripts are available. These are for the period 1954-1962. A list of titles is attached.

Of more recent interest are the following speeches:

"Building a New World" - Address to Knoxville Technical Society Knoxville, Tennessee, January 6, 1964.

"Engineers and the World Bank" - Address to the Engineers Society of Pennsylvania, Harrisburg, Pennsylvania, April 15, 1964.

"The Role of Engineers in Resource Development" - Discussion for VIIIth Convention Union Panamericana de Asociaciones Ingenieros, Caracas, Venezuela, August 20, 1964.

"The Challenge of Distant Horns" - Address to the Institute for International Engineering, Boulder, Colorado, September 25, 1964.

"The Influence of Engineers on a Changing World" - Address at the Annual Awards Luncheon, American Society of Civil Engineers, New York City, New York, October 21, 1964.

The Military Engineer, September-October 1964, "Consulting Engineers and the World Bank."

I am sorry that I am not able to give you a more complete reply but I have never made a serious effort to catalogue my articles, papers and speeches.

Sincerely,

Herbert D. Vogel
Engineer Adviser

Attachment

cc: Mrs. Eliason

HDV/agk

List of Titles of Speeches

1. A Look at TVA
2. Power Production - A Measure of Human Progress
3. Power for National Defense
4. Power for Defense
5. Keynote Speech, 4th Southern Municipal and Industrial Waste Conference
6. Pattern of Cooperation
7. Electric Power and Industrial Development
8. Paper and Pulp Industry
9. Industrial Requirements for Growth
10. Control of Natural Waters
11. Agricultural Activities of TVA
12. Engineer's Role in Resource Development
13. Engineering Leadership in a Dynamic Age
14. Some Operational Aspects of a Large Integrated Power System
15. Role of the Civil Engineer in Multipurpose River Development
16. Engineers and The Space Age
17. Looking at the Record
18. Checking the Routes
19. Keynote Address to Runtan National Convention
20. Light for the World
21. An approach to Water Safety
22. Economic Aspects of TVA
23. Making the Most of One's Resources
24. The Example of Guntersville
25. Regional Resource Development
26. Comprehensive Planning for Resource Development

27. The Soviet Challenge
28. Progress in the Valley
29. Resources and National Defense
30. Conservation and Our National Strength
31. Flood Problems of Expanding Urban Areas
32. The Nation's Stake in TVA
33. The Regional Development of Resources
34. Address to Presidents of Southern Universities
35. A New Approach to Local Flood Problems
36. Address to Southern States Industrial Conference
37. Responsibilities of Higher Education
38. The Challenge to American Supremacy
39. Elk River Development
40. A Pattern for Economic Growth
41. A View of Water Transportation
42. An Introduction to TVA
43. The Value of Cooperation
44. Multiple Resource Development
45. A Tale of Two Cities
46. Clinch and Powell Associations
47. No Freedom without Responsibility
48. Forest for the Trees
49. Statement to the Kentucky Public Service Commission
50. The Valley Authority
51. What Can You Do for Your Country?
52. City Problems of Knoxville
53. Administered Prices
54. Financing Power Development

55. The Coming of Spring

56. Making Use of Leisure

57. TVA and Kentucky

58. The Business and Professional Man's Responsibility for International Understanding

59. Multipurpose Use of Water

60. Resources and Technology

61. Duck River

62. Between-the-Lakes

63. Competition and Administered Prices

64. Water is a Tool

65. Elements of Successful Enterprise

66. World Economic Developments

67. Engineering for Progress

68. Engineer's Week

69. A New Era

70. Goals of Conservation

71. Service for Success

72. The Search for Truth

73. Our Wasted Resources

DER INGENIEUR UND DIE WELTBANK

Vortrag von Herbert D. Vogel, Beratender Ingenieur bei der Internationalen Bank fuer Wiederaufbau und Entwicklung, vor dem

Verband Unabhaengig Beratender Ingenieurfirmen

in Muenchen, am 18. Februar 1965

Es ist fuer mich eine besondere Freude, mit Ingenieuren vom Verband Unabhängig Beratender Ingenieurfirmen hier in Muenchen zusammenzutreffen. Dafuer sprechen drei Gruende. Zuerst fuehle ich mich gegenueber deutschen Ingenieuren stark verpflichtet, denn sie waren es, die mir in den spaeten Zwanzigerjahren meine Grundkenntnisse ueber experimentelle Wasserbautechnik vermittelten. Eine fuehrende Rolle in meiner Unterweisung hatten die Herren Professoren de Thierry und Ludin von der Technischen Hochschule Berlin inne; auch wurden mir die Anleitungen der Herren Dr. Seifert und Dr. Eisner und des Herrn Baurat Koerner von der Preussischen Versuchsanstalt fuer Wasserbau und Schiffsbau zuteil. Zu den anderen Herren, denen ich dankbar verbunden bin, zaehlten damals die Herren Dr. Engel, Dr. Rehbock, Dr. Heisser und Dr. Kirschmer sowie viele andere. Mit Ihnen, als Nachfolger dieser hochangesehenen und fuehrenden Kapazitaeten, fuehle ich mich auf das Angenehmste verbunden.

Zweitens bereitet mir diese Zusammenkunft mit Ihnen Freude indem es mir erlaubt, die vielen Hoeflichkeitsbesuche, die meine Kollegen und ich von Ihnen und Ihren Vertretern in den letzten Monaten genossen

habe, zu erwidern. Der Hauptgrund jedoch besteht in der Gelegenheit, Ihnen ueber die Weltbank zu berichten und einiges darueber auszufuehren, mit welchen Vorhaben sie sich befasst und was die technischen Voraussetzungen fuer eine erfolgreiche Verwirklichung dieser Vorhaben sind.

Die Weltbank - mit vollstaendigem Namen Internationale Bank fuer Wiederaufbau und Entwicklung genannt - wurde anlaesslich der Wirtschaftskonferenz von Bretton Woods (New Hampshire, U.S.A.) im Juli 1944 gegruendet. Zwei Jahre spaeter nahm sie ihre Taetigkeit auf und gewaehrte im Jahre 1947 Darlehen fuer Wiederaufbauzwecke. Diese Ausleihungen beliefen sich auf ungefaehr $500 Millionen. Sehr bald darauf wandte sich die Bank der Finanzierung von Entwicklungsvorhaben zu und richtete ihr besonderes Augenmerk auf diejenigen Gebiete der Erde, die solcher Leistungen besonders beduerfen. Bisher sind nahezu 400 solche Darlehen gewaehrt worden, die auf eine Globalsumme von ueber $8,000 Millionen lauten. Etwa ein Drittel dieser Summe wurde fuer Entwicklungszwecke in Asien und dem Mittleren Osten verwendet. Die uebrigen zwei Drittel waren nach absteigender Groessenordnung fuer Projekte in der westlichen Hemisphaere, Europa, Afrika und Australasien vorgesehen. Die fuer diese Darlehen erforderlichen Kapitalmittel wurden hauptsaechlich durch die Ausgabe von Obligationen aufgebracht, wonach sich auch der jeweilige Zinssatz bestimmt. Die Laufzeit dieser Darlehen richtet sich je nach der Art des zu finanzierenden Vorhabens; durchschnittlich betraegt sie ungefaehr siebzehn Jahre.

Die Gewaehrung von Darlehen durch die Weltbank erfolgt nach drei Hauptgesichtspunkten, wobei die Faehigkeit des jeweiligen Kreditnehmers, die Rueckzahlung des Kredites zu gewaehrleisten, an erster Stelle steht. Als zweiter Moment gilt die voraussichtliche Auswirkung des in Frage kommenden Unternehmens auf die Wirtschaftsstrukture des Empfangslandes. Schliesslich - und dies ist von entscheidender Bedeutung - ist noch festzustellen, ob das Vorhaben durchfuehrbar sein und ob es sachlich geplant und durchgefuehrt wird. Bei einer derartigen Pruefung sind die strengsten Massstaebe des Ingenieurs anzulegen.

Die technischen Vorstudien, die der Bewilligung von Krediten vorausgehen, werden von Fachkraeften der Bank vorgenommen, wobei ihnen oefters private Konsulenten zur Seite gestellt werden, wenn es sich um hochspezialisierte oder grossschichtige Arbeiten handelt. Die von einem voraussichtlichen Kreditnehmer selbst oder seinen Beauftragten angestellten Studien finden vollwertige Beruecksichtigung, und saemtliche Ermittlungen werden einer sorgfaeltigen Bewertung unterworfen.

Bei Verhandlungen ueber Darlehen muss die Gewaehr vorliegen, dass der Kreditnehmer geeignete Fachkraefte zur Projektierung und Durchfuehrung des betreffenden Vorhabens einsetzen wird. Obzwar es der Bank vorbehalten bleibt, die Auswahl eines Konsulenten durch den Kreditnehmer zu ueberpruefen, sieht sie davon ab, namentliche Vorschlaege zu einer solchen Auswahl zu machen. Diese Auswahl soll also eindeutig Sache des Kreditnehmers sein; ebenso ist es Sache der beratenden Firmen, ihre Eignung und Erfahrung einem Kreditnehmer

zur Kenntnis zu bringen. Damit sich die Bank genuegend ueber die Eignung der Konsulenten-Firmen, die sich um Projekte bei Kreditnehmern bewerben, vergewissern kann, muessen sich solche Firmen bei der Bank einfuehren, indem sie ihr eingehende Angaben ueber ihre Organisation, Faehigkeit und Erfahrung vorlegen. Die Bank wird in jedem Fall darauf bestehen, dass die in Frage kommende Firma ueber wertvolle Erfahrungen auf einem analogen Taetigkeitsbereich verfuegt, dass ausreichende Fachkraefte, die die erforderlichen Berufskenntnisse besitzen, zur Bearbeitung des Projektes vorgesehen sind, und dass eine sachkundige Durchfuehrung des Projektes gewaehrleistet ist.

Bisher sind die technischen Voraussetzungen fuer Projekte, die durch Darlehen finanziert werden, erwaehnt worden, dieselben Gesichtspunkte gelten auch fuer Projekte, die im Rahmen der International Development Association durchgefuehrt werden. Letztere Organisation, eir Schwesterinstitut der Bank, hat die Aufgabe, denjenigen Entwicklungslaendern an die Hand zu gehen, die die Voraussetzungen zur Gewaehrung von normalen Krediten nur in beschraenktem Masse erfuellen koennen. Obzwar die Bedingungen fuer Kredite durch die IDA nicht dieselben strikten Massstaebe anlegen wie bei der Bank - es wird z.B. eine geringe Gebuehr anstelle von Zinsen erhoben - erfolgt die Bewilligung von solchen Projekten und deren Durchfuehrung nach denselben Richtlinien. Diese Projekte haben dieselbe Sachlichkeit vorzuweisen;

es muss derselbe Grad von Zweckmaessigkeit hinsichtlich Planung, Entwurf und Durchfuehrung vorliegen wie fuer Projekte, die durch Darlehen der Bank finanziert werden. Auch richtet sich die Auswahl der Konsulenten-Firmen nach denselben Massstaeben bei Projekten der IDA wie bei der Bank.

Nachdem ich nun erwaehnt habe, dass die Auswahl von Konsulenten bei Projekten, die entweder durch die Bank oder die IDA finanziert werden, eine Sache des Kreditnehmers vorbehaltlich der Zustimmung der Bank ist, darf ich kurz darauf hinweisen, dass es sich bei Vorhaben der technischen Hilfe, die durch verlorene Zuschuesse der Bank oder des VN-Spezialfonds finanziert werden, gerade umgekehrt verhaelt. Bei diesen Vorhaben handelt es sich meistens, doch nicht ausschliesslich, um Studien ueber Durchfuehrbarkeit, die die Moeglichkeiten der in einem bestimmten Gebiet vorhandenen Hilfsmittel aufzeigen sollen. Diese Vorhaben koennen verschiedene Ziele zum Gegenstand haben, doch verfolgen sie alle den Grundzweck, eine bestimmte wirtschaftliche Entwicklung zu foerdern.

Bei der Auswahl einer Firma oder einer Arbeitsgemeinschaft von Firmen fuer die Ausfuehrung eines Vorhabens der technischen Hilfe verfaehrt die Bank in derselben Weise, die sie eventuellen Kreditnehmern empfiehlt. Zunaechst werden alle Firmen, deren Eigenschaften nach den gegebenen Voraussetzungen des Vorhabens in Frage kommen, geprueft. Im allgemeinen wird angestrebt, dass die zu pruefende Liste repraesentativ gesehen etwa ein Dutzend verschiedene Firmennamen

enthaelt. Daraufhin erfolgt durch Auslese eine Reduzierung auf etwa sechs Firmen, die dann einer eingehenden Nachpruefung durch ein zu diesem Zweck gebildetes Sondergremium unterworfen werden, dessen jedes Mitglied mit dem Projekt vertraut sein soll. Nach weiterer vom Gremium vorzunehmende Auslese, wobei auch frueher ausgeschiedene Namen wieder auf die Liste gestellt werden koennen, kommt man auf etwa vier Firmen, die meistens ebenso viele Laender vertreten. Das Empfangsland wird nun befragt, ob es gegenueber irgendeiner der Firmen auf der gekuerzten Liste Bedenken hat. Wenn nicht, wird jede Firma aufgefordert, Vorschlaege zu unterbreiten, aus denen der jeweilige Plan zur Durchfuehrung des Vorhabens ersichtlich ist: Anzahl des dabei zu verwendenden Personals, im Aussendienst wie in der Zentrale; Namen und Befaehigungen des gesamten Personals, darunter auch der leitenden Persoenlichkeiten; die dem Projekt zuzuwendende Arbeitszeit der Firmeninhaber; und die von der Zentrale zu erstellenden Dienstleistungen. In diesem Stadium wird noch von zahlenmaessigen Voranschlaegen oder Finanzierungsbedingungen abgesehen.

Nachdem saemtliche Vorschlaege eingegangen sind, werden sie einer sorgfaeltigen Pruefung unterzogen. Ingenieure der Bank, die ueber das betreffende Projekt unterrichtet sind, uebergeben selbstaendige Urteile dem Pruefungsgremium zur Entscheidung. Die Firma, deren Vorschlaege am vorteilhaftesten erscheinen, wird sodann aufgefordert, Verhandlungen ueber einen Vertrag aufzunehmen, unter Einbeziehung der wirtschaftlichen Konditionen. Kommt eine Einigung ueber die

Konditionen nicht zustande, so werden die Verhandlungen mit dieser Firma beendet, um dann mit der naechstfolgenden Firma aufgenommen zu werden.

Wie schon erwaehnt, ist dies derselbe Verfahrensweg, der von einem Land bei der Auswahl seiner Konsulenten-Firma zwecks Bearbeitung eines durch Kredit finanzierten Vorhabens verfolgt werden sollte. Leider ist dies nicht immer der Fall. Man vernimmt immer wieder von Faellen, in denen von Konsulenten Vorschlaege einschliesslich der finanziellen Konditionen - oder auch Voranschlaege - angefordert wurden, sowie von Faellen, bei denen die Entscheidungsmomente anders als durch die Beurteilung von Fachwissen oder Erfahrung bestimmt wurden. Kommt dies vor, so gewinnt das der Bank vorbehaltene Zustimmungsrecht an Bedeutung, um sicherzustellen, dass der endgueltig ausgewaehlte Konsulent auch in der Lage sein wird, befriedigende Arbeit in jedem Stadium des Projektes zu leisten.

Um bei der fachlichen Beurteilung behilflich zu sein, einschliesslich der Faelle, in denen die Bank selbst die Auswahl zu treffen hat, fuehrt die Bank ein vollstaendiges Register der Namen und Befaehigungsnachweise saemtlicher Firmen, die sich um Projektarbeiten bewerben. Jedoch bedeutet die Aufnahme in das Register nicht an und fuer sich, dass die Bank eine Firma approbiert oder als geeignet erklaert hat; auch ist keineswegs daraus zu schliessen, dass die betreffende Firma eine Vorzugsstellung einnimmt. Etwaige Einstufungen der Firmen dienen lediglich der sachlichen Ordnung des Registers, stellen also keine Bewertung ihrer Eignung dar.

Oft hoeren wir, dass diese oder jene Firma vorgibt, sie waere mit der Bewertung "A-1" eingestuft. Der Buchstabe "A" bedeutet lediglich, dass es sich um eine selbstaendige Firma handelt, die nicht von einem Industrie-Konzern abhaengig ist und auch nicht von ihrer Regierung subventioniert wird. Die Ziffer "eins" besagt, dass die betreffende Firma ueber Auslandserfahrungen verfuegt. Geniesst die Firma nicht derartige Erfahrungen, so erhaelt sie je nach der Groessenordnung die Einstufungen "zwei" oder "drei".

Ich will nur betonen, dass sich die Bank bei der Auswahl von Konsulenten vollkommen objektiv verhaelt und nur darauf besteht, dass die fachliche Befaehigung gewaehrleistet ist. Die Bewertung der fachlichen Eignung richtet sich nach der nachgewiesenen Erfahrung der betreffenden Firma und ihrer Inhaber oder Gesellschafter. Das Urteil wird in jedem Fall unter unmittelbarer Beruecksichtigung des vorliegenden Projektes getroffen.

Diese Verfahrensweise hat sich vortrefflich bewaehrt, nachdem bis heute kein einziges der rund 470 Projekte, die durch Darlehen der Bank oder Kredite der IDA unterstuetzt wurden, einen Fehlschlag zu verzeichnen hat. Wohl hat es bisweilen betriebliche Unstimmigkeiten gegeben, aber ein technischer Misserfolg ist nicht zu verbuchen. Die Leistungen auf technischer Seite haben sich als hochwertig erwiesen. Eine der sich daraus ergebenden Folgen duerfte auch sein, dass es noch nie zu einer Versaeumung der Zahlungsverpflichtungen

gegenueber der Bank gekommen ist. Auf jeden Fall hat die technische Seite ihren Beitrag zum Erfolg der Projekte erbracht und dadurch der fruchtbringenden Taetigkeit der Bank seit ihrer Gruendung in 1944 einen starken Aufschub gegeben.

Zum Schluss sei noch auf die Projekte zur Erschliessung von Hilfsmitteln hingewiesen, deren Durchfuehrung grosse Anforderungen an das Fachwissen und die Faehigkeiten des Technikers stellt. Da sich diese Vorhaben in einem grossen Rahmen bewegen und auch stark von den Wechselfaellen der Natur sowie von der Verschiedenheit und Mannigfaltigkeit geographischer Gegebenheiten bedingt sind, kommen hierzu meistens Grossunternehmen in Frage, die die Vorteile einer sachkundigen Leitung und straffen Koordinierung aufweisen. Benoetigt ist eine Vielfalt von Kapazitaeten, vom Ingenieur bis zum Volkswirt, vom Agronom bis zum Architekten. Wenn es sich um grossraeumliche Studien und Erhebungen handelt, duerften Arbeitsgemeinschaften, eventuell auch internationale, am Platz sein.

Deswegen haben es auch kleinere Unternehmen als vorteilhaft befunden, in vielen Faellen ihre Faehigkeiten zusammenzulegen und sich in Einheiten zu verbinden. Ihre eigene Organisation, hier versammelt, hat den Schritt getan in der gewuenschten Richtung zu gemeinschaftlichen Unternehmungen in der Zukunft. Die Bildung der Deutschen Projekt-Union stellt einen weiteren und groesseren Schritt dar, um es den angegliederten selbstaendigen Beratungsfirmen zu ermoeglichen, die Konkurrenz mit groesseren und weiter gespannten Unternehmen anderer Laender aufzunehmen.

Einigkeit verleiht Kraft. Werden die Faehigkeiten, Kenntnisse und Erfahrungen vieler kleinerer Gruppen zusammengefasst, so koennen grosse Aufgaben erfolgsversprechend in Angriff genommen werden. Die Summe der Erfahrungen, besonders im Ausland, erleichtert die Bewaeltigung von Auftraegen, wobei der Gewinn besser ausfaellt, als dies auf andere Weise moeglich waere. Hierzu kommt noch als zusaetzliche Befriedigung die Erkenntnis, dass Ihre Arbeit massgeblich zur Gestaltung einer neuen Welt beigetragen hat.

ENGINEERS AND THE WORLD BANK

Address to
Verband Unabhängig Beratender Ingenieurfirmen
Munich, Germany
February 18, 1965
by
Herbert D. Vogel
Engineer Adviser
International Bank for Reconstruction and Development

It gives me great pleasure to meet with the engineers of the Verband Unabhängig Beratender Ingenieurfirmen here in Munich. There are three reasons for this. First, I have a strong feeling of obligation to the engineers of Germany, because it was from them that I obtained my basic knowledge of experimental hydraulics in the late twenties. Foremost among my mentors were Professors de Thierry and Ludin of the Berliner Technische Hochschule, and closely associated were Drs. Seifert and Eisner, and Baurat Körner of the Preussische Versuchsanstalt für Wasserbau and Schiffsbau. Among others of that day, to whom I am indebted, were Drs. Engel, Rehbock, Heisser and Kirschmer, not to mention a host of others. It is good to be with you who are the successors of those fine and able men.

A second reason for my pleasure in being with you is that it allows me to repay the many courtesy visits that my colleagues and I have received from you and your representatives during the past several months. But most important is the opportunity afforded me to tell you something about the World Bank, the character of its projects and the kind of engineering services that are required for their successful prosecution.

The World Bank, the more formal name of which is the International Bank for Reconstruction and Development, was founded at the Economic Conference at Bretton Woods, New Hampshire, in July 1944. It began operations two years later and, in 1947, made loans for postwar reconstruction. These ran to about $500 million, but quickly the Bank turned to development financing,

directing its attention primarily to the areas of the world where such services are most needed. Its loans to date number close to 400 and run to a total of over $8,000 million. About a third of the dollars total has been applied to development projects in Asia and the Middle East. The remaining two-thirds, in descending orders of magnitude, have supported projects in the Western Hemisphere, Europe, Africa and Australasia. Funds for these loans are obtained largely through the sale of bonds, and interest rates are determined on that basis. The term of loans is related to the character of the projects financed and has averaged about seventeen years.

The lending operations of the World Bank are based on three cardinal considerations, first of which is the ability of the borrower to repay the loan. Next, is the probable effect of the proposed project on the general economy of the country receiving the loan. Lastly - and this is of vital importance - it must be determined that the project is technically feasible and will be soundly designed and executed. Engineering judgment of the highest order is required in the latter connection.

Investigations of a technical nature leading to the approval of loans are conducted by Bank staff, assisted often by individual consultants when unusual specializations are required or the work load is too great. Consideration is given to studies carried out by the prospective borrower and the firms employed by him, and all findings are carefully weighed.

Incident to the negotiation of a loan, assurances are obtained that suitable engineering skills will be employed by the borrower in prosecution of the design and execution of the subject project. While the Bank reserves to itself the right of passing upon a borrower's selection of a consultant, it refrains from suggesting the names of candidate firms for consideration.

This makes it clearly a responsibility of the borrower to prepare his own list and it becomes incumbent upon consulting firms to make their abilities and experience known to borrowers. In order that the Bank may be sufficiently informed about the qualifications of consulting firms seeking the consideration of borrowers, it is necessary for such firms to make themselves known by submitting detailed information relating to their organizational capability and experience. The Bank will insist in every case that the firm appointed shall have had satisfactory experience on comparable projects; that the staff to be assigned to the particular work is qualified and adequate, and that responsible execution of the project may be expected.

Although discussion to this point has centered about the engineering of projects financed by loans, it should be noted that the same principles apply to projects financed by credits of the International Development Association. This organization, created as an affiliate of the Bank, was designed to meet the needs of the less developed countries which may possess limited ability to service conventional loans. While the terms of IDA credits are less demanding than those of Bank loans, and a small service charge suffices for interest in each case, there is no difference in the rules governing the approval of a project or its execution. Projects must be just as sound, just as well conceived, and just as carefully designed and thoroughly executed as though financed by Bank loans. The same rules, therefore, apply to the selection of consultants for projects financed by IDA as by the Bank.

At this point, having indicated that the selection of consultants for work on projects financed by Bank loans or IDA credits is a responsibility of borrowers, subject to Bank approval, I might digress to tell you that the rule is reversed in the case of technical assistance projects financed by grants of the Bank or the United Nations Special Fund. Projects of this nature take the

form usually, though not always, of feasibility studies designed to assess the potentialities of resources within a defined area. They may relate to many different things, but common within each is the inherent possibility of developing the basis for a specific, justifiable undertaking.

In making its selection of a firm or consortium of firms to carry out a technical assistance project, the Bank employs a procedure similar to that which it recommends to borrowers in the case of loans. First, a review is made of all firms whose capabilities coincide with those required for the study or survey. The principal consideration must be the adaptation of its talents to the task at hand, its knowledge of the locale in which it will work, and facility with languages to be encountered. In general, the effort is made to develop a representative and diversified list of perhaps a dozen firms. Then, by a process of elimination, the number is reduced to a half dozen or so, for detailed consideration by an ad hoc board, each member of which has particular knowledge of the project. Further eliminations, or even restorations, may be made by the board to develop a final list of perhaps four names, representing usually as many member countries. The beneficiary country is asked at this point if it would object to the selection of any firm on the shortened list. If no objections are received, each firm is requested to submit a specific proposal indicating how it would plan to carry out its assignment; the number of people it would use in its execution, both in the field and the home office; the names and experience records of all staff to be employed, including supervisory personnel; the amount of time to be devoted by principals of the firm; and the services to be provided in or by the home office. No request is made at this time for an estimate or statement of financial terms.

When all proposals have been received, a careful evaluation is made of each. Individual engineers of the Bank staff who have studied the project make independent judgments, tabulating their results for consideration by the selection board. The firm submitting the most advantageous proposal is then invited for the negotiation of an agreement, including financial terms. If an agreement cannot be reached on terms, negotiations are terminated and reopened with the next firm in line.

As I have indicated, this is the same procedure that a country should follow in selecting a consulting firm for work on a project financed by a loan or credit. Unfortunately, all do not. We hear frequently of consultants being asked to submit proposals with financial terms - or estimates - attached, and sometimes it appears that considerations other than those of capability and experience have become controlling factors. In such cases, it is important for the Bank to exercise its right of approval to insure that the consultant finally selected will be able to perform creditably throughout all phases of the undertaking.

To assist it in this judgment and to aid when selections must be made by its own staff, a comprehensive file is maintained by the Bank to include the names and experience records of all firms desiring to be included. The inclusion of a firm's name and records in this file does not imply approval or prequalification by the Bank in any sense, and should not be considered as constituting registration in any preferred category. Classifications applied to firms in this connection are for filing purposes only and do not reflect any evaluation of capabilities.

We hear often of firms representing themselves as having been given a classification by the Bank of "A.1" The letter "A" indicates only that

the firm is independent, that it has no connection with an industrial organization and is not subsidized by its government. The numeral "one" means that it has had some experience on projects outside its own country. If it has not had such experience it is assigned the number "two," or "three," depending upon its size.

What I am trying to say is that the Bank takes a wholly impartial view with respect to the selection of consultants in every case, insisting only that there be an assurance of professional competence. Judgments as to capability are based upon what the record may show with respect to the experience of the firm and the background of the individuals comprising it. Each is related directly to the problem at hand.

Proof that this policy has been wise is found in the fact that of all the many projects financed by loans of the Bank and credits of IDA, a total of some 470 in all, none shows a record of failure. Minor misadventures of a technical nature may have occurred from time to time, but no engineering disasters have been recorded. The history of engineering performance has been extremely good. It may be largely because of this that the Bank has had no defaults in the payment of its loans. At least the engineering contributions to the success of projects have had a strong influence on the success of the Bank since its conception in 1944.

In closing, I would like to direct your attention to the fact that resource development projects make great demands upon the skills and capabilities of engineers. Because of the wide scope of such studies, the vagaries of nature, the many and diverse geophysical elements involved; large organizations, carefully directed and thoroughly coordinated, are nearly always required. Varied talents, too, are needed, ranging from those of the engineer to those of

the economist - from those of the agronomist to those of the architect. Consortia, even of an international character, may be required for surveys and studies embracing large areas.

For this reason small firms have found it necessary to combine their talents in many cases, and to draw together in single groupings. The formation of your organization, here assembled, represents a step in the right direction in that it establishes a basis for such joint ventures in the future. Organization of the Deutsche Projekt Union has resulted in another and greater step toward making your independent consulting firms competitive with the larger and more embracing ones of other countries.

In union there is strength. By combining the capabilities, skill, and experience of many small groups, larger assignments may be sought with greater hope of success. As the aggregate experience grows, particularly in foreign lands, assignments will come easier, with greater rewards than could be achieved otherwise. Not the least of your rewards will be the satisfaction derived from a knowledge that your efforts have contributed greatly to the building of a New World.

Vogel

Speech to

ANNUAL CONFERENCE OF
THE ASSOCIATION OF MANAGEMENT CONSULTANTS

Statler - Hilton Hotel
New York City
May 28, 1965

Successful banking results from backing successful projects. The success of projects depends upon their technical and economic viability; their compatibility with encompassing programs for development and growth; and their effective, efficient operation after completion. All of these factors require in various combinations the expertise of engineers, economists and management specialists.

The World Bank like every other bank, large or small, must weigh carefully both the feasibility of the project it is asked to support, and the capability of the borrower to repay the loan. Judgment in either case is based upon studies and reports of skilled observers and analysts. The Bank's staff provides a nucleus and directive force for investigations leading to the determination of a project's feasibility before realization and its management afterwards, but consultants are used freely at all stages to assist both Bank and borrower.

Let us consider the case of a new-born country seeking to establish a base for future development. As a member of the International Bank for Reconstruction and Development, it may well turn to that organization for initial guidance. In response to this, the Bank may send a study group to the country to make a preliminary assessment

of its natural resources and potentials for development. This may serve as a basis for more detailed studies leading to the formulation of a broad, integrated program. From such a program, projects are evolved, identified, scrutinized and studied, and finally submitted for detailed consideration by the Bank.

Much of the work of this nature and that relating to materialization of the project and its later administration is handled directly by the technical staff of the Bank which includes engineers of many disciplines, economists, agriculturalists, agronomists and other. Most of these are found in the Projects Department which has technical divisions to cover the several categories of projects that are supported and financed by the Bank.

In the process of analyzing a country's potentials for future development, and in framing programs to bring it about, consultants are used extensively by the country and by the Bank. Often they are employed as individual members of larger teams, and, equally often, the services of firms may be used. Their expertise may vary from engineering and agriculture to economics and management, and may include all specialties between. The method of attack on any problem depends upon the nature of the problem itself.

Basic to the consideration of the suitability of any project for a loan is a determination of the country's creditworthiness. This must be viewed in the light of the economic position of the borrowing country and in respect to the effect on it of the project itself. Many projects are revenue producing and their effects may be directly

determined; others will have only indirect effects, being of a social nature, and servicing of the loan will have to be from some other source such as tax revenues. The implications of these effects on the national economy must, of course, be carefully considered in each case.

As to projects themselves, a number of questions may be properly asked. The first would relate to the need of the country's economy for the goods or services to be produced or to result. This could be framed as, "What benefits can be expected to accrue?" An economist can be expected to provide the answer.

A second question is, "Has the project been soundly conceived, adequately planned and properly designed?" These are engineering questions in the main, but problems of management and organization with commercial implications may be involved. Professional consultants may be needed to supplement Bank staff in finding all the answers.

Other questions may relate to methods of financing and returns to be expected from the investment. Financial analysts within the Bank give these their consideration.

Once a loan has been made, it is a responsibility of the borrower to get the work under way as quickly as possible. The Bank requires that competent skills be employed in the engineering of the project and, if such skills are not available within the country itself, that they be obtained by the employment of consultants from other countries that are members of the Bank. Selection of consultants in such cases is by the borrowing country subject to concurrence of the

Bank. The firm selected and approved will act generally as adviser to the appropriate agency in all technical matters relating to the project, will carry it through the design stage, prepare plans, specifications and bidding documents, analyze the bids received and recommend award, and, finally, will supervise the construction.

Management consultants are seldom used during the creative stage of a project. Their greatest usefulness is found in connection with determining its justification in the beginning and in insuring good management of its operation after it has been put to use. It may be that a public utility system which operates facilities built by Bank loans, will give indication of unsound personnel policies, of applying unrealistic rates, or of generally loose administration. In such instances, study by an impartial management consultant may point the way to remedies that will save the project from failing to be as productive as was anticipated when the loan was granted.

In another country, there may be harbor facilities financed by a loan, that have been found during visits by Bank staff members to be inadequately maintained or improperly managed. The creation of an efficient, well organized operating agency, may shift the project from red to black. Management firms of one kind or another are looked to for assistance in such instances.

Another type of organization frequently requiring the assistance that can be given by people expert in the art of management is that which administers the highways of a country or a region of the country. Since varying technical skills are required in this as well

as in the other cases mentioned, it is often appropriate to combine organizations of different capabilities.

In the files of the Bank are experience records of some 250 firms offering management services to include studies relating to personnel, organization, and operation, economic studies, market surveys, research and development, inspection and testing, transportation surveys and similar tasks. Nearly 150 are United States firms, the remainder are from other countries, principally European. The largest number, next to those of the United States, are from the United Kingdom. Many combine other services of a technical nature with those that can be classified under the broad heading of management. Also, a fair number of consulting engineering firms, manufacturers, and contractors offer management services along with those that constitute their principal lines of endeavor. Some are highly specialized in fields such as forestry, or in the operation of plants designed for the conversion of forest products. A number are associated with universities. Outside the United States, particularly on the European continent, it is not unusual to find government bureaus engaged in consultation not only in the management field but along allied technical lines.

Now, while all of this may have some general interest for you of the management profession who are meeting here, I presume you have been wishing that I would get to the point and tell you how consulting firms are selected. There is a simple rule for this. Selection is by the organization that pays for the services. In the case of Bank loans, this is the borrower; but the Bank reserves the

right of approval. Its reason for reserving that right is that, quite obviously, it desires to have its loans repaid and payments come easier if it has been backing a winning horse.

When studies are paid for by the Bank from its own resources or when the Bank acts as an executing agency for studies financed by the U. N. Special Fund, the Bank selects the consultants. This is done by combing the files of firms whose specialities lie in the field of the study that is to be undertaken. The first list may be quite long and will include the firms of many countries. The records of the firms as contained in the Bank's files are then studied in considerable detail with attention to the experience of each firm in the particular field, its experience in countries of a background similar to that in which the study will be conducted, the qualifications of its principal staff and technical personnel, and its probable acceptability to the country in which it will work.

By a process of elimination, the long list will be reduced to a shorter list of, say, seven or eight names, and this receives the attention of a special committee, comprised of people who are knowledgeable both of the problem and the firms specializing in the questions under consideration. The deliberations extend to discussions of the capabilities of firms that may not have been included on the shortened list or even represented in the Bank's files. The list is now reduced to four or five. Firms of the final group are then invited to submit proposals based on terms of reference supplied to them, but only after it has been determined that any one of the group will be acceptable to

the country receiving its services. Proposals as requested at this time should include a statement of the firm's understanding of the problem, its analysis of the problem, and a general plan for an attack upon it. They should include the names and backgrounds of personnel to be employed, the leadership to be given, the support to be rendered by the home office, and the time to be spent both in the field and at home. They should not include financial terms.

It is obvious that the preparation of proposals for a large project can be costly, both as to time and money. Among other things, it may require travel to the country where the work is to be undertaken. Any firm undertaking to prepare and submit such a proposal should see a reasonable chance of getting the job. Most will enter into competition willingly with three or four others, but to involve more than that number is to do an injustice to all. This is a principal reason for keeping the final list small.

When all proposals have been received, careful analyses are made by several staff members of the Bank, working independently. Ratings are prepared and submitted to the selection committee for final consideration. A choice having been made of the firm best qualified for the job, representatives of that organization are then called in to discuss financial terms. If these can be agreed upon, a contract is drawn up and signed.

The process of selection made by a borrower is generally similar to that which has been just described. The borrower prepares his own initial list, seeking Bank approval at an early stage and the

Bank will assist in preparing terms of reference and contract documents, In such cases it is the desire of the Bank to be as helpful as possible, not only with an aim to assuring that the consultant will be required to perform his task fully and satisfactorily, but that his professional interests will be preserved.

There is, of course, much that could be said about the problems that arise in connection with work undertaken many miles from a home base under unfamiliar circumstances. Difficulties are many, including those engendered by inadequate communication and adverse climatic conditions. But the rewards are great, particularly in the satisfaction that comes from developing new standards in old lands and leading the way to better living.

Herbert D. Vogel
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International Bank for
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Washington, D. C. 20433

Speech to

FIDIC

at 1965 General Assembly Meeting

Helsingør, Denmark
June 3, 1965

Successful banking results from backing successful projects. The success of projects depends upon their technical and economic viability; their compatibility with encompassing programs for development and growth; and their effective, efficient operation after completion. All of these factors require in various combinations the expertise of engineers, economists and management specialists.

The World Bank like every other, large or small, must weigh carefully both the feasibility of the project it is asked to support, and the capability of the borrower to repay the loan. Judgment in either case is based upon studies and reports of skilled observers and analysts. The Bank's staff provides a nucleus and a directive force for investigations leading to the determination of a project's feasibility before realization and its management afterwards, but consultants are used freely at all stages to assist both Bank and borrower.

Let us consider the case of a new-born country seeking to establish a base for future development. As a member of the International Bank for Reconstruction and Development, it may well turn to that organization for initial guidance. In response to this, the Bank may send a study group to the country to make preliminary assessment of its natural resources and potentials for development. This may serve as a basis for

more detailed studies leading to the formulation of a broad, integrated program. From such a program, projects are evolved, identified, scrutinized and studied, and finally submitted for detailed consideration by the Bank.

Much of the work of this nature and that relating to materialization of the project and its later administration is handled directly by the technical staff of the Bank which includes engineers of many disciplines, as well as economists, agriculturalists, agronomists and other specialists. Most of these are found in the Projects Department which has technical divisions to cover the several categories of projects that are supported and financed by the Bank.

In the process of analyzing a country's potentials for future development, and in framing programs to bring it about, consultants are used extensively by the country and by the Bank. Often they are employed as individual members of larger teams, and often too, the services of consulting firms may be used. Their expertise may vary from engineering and agriculture to economics and management, and may include all specialties between. The method of attack on any problem depends upon the nature of the problem itself.

Basic to the consideration of the suitability of any project for a loan is a determination of the country's creditworthiness. This must be viewed in the light of the economic position of the borrowing country and in respect to the effect on it of the project itself. Many projects are revenue producing and their effects may be directly

determined; others will have only indirect effects, being of a social nature, and servicing of the loan will have to be from some other source such as tax revenues. The implications of these effects on the national economy must, of course, be carefully considered in each case.

Specifically, as to projects, a number of questions may be asked. The first would relate to the need of the country's economy for the goods or services to be produced or to result. This could be framed as, "What benefits can be expected to accrue?" An economist can be expected to provide the answer.

A second question is, "Has the project been soundly conceived, adequately planned and properly designed?" These are engineering questions in the main, but problems of management and organization with commercial implications may be involved. Professional consultants may be needed to supplement Bank staff in finding all the answers.

Other questions may relate to methods of financing and returns to be expected from the investment. Financial analysts within the Bank give these their consideration.

Once a loan has been made, it is a responsibility of the borrower to get the work under way as quickly as possible. The Bank requires that competent skills be employed in the engineering of the project and, if such skills are not available within the country itself, that they be obtained by the employment of consultants from other countries that are members of the Bank. Selection of consultants in such cases is by the borrowing country, subject to concurrence of the Bank. The firm selected and approved will act generally as adviser to the appropriate

agency in all technical matters relating to the project, will carry it through the design stage, prepare plans, specifications and bidding documents, analyze the bids received and recommend award, and, finally, will supervise the construction.

The Bank suggests to its borrowers that consulting firms be selected on the basis of qualifications for the specific work at hand and that no consideration be given to fees until a selection has been made. If agreement cannot be reached as to what may be considered reasonable, negotiations should be broken off and reopened with the next firm in line for consideration.

Although borrowers may, on occasion, request assistance by the Bank in preparing a list of firms to be invited to submit proposals, the Bank has taken the position that guidance should be obtained from other sources. As an International organization, it cannot properly, it feels, place the firms of any of its member countries in positions of priority over those of others. It recommends, therefore, that information be sought from diplomatic missions or from associations of consulting engineers such as those that comprise the membership of FIDIC.

As recommended by the Bank, the borrower or its agency should compile an initial list of firms believed to be qualified by experience to carry out the work of the project. Assuming that this list will be fairly long, it should then be shortened by eliminating the firms considered to be least qualified. Efforts should be made to evolve finally a list of four or five firms to receive invitations to submit proposals describing how each would undertake the assignment, the staff

it would employ, the supervision that would be given the work, the back-up facilities available in the home office and in affiliated organizations, language qualifications of personnel and all other matters bearing upon capabilities related to the task.

When all proposals have been received, careful evaluation should be made of each to determine their relative merits. The organization judged most competent to undertake the work should then be asked to send its representatives to negotiate a fee and draw up a contract which will clearly specify the terms of reference to be followed. The Bank is always pleased to assist in this connection, not only to insure that the borrower will receive a full measure of service but that the rights of the consultant will be preserved.

In the files of the Bank are experience records of nearly 2000 firms offering consulting services, although many of these are in fields of management. Nearly half are United States firms, the remainder are from other countries, principally European. The largest number, next to those of the United States, are from the United Kingdom. Many combine services of a specialized nature with those that can be classified under the broad heading of engineering. Also, a fair number of manufacturers, and contractors offer engineering services, but to be considered favorably they must disqualify themselves as bidders for any part of the construction or supply of equipment that may be related to the project.

When studies are paid for by the Bank from its own resources, or when the Bank acts as an executing agency for studies financed by the U. N. Special Fund, the Bank selects the consultants. This is done by the same methods that it recommends to its borrowers for projects financed by loans. Files are combed to separate those firms whose specialities lie in the field of the study that is to be undertaken. The first list

may be quite long and will include the firms of different countries. The records of the firms as contained in the Bank's files are then studied in considerable detail with attention to the experience of each firm in the particular field, its experience in countries of a background similar to that in which the study will be conducted, the qualifications of its principal staff and technical personnel, and its probable acceptability to the country in which it will work.

By a process of elimination, the long list will be reduced to a shorter list of, say, seven or eight names, and this receives the attention of a special committee, comprised of people who are knowledgeable both of the problem and the firms specializing in the questions under consideration. The deliberations extend to discussions of the capabilities of firms that may not have been included on the shortened list or even represented in the Bank's files. The list is now reduced to four or five. Firms of the final group are then invited to submit proposals based on terms of reference supplied to them, but only after it has been determined that any one of the group will be acceptable to the country receiving its services. When all proposals have been received, careful analyses are made by several staff members of the Bank, working independently. Ratings are prepared and submitted to the selection committee for final consideration. A choice having been made of the firm best qualified for the job, representatives of that organization are then called in to discuss financial terms. If these can be agreed upon, a contract is drawn up and signed.

It is obvious that the preparation of proposals for a large project can be costly, both as to time and money. Among other things, it may require travel to the country where the work is to be undertaken. Any firm undertaking to prepare and submit such a proposal should see a reasonable chance of getting the job. Most will enter into competition willingly with three or four others, but to involve more than that number is to do an injustice to all. This is a principal reason for keeping the final list small.

There is, of course, much that could be said about the problems that arise in connection with work undertaken many miles from a home base under unfamiliar circumstances. Difficulties are many, including those engendered by inadequate communication and adverse climatic conditions. But the rewards are great, particularly in the satisfaction that comes from developing new standards in old lands and leading the way to better living. The member associations of FIDIC are each alert to the opportunities that exist and through this organization may be mutually helpful in connection with any projects requiring international cooperation.

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Washington, D. C. 20433 USA

Gen Vogel's speech 6/3/65 - in Dutch?

#314

Raadgevend Ingenieur, Gravenhage
September 1965

Generaal H. D. Vogel [1])

De Wereldbank en de raadgevend-ingenieurs [2])

Een bank boekt goede resultaten wanneer zij succesvolle projecten steunt. Het succes van projecten hangt af van hun economische en technische levensvatbaarheid, hun verenigbaarheid met aansluitende programma's voor ontwikkeling en groei en hun doelmatige, economische werking na de voltooiing. Al deze factoren vereisen in verschillende combinaties de expertise van technici, economen en organisatiedeskundigen.

Evenals iedere andere grote of kleine bank moet ook de Wereldbank zorgvuldig de uitvoerbaarheid van een project waarvoor haar steun wordt gevraagd beoordelen, alsmede de mogelijkheden voor de credietnemer om het geleende bedrag terug te betalen. Voor ieder project is het oordeel gebaseerd op studies en rapporten van bekwame waarnemers en analysten. De staf van de bank vormt de kern en geeft leiding bij het onderzoek naar de uitvoerbaarheid van een project vóór realisering en naar de wijze waarop het daarna moet worden geleid, maar adviseurs worden in de verschillende stadia in ruime mate ingeschakeld, zowel ten behoeve van de bank als van de credietnemer.

Laten wij eens het geval bezien van een nieuw gecreëerde staat die zoekt naar een basis voor verdere ontwikkeling. Als een lid van de „International Bank for Reconstruction and Development" kan het zich tot deze organisatie wenden voor een eerste advies. Naar aanleiding hiervan kan de bank een studiegroep naar het land zenden om een voorlopig inzicht te krijgen in de natuurlijke hulpbronnen en de mogelijkheden voor verdere ontwikkeling. Dit kan de grondslag vormen voor meer gedetailleerde studies die leiden tot de formulering van een breed alles omvattend programma. Uit een dergelijk programma worden afzonderlijke projecten gekozen, nader omschreven, zorgvuldig bestudeerd en tenslotte voor een meer gedetailleerde beschouwing aan de bank overgedragen.

Veel van dit werk en van de werkzaamheden met betrekking tot de realisering van het project en het beheer wordt verricht door de technische staf van de bank waarin technici van verschillende richtingen aanwezig zijn evenals economen, landbouw-

[1]) Engineer Adviser van het Projects Department van de International Bank for Reconstruction and Development.

[2]) Rede, gehouden op de algemene vergadering van de Fédération Internationale des Ingenieurs-Conseils op 3 juni 1965 te Helsingør, Denemarken.

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(from preceding page)

kundigen, landhuishoudkundigen en andere specialisten. De meesten hiervan maken deel uit van het „Projects Department", dat technische afdelingen heeft die overeenkomen met de verschillende categorieën projecten die door de bank worden gesteund en gefinancierd.
Bij het analyseren van de mogelijkheden voor de toekomstige ontwikkeling van een land en het opzetten van programma's om deze te realiseren worden adviseurs in ruime mate zowel door de bank als door het betreffende land ingeschakeld. Vaak worden zij aangesteld als individuele leden van grotere teams, vaak ook kunnen de diensten van grote adviesbureaus worden gebruikt. Hun deskundigenrapporten kunnen uiteenlopen van technische en landbouwkundige onderwerpen tot economie en bedrijfsorganisatie en alle andere specialisaties daartussen in. De wijze van aanpakken van een probleem hangt af van de aard van het probleem zelf.

Of een project al dan niet voor een lening in aanmerking komt hangt voornamelijk af van de vraag of het land credietwaardig is. Deze vraag moet worden gezien in het licht van de economische positie van het credietnemende land en van de invloed van het project daarop. Verschillende projecten zullen inkomsten opleveren en het effect daarvan kan duidelijk worden aangetoond; anderen zullen echter slechts een indirect effect hebben doordat zij een sociaal karakter hebben; de aflossing van de lening zal dan uit andere bronnen, zoals de belastingen, moeten komen. Het effect hiervan op de nationale economie moet natuurlijk van geval tot geval zorgvuldig worden nagegaan.
Bij de beoordeling van projecten moeten vele vragen worden beantwoord. De eerste heeft betrekking op de behoefte van het land aan de te verwerven goederen of diensten. Dus „welke voordelen kunnen worden verwacht?". Op deze vraag zal een economoom het antwoord moeten geven. Een tweede vraag is „Is het project gezond opgezet, op de juiste manier gepland en goed ontworpen?". Dit zijn hoofdzakelijk technische vragen maar hierbij kunnen zich tevens problemen betreffende de leiding en de organisatie voordoen. Beroepsadviseurs kunnen nodig zijn om de staf van de bank te assisteren bij het vinden van de antwoorden.
Andere vragen kunnen betrekking hebben op de methoden van financiering en op de inkomsten die van de investering kunnen worden verwacht. Financiële deskundigen van de bank zullen hierover hun mening geven.

Zodra een lening is gegeven is het de verantwoordelijkheid van de credietnemer dat zo snel mogelijk met de werkzaamheden wordt begonnen. De bank eist, dat bij de technische uitvoering van het project deskundige krachten worden ingeschakeld; zijn deze in het land zelf niet beschikbaar dan moeten adviseurs worden aangetrokken uit landen die lid zijn van de bank. De keuze van de adviseurs is een zaak van het lenende land, hierover dient echter overeenstemming met de bank te bestaan. Het adviesbureau dat is uitgekozen en goedgekeurd zal in het algemeen optreden als adviseur van de aangewezen instantie voor alle technische kwesties betreffende het project. Het zal dit door het ontwerpstadium brengen, de plannen voorbereiden, de bestekken en inschrijvingsdocumenten opstellen, de inschrijvingen beoordelen, het werk gunnen en tenslotte toezicht houden op de uitvoering.
De bank geeft credietnemers in overweging, adviesbureaus te kiezen op grond van hun deskundigheid op het gebied van de uit te voeren werkzaamheden en geen aandacht te schenken aan het honorarium voordat een keuze is gemaakt. Wanneer geen overeenstemming over een redelijke betaling kan worden bereikt moeten de onderhandelingen worden afgebroken en moet contact worden opgenomen met het volgende in aanmerking komende bureau.
Hoewel credietnemers desgewenst de hulp van de bank kunnen inroepen voor het samenstellen van een lijst van bureaus, die in aanmerking komen voor een uitnodiging tot het indienen van voorstellen, huldigt de bank toch in het algemeen het principe, dat informaties daarover uit een andere bron moeten worden verkregen. Als een internationale organisatie meent men, niet de bureaus van welk van de aangesloten landen dan ook in een voorkeurspositie te kunnen plaatsen boven die van andere aangesloten landen. De bank adviseert daarom informaties te vragen aan diplomatieke vertegenwoordigingen of aan verenigingen van raadgevend-ingenieurs zoals bijv. de leden van de FIDIC.
Overeenkomstig de aanbeveling van de bank moet de credietnemer of zijn vertegenwoordiger een lijst opstellen van bureaus waarvan kan worden aangenomen, dat zij bevoegd zijn de werkzaamheden van het project uit te voeren. Aangenomen kan worden dat deze lijst tamelijk lang wordt; zij moet dan ook worden bekort door de bureaus te elimineren die het minst bevoegd kunnen worden geacht. Er moet naar worden gestreefd te komen tot een lijst van vier of vijf bureaus die kunnen worden uitgenodigd een voorstel in te dienen over de wijze waarop zij de opdracht denken uit te voeren, over de staf die zij met het werk denken te belasten, over het toezicht dat zij op het werk denken uit te oefenen, over de mogelijkheden waarover zij zelf beschikken of waarover zij bij relaties kunnen beschikken en over alle andere gegevens die inzicht kunnen geven in hun geschiktheid voor het werk.
Wanneer alle voorstellen zijn ontvangen moet elk daarvan nauwkeurig worden beoordeeld. De als meest geschikte uitgekozen organisatie moet dan worden gevraagd een vertegenwoordiger te zenden om te onderhandelen over het honorarium en om een contract op te stellen waarin nauwkeurig de te volgen gedragslijn is vastgelegd. De bank is steeds gaarne bereid hierbij hulp te verlenen, niet alleen om er zeker van te zijn, dat de credietnemer alle hulp ontvangt waarop hij recht heeft maar ook om de rechten van de adviseur veilig te stellen.
De bank beschikt over een kaartsysteem van ongeveer 2000 adviesbureaus, waarvan echter het merendeel op het gebied van de bedrijfsorganisatie werkzaam is. Ongeveer de helft zijn Amerikaanse bureaus de rest van andere nationaliteit, voornamelijk Europese. Het op één na grootste aantal is afkomstig uit Engeland. Vele van hen combineren gespecialiseerde diensten met diensten die kunnen worden samengevat onder het hoofd „engineering". Ook een tamelijk groot aantal fabrikanten en aannemers dient zich aan als adviseur, maar deze komen slechts in aanmerking wanneer zij tevoren toezeggen niet te zullen inschrijven voor welk onderdeel van de constructie danook of voor levering van materialen voor het project.
Wanneer de onderzoekingen door de bank worden betaald uit eigen middelen of wanneer de bank optreedt als uitvoerder van studies die worden gefinancierd door het U.N. Special Fund, kiest de bank de adviseurs. Dit geschiedt op dezelfde wijze als door de bank wordt aangeraden aan de credietnemers. De kaartsystemen worden uitgekamd om bureaus te zoeken die gespecialiseerd zijn op het gebied waarop de studie moet worden uitgevoerd. De eerste lijst kan tamelijk lang zijn en bureaus uit verschillende landen bevatten. De prestaties van de bureaus worden dan gedetailleerd bestudeerd waarbij vooral aandacht wordt geschonken aan de ervaring van ieder bureau op het betreffende gebied, hun ervaring in landen die vergelijkbaar zijn met het land waarin de studie moet worden uitgevoerd, de bevoegdheden van de staf en het technische kader en hun aanvaardbaarheid voor het land waar het werk moet worden gedaan.
Door eliminatie wordt de lijst ingekort tot ongeveer zeven of acht namen en deze worden door een speciale commissie bestudeerd welke is samengesteld uit mensen die zowel op de hoogte zijn met het probleem als met de bureaus die zijn gespecialiseerd op het betreffende gebied. De beraadslagingen gaan soms zo ver, dat zij betrekking hebben op bureaus die niet op de lijst voorkomen of die zelfs niet in het kaartsysteem van de bank zijn vertegenwoordigd. De lijst wordt dan bekort tot vier of vijf namen. De bureaus van de laatste groep worden dan uitgenodigd een voorstel in te dienen gebaseerd op hen verstrekte gegevens. Dit geschiedt echter pas wanneer vast staat dat elk van de bureaus van deze groep aanvaardbaar is voor het land dat hulp ontvangt.

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Wanneer alle voorstellen ontvangen zijn worden zij zorgvuldig geanalyseerd door verschillende stafleden van de bank die onafhankelijk van elkaar werken. Beoordelingen worden opgesteld en ter overweging overgedragen aan het definitieve selectiecomité. Wanneer de uiteindelijke keuze is gemaakt worden vertegenwoordigers van het bureau uitgenodigd de financiële voorwaarden te komen bespreken. Wanneer daarover overeenstemming wordt bereikt kan het contract worden opgemaakt en getekend.

Het is duidelijk dat het opstellen van voorstellen voor een omvangrijk project veel tijd en geld kan kosten. Het kan onder andere noodzakelijk zijn een bezoek te brengen aan het land waar het werk moet worden uitgevoerd. Ieder bureau dat hieraan begint moet een redelijke kans aanwezig achten de opdracht te krijgen. De meesten zullen bereid zijn mede te dingen met drie of vier andere bureaus maar het zou onredelijk zijn ten opzichte van allen dit aantal uit te breiden. Dit is de voornaamste reden waarom de uiteindelijke lijst klein wordt gehouden.

Er zou uiteraard veel te zeggen zijn over de problemen die zich voordoen wanneer het werk moet worden verricht op zeer grote afstand van het bureau en onder vreemde omstandigheden. De moeilijkheden zijn talrijk, onder andere als gevolg van de slechte verbindingen en de vreemde klimatologische omstandigheden. De voldoening is echter groot, speciaal wanneer het er om gaat nieuwe mogelijkheden te scheppen in een oud land en de weg naar betere levensomstandigheden aan te geven.

De bij de FIDIC aangesloten organisaties zijn toegespitst op de bestaande mogelijkheden en kunnen door hun organisatie tesamen behulpzaam zijn bij alle projecten die internationale samenwerking vereisen.

Photo Review, Dunedin
September 1, 1965

A WORLD BANK Feature

It's named The Bullet, and with a top speed of 120 mph, it's by far—

The Fastest Train In The World

As dusk approaches, The Bullet streaks across a bridge spanning the highway in Atami, one of the seaboard cities on the Tokyo-Osaka line. The line itself — Tokaido — means "Road to the Eastern Sea."

Three hours' travel by train on the new Tokyo-Osaka line, and you have covered 311 miles! This is the world's fastest passenger train service, and it came into operation earlier this year.

Construction of the new line, which runs parallel to the old one linking Tokyo, Yokohama, Nagoya, Kyoto and Osaka, was financially assisted by a loan of 80 million dollars made by the World Bank to the Japanese National Railways four years ago.

The "New Tokaido Line" as it is called, is Japan's most historic route, serving forty per cent of the country's population, all Japanese cities with a population of a million or more, and most of the country's major ports.

Industries in the area account for more than 70 per cent of the national industrial output, including heavy industry, shipbuilding, electrical equipment, chemicals and textiles. In addition, the highly developed agriculture of the region produces 25 per cent of the country's farm output.

For some time before the coming of The Bullet, the congestion of transport facilities had been an obstacle to the economic development of the region. Highways in the area were continually crowded to capacity and the existing narrow-gauge railway was carrying more than 300 trains a day.

The new railway is an electrified system with standard gauge double track throughout. The track is made of long, welded rails, each measuring about a mile in length and carried on pre-stressed concrete sleepers. The curves in the track are gentle to permit the maintenance of high speeds. There are no level crossings on the entire route. Crossings with roads, waterways and other railway lines are all specially graded.

The new line carries passenger trains during the day and freight at night. Even the freight trains travel at speeds approaching 100 miles an hour. All trains, although operating at such high speeds travel with maximum safety. They are controlled by an Automatic Train Control device which regulates the train speeds electronically in accordance with signal indications.

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ENGINEERING -- A BUSINESS OR A PROFESSION?

Address by Brig. Gen. H. D. Vogel
Engineer Adviser World Bank

To Institute for International Engineering
October 6, 1966
Denver, Colorado

The disciplines of engineering take many forms and vary widely in their demands. They range from fields of research and investigation through planning and design to production and construction. They involve many levels of skills, knowledge and expertise. All are employed one way or another, some time or another, in the development of natural resources, for there is no limit to either the direction or the extent of man's upward path.

How, nevertheless, varied the projects of regional development may be, there are, almost without exception, two distinct types of engineering activity required for their prosecution. The first of these may be loosely classified as preliminary planning. More accurately, it embraces all the investigational work and study that precedes financial authorization of a project. The second type relates to execution of the project, which entails the preparation of detailed designs, plans and specifications, the drafting of bidding and contract documents and the supervision of construction. These are technical functions requiring the professional services of engineers, supplemented as need be by related professionals such as geologists and architects, and by sub-professionals such as draftsmen and surveymen.

The point to note is that project execution requires almost exclusively the kind of services that are provided normally and appropriately by an engineering organization either part and parcel of the owner's organization or employed as a consultant. Preliminary planning, on the other hand partakes so largely of economic and other considerations that an engineering organization is seldom sufficient unto itself. Additionally, it may require the services of agronomists, agriculturalists, economists, chemists, foresters, meteorologists, geophysicists, and management specialists or others. Appropriate groupings of individuals from these areas of expertise may first be employed to assess the basic resources of a region or country and to relate them to needs. A direction of development must then be indicated and a general plan evolved. In the case of a developing nation, the government itself, with the aid of consultants, may then work out a general program within which projects can be identified and evaluated. Finally the feasibility of specific projects must be determined as a basis for financing.

The need of engineers is evident in connection with all investigations and studies leading to project identification and serving as a basis for the determination of technical and economic feasibility. There may, however, be an even greater need for economists in the latter instance; and, where multi-purpose features are involved, there may be need for a greater emphasis on agriculture or forestry, or the sciences and techniques of other pursuits, than on engineering in the abstract.

Thus, while engineering firms, may have well-qualified, in-house personnel for project execution, they may find themselves short of the specializations needed for preliminary surveys, investigations, and feasibility studies. This can be true of the larger firms as well as the smaller ones. Bigness alone is not the answer.

Generally speaking, the teams needed for resource studies in developing countries are distinguished more by the variety of talents represented in them than by their numbers. A study, for instance, to determine the feasibility of constructing a deep-water port might involve a choice of location along with the preparation of preliminary designs for terminal facilities, navigation channels and connections to existing highways. This would require, among other things, an evaluation of anticipated benefits, and a determination of methods to be employed for its operation, as well as an analysis of financial aspects. The team required for such a study might consist of some twenty men including port specialists, highway engineers, hydrologists, economists, estimators, agronomists and others. Also needed, in all likelihood, would be the facilities of a large hydraulic experiment station equipped for harbor model testing.

Even a relatively large engineering consulting firm would be unlikely to have such personnel and facilities within its organization, and it would be necessary for it to obtain outside assistance, probably by enlisting the services of independent consultants. A smaller engineering firm with special orientation to feasibility studies, rather than to design and construction, might form a team just as competent by associating itself with specialty firms for economics, agronomy, forestry, etc. Laboratory facilities for hydraulic model testing are limited in the United States, as opposed to Europe, the larger ones operated by Government agencies being not generally available to private consultants. Several universities, however, have facilities that are obtainable.

There is a present day tendency not only in the United States but around the world for big organizations to get bigger and the little ones to get crowded out. This is no less true with respect to consulting firms than to industrial corporations. The bread and butter of the larger engineering consulting firms is the design of projects and the supervision of construction. As more work is taken on, it becomes necessary to expand the organization, and then new assignments must be obtained to keep the staff busy and meet the payroll. This cannot be done by sitting in the

home office waiting for business to come. Representatives must be sent out to sell the firm and extend its reputation. These must be followed by principals of the firm, and soon the principals find that they are spending more time traveling and selling than in technical supervision.

There is a real danger in this to the profession as a whole, for attitudes change under pressure, and engineering leadership, judicially applied, may be forced to give way to business "drivership" financially motivated. The question then may be how to keep engineering a profession and not let it get out of hand, controlled only by business principles.

Already there are signs that business-getting has become more important, particularly to the larger firms, than adherence to the old-time codes of professional ethics. The thought appears to be growing that ethics are alright in their place, but if they get in the way of business, then business must come first. Two of the largest United States professional organizations have recently revised their codes with a bow in that direction.

Article 3 of the Guide to Professional Practice under the Code of Ethics, American Society of Civil Engineers, states:

> "It shall be considered unprofessional to invite or submit priced proposals under conditions that constitute price competition for professional services."

To make it crystal clear what is intended, the article goes on as follows:

> "(4) He shall not submit a priced proposal written or verbal, which includes a stated fee or estimated range of fees in any form in response to:
>
> (a) A public advertisement for bids
>
> (b) Any invitation if there is reason to believe that multiple invitations have been issued.
>
> (5) He shall not be a party to requesting two or more priced proposals for comparative purposes."

Apparently the purpose of this was all too clear when it came to getting assignments in countries where bids are requested, for in 1963 the ASCE Board of Direction put in the following loophole:

> "On foreign work, for which only United States Engineering firms are to be considered, a member shall order his practice in accordancance with the ASCE Code of Ethics. On other engineering work in foreign countries, he may adapt his conduct according to the professional standards and customs of that country, but shall adhere as closely as possible to the principles of this code."

The National Society of Professional Engineers takes also a thoroughly righteous attitude in its basic code, which is as follows:

> "He shall not submit or solicit engineering proposals on the basis of competitive bidding. Competitive bidding for professional engineering services is defined as the formal or informal submission or receipt of verbal or written estimates of costs or proposals in terms of dollars, man-days of work required, percentage of construction costs, or any other measure of compensation whereby the prospective client may compare services on a price basis prior to the time that one engineer, or one engineering organization, has been selected for negotiation. The disclosure of recommended fee schedules prepared by various engineering societies is not considered competitive bidding. An engineer requested to submit a fee proposal or bid prior to the selection of an engineer or firm subject to negotiation of a satisfactory contract, shall attempt to have the procedure changed to conform to ethical practices, but if not successful, he shall withdraw from consideration for the proposal."

But just a few months ago, in July of this year, the hunger for business became so great that the NSPE found it desirable to add the following amendment:

> "When engaged in work in foreign countries in which the practice is to require the submission of tenders or bids for engineering services, the engineer shall make every reasonable effort to seek a change in procedure in accordance with this section, but if this is not successful, the engineer may submit tenders or bids as required by the laws, regulations or practices of the foreign country."

Even the very proper Association of Consulting Engineers of London says, "No member shall knowingly compete on the basis of professional charges with another Member for employment." By inference it is perfectly alright to compete with those who are not fellow members. The morality in all this seems akin to that contained in the statement: "It is wrong to steal from one's friends or unless hungry."

The International Bank for Reconstruction and Development (The World Bank) and the other principal international lending agencies based in Washington take stands in opposition to requesting priced proposals. The same policy applies both to themselves and to borrowers. Proposals are judged on merit--not price--and financial terms are discussed only after a firm has been selected for negotiations. The reasons for this are obvious and need not be discussed here, except to say that they are not based on indifference by the Bank to engineering costs. The Bank, while never unwilling to pay what work is worth, must, nevertheless, take care to ascertain that the proposed work is not over-priced in any case. The choice having been made, therefore, of a firm considered to be most suited to the task at hand, negotiations are entered into to determine suitable financial terms. Here business methods properly prevail and detailed

analyses are made of salaries to be paid, including social benefits and overseas inducements, organizational overhead and fees. Field costs are generally reimbursable as incurred. Seldom indeed does it prove impossible to reach agreement on these matters, but if agreement is found impossible to reach, negotiations are ended and reopened with the firm next in line.

In one important respect, the World Bank disagrees with the NSPE definition of what constitutes a priced proposal. It does not accept the definition that it includes "the submission or receipt of....man-days of work required." While the Bank does not ask consultants from whom proposals are invited to submit estimates of man-days, it does want estimates of the time it is expected that each member of the proposed team will be working both in the country of the undertaking and in the home office. It is important to a determination of how well the job will be accomplished to know these basic and important facts, as well as who will constitute the team and what is each member's capability.

It would be difficult, if not impossible to estimate with accuracy the number of consulting firms, engineering and otherwise, that are avidly seeking business today. And even if an accurate estimate could be made, it would be different tomorrow, because firms come and go. Certain it is, however, that competition is great and the smaller firms find little encouragement when they view the magnitude of projects on the world scene, most of which, from extensive irrigation schemes to large dams, require the in-house facilities and capabilities of large organizations for execution. Preliminary studies are not generally so demanding in this respect. Rather than requiring the self-contained sufficiency of an engineering staff, they may call for a variety of talents from other fields and these may be found among a few, smaller specialized firms. Such firms, by joining forces may perform as creditably as larger ones. In this connection, it is not undesirable to form associations transcending national lines, and definite benefits may result from contacts established with consultants of developing countries.

Engineering in the final analysis must remain a profession. As such it can find parallels in other professions such as law and medicine. However large our legal corporations or hospitals may become, or however they may be organized, they must remain subservient to professional control and guidance. Similarly, engineering organizations -- large or small -- will reach their highest levels of performance when kept within professional bounds under the personal direction of qualified and dedicated professional men.

Vogel

DISCUSSION FOR PANEL ON ENGINEERING ETHICS

The First International Consulting Engineers Congress

May 10, 1967

The subject for discussion by this panel is extremely broad. It constitutes the basic reason for the formation of professional societies and associations, not only by engineers but by the followers of other intellectual or sophisticated callings. As defined by the dictionary, ethics is the science of moral duty or, more broadly, the science of ideal human character. It is thus, at once, the motivation and goal of human progress, the basis of most religions, and a fundamental guide to perfect conduct.

With this in mind, nothing could be more presumptuous than to undertake in limited time a discussion in depth of engineering ethics. If, however, we accept the view that the ethical engineer must act always for the best interests of his client and/or the public and abide by the Golden Rule with respect to his fellow members of the profession, we may examine one or two points bearing upon these considerations.

It may be noted that both the client and the public are mentioned as possible alternatives with respect to interests that may be served. This is because their interests are not always identical. The client may desire economy of design at the sacrifice of safety; the public may deem it better to be safe. Ethics leaves room for but one choice. The public interest is paramount.

The public interest also demands that engineers cooperate among themselves, particularly in common fields to avoid duplication of efforts. Paradoxically, it requires at the same time that they be highly competitive. But competitive in a very special sense. And this brings me to the point of my argument about ethics.

Competition is the basic element that insures the success of a business or industrial enterprise. The organization that can place a better item in the hands of the consumer at lower cost is the winner and the consumer profits along with it. Competition within professions has the same general objective, but with one major difference: the product is not an end in itself but rather the means by which a final objective is to be attained. Therefore, quality of the service is of far greater importance than its cost, although cost, of course, must be kept within reasonable bounds. Bad advice, bad planning, or cut-rate engineering may lead to final results so costly that no one can afford them.

This is the principal reason that discouragement should be given to the solicitation of bids for engineering services. Another reason leading incidentally to the same end is that competitive pricing may result in subsidization motivated by hopes of greater profit in the construction stage. In either case, the owner, who can ill afford it if a developing nation, is left with higher prices or an inferior project (or both) when construction has been completed.

The question uppermost in the mind of every responsible engineering firm faced with a request for a priced bid is obviously whether or not to take a chance on losing the job by failing to be responsive. This is only another version, of course, of the question that rises to face nearly every person every day. Stated simply it is: how important is it to be wholly ethical? Isn't it enough to be just mostly honest?

Several of the engineering societies of countries which should be leading the way to more ethical world practices have chosen to evade the issue by saying that moral principles should be adhered to at home or in competition with fellow members, but that anything goes when abroad or in competition with outsiders. Specifically, the American Society of Civil Engineers, after taking a firm stand against bidding for professional contracts, then says, "On foreign work, for which only United States engineering firms are to be considered, a member shall order his practice in accordance with the ASCE Code of Ethics. On other engineering work in foreign countries, he may adapt his conduct according to the professional standards and customs of that country, but shall adhere as closely as possible to the principles of this code."

The National Society of Professional Engineers of the United States takes an exceptionally straightlaced view of the situation by not only condemning competitive bidding for professional assignments, but by then defining bidding as including "formal or informal submission or receipt of verbal or written estimates of costs or proposals in terms of dollars, man days of work required, percentage of construction costs, or any other measure of compensation whereby the prospective client may compare services on a price basis prior to the time that one engineer, or one engineering organization has been selected for negotiation." This, however, is vitiated by an amendment of last year which permits bidding in foreign countries "as required by the laws, regulations or practices" of the countries.

The Association of Consulting Engineers of London leaves the door more widely open by saying, "No Member shall knowingly compete on the basis of professional charges with another Member for employment." Thus, while indicating general agreement with the basic principle of the Golden Rule, the Association sees fit to qualify its application.

The Engineering Societies of Western Europe and the U.S.A. (EUSEC) agrees that "a member shall not knowingly compete on the basis of professional charges with another engineer," but hedges in the case of foreign countries by ordering adherence "so far as applicable" -- whatever that may mean.

It is refreshing to note a number of organizations that take and hold an unequivocal position with respect to price competition for professional assignments. Among them, besides the World Bank and the Inter American Development Bank, are: The Consulting Engineers Council (U.S.A.), The Pan-american Federation of Engineering Societies (UPADI), and the Asociacion de Ingenieros Consultores Colombianos. There are probably others, but the ones named are surely deserving of applause. FIDIC at this meeting will be considering whether or not to join the elite circle.

The American Institute of Consulting Engineers almost made it by saying somewhat verbosely:

> "Resolved, that the American Institute of Consulting Engineers strongly condemns the practice, on the part of some public officials and corporations, of publicly soliciting bids from engineers for the rendering of professional engineering services; and considers it unprofessional and inconsistent with honorable and dignified bearing for any member of the Institute to invite proposals for the performance of engineering services or to state a price for such services in response to any such invitation..."

This is a splendid, brave statement -- to this point -- and if left there it would be a credit to any professional organization. Unfortunately, someone weakened, and added as a loophole, "...when there are reasonable grounds for belief that price will be a prime consideration in the selection of the engineer."

I have mentioned in passing, the World Bank and its policy for the selection of professional consultants. Its longer name is the International Bank for Reconstruction and Development and it has two associated organizations within its physical structure. These are the International Development Association (IDA) and the International Finance Corporation (IFC). IDA handles credits to the less affluent countries on easier terms than the Bank, and IFC assists private enterprises in the developing countries by loans and equity investments. Consultants for all projects financed by loans are selected by borrowers subject to Bank approval. Approval is generally given to a number of firms comprising a slate submitted by the borrower, who is then at liberty to select among them. The Bank makes it clear, however, that it desires the selection made on the basis of merit and not by asking for bids. It describes in a pamphlet furnished to all borrowers the procedures that are employed by the Bank in making selections and urges that these be adopted as policy by each borrower.

The pertinent extract is as follows:

> "The selection of a consulting firm for a particular assignment, whether by Bank or borrower, should begin with the preparation of a reasonably sized list of firms claiming expertise in the field. The list may then be shortened by detailed studies of each firm's experience and capabilities until four or five remain as comprising a final list

to receive invitations for proposals. It is desirable that borrowers submit to the Bank the final list of consultants before invitations for proposals are sent out so that the Bank may satisfy itself that the firms are qualified to perform the work. Invitations should define the objectives of the undertaking and stipulate the conditions under which the work is to be performed. It should be clearly indicated that financial terms are not desired at this stage; that selection will be made entirely on the basis of qualifications to perform the work and not on price. Consultants should furnish, as a part of their proposals, estimates of the time required both in the field and the home office to comply with the terms of reference, as well as the names and qualifications of those who would comprise the team."

"Proposals, when received, should be carefully analyzed and compared with respect to plans of approach, schedules, experience and capabilities of personnel to be assigned, the quality of supervisory leadership to be furnished, attention to be given by principals of the firm, facilities of the home office, and the assistance, if any, that may be available from others. Familiarity with the language and customs of the country in which the work is to be performed should be given due consideration. After selection has been made of a firm considered to be best qualified for the assignment, negotiations should be opened in order to agree upon the financial terms of the contract."

"The firm selected should submit a statement of its estimated costs and proposed remuneration and be ready to justify the elements involved. If the proposed financial terms appear reasonable a contract should be entered into. If the proposed charges appear too high, efforts should be made to reach a mutually satisfactory agreement. If this is not possible, negotiations should be terminated and opened with the firm next in line."

It will be noted that contrary to the National Society of Professional Engineers, the Bank does not consider that estimates of time (man-months) required for the job constitute pricing. It believes that such estimates are necessary as a means of judging the understanding of the firm as to what is to be undertaken and accomplished. It is true that such estimates give a rough indication of the cost that will be incurred, but more importantly they indicate which firms may be entirely out of line in their concepts of work. As between firms with similar schedules, price differentials could be in either direction and in any case the differentials of price would probably be so slight as to have insignificant effect on the overall cost of the project which may eventuate.

In all that I have said, I have not provided any real basis for a solution to the problem that has been recognized but dodged so effectively by some of the responsible engineering societies. I can only suggest that those societies must face up to the fact that engineering ethics are not

improved in the wealthier, industrialized countries by yielding and conforming to the standards of the underdeveloped ones. I would suggest too that it may be better for a firm to lose an occasional assignment than to sacrifice its principles. Some might be surprised in fact if they stood their ground and stated clearly their moral principles, adding their disbelief that any ethical, responsible firm would respond to a request for priced proposals. If a clear-cut proposal were to be submitted without prices, but defining the scope of work anticipated, the team to be employed, and the time estimated to do the job, it would stand a very good chance of winning against the proposals of those who disregard the ethics of their profession.