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ARMSTRONG

THE APPRAISAL OF WATER AND SEWERAGE PROJECTS

Walter J. Armstrong
Assistant Chief, Industry Division
International Bank for Reconstruction and Development



Introduction

The International Bank for Reconstruction and Development is now in its sixteenth year of operation--having loaned about \$6.5 billion in some 62 member countries. In the first years emphasis was on the reconstruction of war-torn countries. As reconstruction funds became available from other sources, the Bank, early in its operations, turned to lending for development. Loans have been largely concentrated on productive projects of high priority in the fields of transportation, electric power, industry and agriculture. Bank loans to governmental or private borrowers are made on conventional terms, at the going interest rate (at present 5 3/4%) for periods usually not exceeding 25 years.

Bank loans are made to borrowers (who may be governments, governmental bodies or private enterprises) who are creditworthy-- i.e., who are able to make effective use of outside capital and who are able to service foreign debt. More recently it has become apparent that funds on special financial terms are needed for countries which are nearing or perhaps already have reached their safe borrowing limit. Therefore, in September 1960, the International Development Association (IDA) began operations, making credits available to governments of member countries for 50 years with a 3/4 of 1% service charge but free of interest.

IDA is able to invest in both productive projects and social service projects, such as water and sewerage, and education. The Bank also recently has begun to lend for water projects.

It should be noted here that the same staff serves the Bank and IDA and the same standards of appraisal apply, irrespective of the source of funds.

It is still the main desire of the Bank and IDA to finance productive projects which have a high priority in the needs of the member countries. Water supply and sewerage projects to be considered, must have a high priority in the over-all development needs. Or in other terms, does the lack of proper water supply and distribution system or a sewage disposal system inhibit productive development? For example, is there an uncontrolled health problem which affects worker output; is industrial development hampered by the lack of an adequate water supply; or is it an essential ingredient of a rising standard of living?

The procedure for making an application to the Bank or IDA is quite simple and informal. A visit or a letter is all that is required. However, before we can get very far in discussions we must have an indication from the government of the country concerned that it supports the project and will be prepared to guarantee the loan if one is granted. We would expect to receive with the initial application as much information as is available concerning the project. If, at this point, the project as presented shows signs of inadequate preparation, we may suggest that additional studies be carried out.

After studying the information in Washington, we would investigate the project in the field, and then prepare an appraisal of the project, containing recommendations for the amount and conditions of a possible loan or credit, for consideration of the management of the Bank or IDA.

The Bank and IDA admittedly have had limited experience with water and sewerage projects. Credits and loans have been made for three water projects (through May 22, 1962). One of these was to the City of Reykjavik, Iceland for a hot water system for heating purposes, using geothermal sources; not exactly a conventional water project. Another dozen projects are in various stages of examination. However, we have had a great deal of experience in the analysis and appraisal of projects in many other fields, and we find that the same techniques of appraisal apply equally well to the examination of water and sewerage projects.

However, we do not pretend to be the final authority on the subject of project appraisal. We have made mistakes, but we have tried to learn from our mistakes so as not to repeat them. I have no doubt we shall make more mistakes in the future and have plenty of scope for learning from them also.

At this point a word of caution is necessary. There are many aspects of project appraisal—to keep this paper within reasonable limits it is necessary to generalize at the expense of precision. The particular conditions of a given project may well justify deviation from any general rule.

General Approach to Appraisal

In appraising a project, we in the Bank and IDA do not take the relatively narrow point of view of a conventional creditor. We do expect to be repaid on time of course, but equally important, we are interested in the execution of the project and in its successful operation to the maximum benefit of the people it is intended to serve. We therefore do not confine our scrutiny to the project itself, but are interested in all the circumstances surrounding it, the whole economic complex of which the project will form a part. In practice, this means that we investigate six different aspects of the project, namely:

- 1) The Economic Aspect;
- 2) The Technical Aspect;
- 3) The Managerial Aspect;
- 4) The Organizational Aspect;
- 5) The Commercial Aspect;
- 6) The Financial Aspect.

1) The Economic Aspect of Project Appraisal

Before we look at a project, our economists study the whole economy of the country involved in order to form a judgment about the relative priorities of the development needs of the different sectors. One of the most important problems is the balance between "economic" or "productive" projects and "social" projects which may be urgent and beneficial, but which do more to raise levels of consumption than to promote economic productivity. In many of the countries in which

we work, it is evident that the highest priority should be given to the development of the basic services such as transportation and power, or to the development of agriculture and basic industry.

It is not that "social" projects are in any way undesirable in themselves; it is rather that they often represent the fruits of progress rather than the means for achieving progress. The community can afford to build and support such facilities only if through productive investment it can achieve expanding income and over-all economic development.

In order to establish that a water or sewerage project is of high priority, it is necessary to determine what benefits to the economy and society may be expected. What are the health problems which may be overcome, or a start made on overcoming them? Is industrial development hampered by the lack of a water supply? What fire losses might be avoided, or how much might be saved in insurance premiums with a proper water system?

These are difficult questions to answer with any degree of precision--the first one is often times the most difficult of all. There is above all a need for accurate statistics and data on a comparable basis. At present one almost has to proceed on the assumption that the provision of an adequate water supply is bound to bring about improvement in the general health of the population.

Once it has been decided that a particular project is of high priority there are still a number of economic questions to be answered. Some of these deal with technical and financial matters and could just as well be considered in later sections, but for emphasis they are grouped here.

An important aspect of the economic appraisal is the examination of the basic assumptions used in designing a project. How much water or sewerage service is really needed? How much service can be paid for? Too often we see projects based on a per capita per day figure literally pulled out of the air. Someone in an office has decided that a certain figure should be used. Also, we have seen feasibility reports which say that City "X" under study has a population the same as City "Y" in the United States which uses "Z" million gallons per day. Therefore the system for City "X" will be designed for "Z" million gallons per day.

The first approach is bad enough but the second is complete nonsense. It ignores differences in income, facilities available, habits and water availability. Each project must be designed for the particular location and taking into account the needs of this location.

In one case, in a water scarce region, we questioned the per capita consumption design figure and insisted that a careful study be made. The result of this study was that 57% of the population probably would not use more than 10% of the original design figure.

Whether or not the water is metered has an important bearing on consumption. Probably many apparent water shortages could be eliminated or greatly alleviated by the installation and proper use of meters.

Another important economic consideration is how far ahead should one build. Certainly one needs to plan ahead and develop a long-range master plan, which of course should be reviewed and revised periodically. However, in many countries one can't afford to install facilities which would take care of growth for the next 25 years.

The value of money in the particular country should be a primary determining factor. In most developing countries money is worth a minimum of 10-15% per year as measured by local interest rates. In such circumstances unless facilities can be fully utilized within a five to ten year period money will have been wasted in over investment. In economic terms, in many cases it will be cheaper to duplicate facilities within a relatively short period than to build them now.

2) Technical Aspects

This side of the investigation covers the engineering features of the project, some of which have economic and financial overtones. Basic design assumptions have already been mentioned.

For a water project, what is the source of water; what tests have been made, what records are available to assure a continuous supply? What treatment is indicated by chemical and bacteriological analyses? What degree of treatment is consistent with the condition of the distribution system and with health and economic considerations? Have alternative sources been investigated?

While we do not design systems we do review in some detail the layout proposed equipment, etc. Oftentimes, considerable savings can be made without infringing on the realistic objectives of the project by designing to somewhat lower standards than called for by U.S. or European practice. As an example, perhaps the filter rate should be twice that of traditional U.S. practice.

It is necessary to consider whether the engineering arrangements are satisfactory. In many cases it may be necessary to employ consultants to assist local authorities. The scope of the consultants'

work may need to cover any or all of the following functions: feasibility studies, design, preparation of specifications, drafting of invitations to bid, analysis of tenders and recommendation for placing contracts, arrangements for the payment of suppliers and contractors and for the transport of supplies, inspection and expediting of supplies and equipment, supervision of construction, training or arrangement for the training of operating personnel and staff, and sometimes the supervision of initial operations.

Where consultants are employed it is necessary to be sure not only that the firm is experienced and has a good record but also that their staff and organization for the project is adequate.

The technical appraisal also includes the investigation of the proposed construction schedule. This must take into account all the different phases from design through installation and initial operation. It also needs to consider the effect of seasonal variations in working conditions, and problems of procurement and delivery.

The appraising engineers' work also involves the investigation of the construction and operational cost estimates; starting with an examination of the assumptions on which the cost estimates have been based. The cost estimate must include adequate allowances for physical contingencies and for likely increases in the general level of costs during the construction period. It may be necessary to include the cost of interest on borrowed funds during the construction period. In addition, an adequate allowance for the initial working capital must be included. It is necessary to check carefully that all costs associated with the project are included. We have found in some cases that

no plans have been made for connections, meters, or even secondary distribution mains. The cost of such facilities must, of course, be included in the financial planning for the project.

The cost estimates usually need to be broken down according to the amounts which will be spent locally and abroad, according to a time schedule, and according to the different elements of the project.

For some projects it may be necessary to check geological investigations for foundations and to examine hydrographic records, both in order to confirm the minimum safe stream flow and to estimate the maximum flood to be taken into account. Perhaps the potential sedimentation of reservoirs must also be examined.

Sometimes construction work cannot be delayed until all of the detailed engineering has been completed. In such cases there may be room for a substantial margin of error in the amount of work to be done, particularly in the amount of earth or rock to be moved. Adequate allowances must be made for these uncertainties when the cost estimates are prepared.

3) Managerial Aspects

No project can be successful unless it has good management. One difficulty frequently met in many countries is the limited concept of the role of management, where it is not understood that management is much more than simply keeping pressure up in the water mains.

The appraisal of management presents peculiar difficulties. It is something which cannot be measured precisely and much must depend on the investigators' "feel" for the situation. Of course, where a

project is to be carried out by an existing organization much can be learned about the quality of management from a study of what has happened in the past. However, it may happen that a management with a good past record may be inadequate to handle a greatly-expanded operation. In particular, proper delegation of authority is sometimes difficult to obtain, and this may be due not only to unwillingness to delegate from the top but also to lack of executive ability on the second level.

The shortage of management experience and ability is one of the main difficulties standing in the way of economic development in many countries. In many cases, the only reasonable assurance of adequate management is to import it. It may be possible to arrange for a management contract with a foreign organization, or it may be practical to employ individuals from abroad. One of the objectives of such arrangements should be to train local people to take over all operations as soon as practicable.

4) Organizational Aspects

This side of the investigation of a project falls naturally into two phases, the organization required to bring a project to the operating stage and the organization required thereafter. The type of problem here is the extent to which responsibility and authority should be centralized or delegated.

Water and sewerage facilities most often are owned by city, municipal, or other governmental bodies. Their operations may be managed by an autonomous authority, by a ministry or a department of

the governmental entity. We have no fixed ideas on the "best" way of organization. What we are after is a water or sewerage facility which is efficiently run and which has sufficient authority to take certain actions without continued reference to a governing body which may make decisions based on political considerations. How this is best accomplished must be determined in the light of local circumstance and the scale of operation. Our desire is to have at the lowest practicable governmental level a separate, self-contained unit which can operate on a professional basis. It should also be able to collect its charges and be able to keep its revenues, to the extent needed for operation, maintenance and expansion of the system.

An important phase of organization is the question of internal controls. In order for management to be able to function efficiently an organization must be able to provide without delay intelligently presented information which is constantly checking performance against expectations and bringing to light problems as they arise. It is, of course, equally important that an organization should be able to put the decisions of management into practice without undue delay and to make sound projections and plans for the future.

5) Commercial Aspects

In simplest terms the appraisal of the commercial aspects involves the investigation of the arrangements for purchasing the materials and services for the construction and operation of the project and for selling the product--in this case water or sewer service. It is necessary to be assured that those responsible for

the project have the necessary knowledge and experience to come to the best decisions about the way in which the available money is to be used.

In the construction phase, the main objective is to see that the proposed arrangements will ensure that the best value is obtained for the money spent. This normally means that the arrangements should provide effective competition among potential suppliers and contractors. The best way to ensure this usually is through international competitive bidding. It is true, of course, that there are exceptions to this. For example it may be most economic to standardize on the basis of existing equipment in order to reduce both the investment in spare parts and the cost of maintenance. Simplicity of equipment may also be a major factor. Above all, the specifications must be realistic to the needs of the country.

One word of warning may be in order here. The lowest bid does not always represent the best value. It is necessary to take account of quality, of the experience of the supplier, of the terms of delivery and payment, the care and cost of maintenance and so on before coming to a decision which is the right offer to accept.

At the operating stage, the arrangements for selling the water or sewer service must be investigated. How are connections and meter installations to be handled? What is the rate schedule? Are present rates adequate or must they be raised for the project? If rates must be raised, what effect could this have on water sales?

6) Financial Aspects

All of the information gathered under the previous headings is focused toward the financial aspects of the project. This side of

the investigation normally falls into two parts: that concerned with the amount of money required to bring the project into operation and with the sources from which this money is to be obtained, and that concerned with the operating costs and revenue and the prospective liquidity in the operating phase. In order to explain this approach fully, the main outline of the following paragraphs assumes a project which is to be carried out by an organization already engaged in operations, and already earning revenue.

Taking first the construction period, the first question is, how much money will be needed? The total financial requirements will include some or all of the following items:

- a) the costs of goods and services required for the project, including engineering expenses;
- b) allowances for escalation and contingencies;
- c) the cost of other capital investments to be made during the same period;
- d) interest during construction;
- e) repayment of existing debt during the construction period;
- f) working capital.

Even water and sewerage projects need working capital. The estimation of working capital requirements has to be based on reasonable assumptions concerning chemical stocks, spare parts, wages, etc. and the terms on which the service is sold, i.e. are charges collected monthly, bimonthly or quarterly? Will connection charge collections be extended over a period of years?

The second question, from where will funds come to cover the above total requirements? The sources from which expenditures will be met normally will include funds generated from operations (depreciation and earnings), borrowings (long-term, short-term or both), public funds from central or local budgetary sources, etc.

The next step in the financial analysis is to prepare projections of three kinds:

- a) estimated earnings during the construction period to determine the amount of self-generated funds to be applied to the project;
- b) a cash flow estimate, (a statement of estimated receipts and expenditures) from which it can be seen whether funds will be available at the right time to meet the expected requirements; and
- c) balance sheets which show the financial situation of the organization.

These projections then have to be carried on into the operating period to show the likely financial results of the operation. In these forecasts account must be taken of the time required to build up the connected load.

With these forecasts in hand the investigator has to form various judgments. He has to satisfy himself that there will be no shortage of funds during the construction period and that the financial situation at the end of the period will meet the requirements of sound financial principles. He has to judge whether the expected revenue

during the operating period represents a reasonable return on the capital invested, whether there is an adequate margin in the funds generated by operations to meet fixed financial obligations and whether revenue will be adequate to establish reserves for further expansion.

In the light of these judgments, the investigator should be able to say whether the proposed financing plan is sound, or whether some change is necessary. He should, in addition, be able to formulate the conditions upon which money should be made available for the project. The object of these conditions will, among other things be to ensure that subsequent action on the part of the management will not jeopardize the soundness of the financial situation and prospects. This may involve placing limitations on freedom to incur future debt or making arrangements for the provision of additional funds in case they are needed to complete the project. It may also be desirable to obtain an undertaking that adequate rates will be maintained.

We do feel that revenues should be sufficient to cover operating and maintenance costs, realistic depreciation and provide a reasonable return on the investment. This should mean that the organization should be able to repay debt, provide for normal replacements and renewals, normal year to year extensions of service and be able to establish a reserve for contribution to the costs of future major expansion projects. In some cases a lower than normal rate of return may be acceptable because of other benefits of the project. Nevertheless, the calculation of a reasonable rate of return is still necessary to show what the project is costing the country.

Conclusion

After reading the foregoing, I am sure that satisfying the Bank or IDA appears to be a formidable task. To be quite truthful, it is. Yet we do not feel that we are being unduly severe in our appraisal--certainly no more severe than good management should be in examining their own project. We are interested in providing financial assistance for sound projects, but we are not interested in providing finance beyond that necessary to accomplish the sound aims of a project.

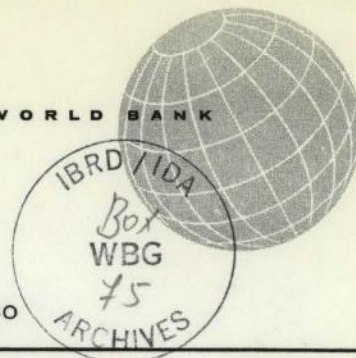
Most developing countries need so many things to assist development--roads, schools, power, housing, etc.--that usually their legitimate needs are in excess of their financial means. By careful planning and control, it is often possible to save considerable money--money which can then be used for other essential investment needs.

May 22, 1962

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

1818 H STREET, N.W., WASHINGTON 25, D. C. TELEPHONE: EXECUTIVE 3-6360

WORLD BANK



Speech by Mr. Walter J. Armstrong on February 26, 1963,
before the Iowa Engineering Society, Cedar Rapids, Iowa

THE ENGINEERS' ROLE IN THE WORLD BANK AND IDA

Let me first say how much we in the World Bank and the International Development Association appreciate the invitation to address the members of the Iowa Engineering Society. It is also a special pleasure for me to return to the area where -- quite a few years ago -- I spent a most pleasant and profitable year.

Before turning to the Role of the Engineers in the Bank and IDA, let me briefly describe these organizations. The International Bank for Reconstruction and Development, commonly called the World Bank, was organized at the Bretton Woods Conference in 1944 along with the International Monetary Fund.

The purposes of the Bank were to assist in the rehabilitation of war-torn countries, to assist in the development of its member countries, and to promote the flow of private investment funds into the member countries. In the first years emphasis was on the reconstruction of war-torn countries but, as reconstruction funds became available from other sources, the Bank early in its operations turned to lending for development.

As at December 31, 1962 the Bank had 81 free world member countries and in 16½ years of operations had made 333 loans totaling \$6.8 billion equivalent in 61 member countries; had disbursed \$5.1 billion equivalent; had sold participations to banks and insurance companies totaling \$1.4 billion; had borrowed \$4.0 billion equivalent on the world money markets (of which \$2.5 billion is outstanding); and had made a profit of \$755 million, all of which has been put into reserves. I should also say that the Bank has a staff of close to 800 from more than 40 different countries.

Bank loans are made to borrowers (who may be governments, governmental bodies or private enterprises) who are creditworthy, i.e., who are able to make effective use of outside capital and who are able to service foreign debt. Industrial loans are made only to private enterprises. Loans have been concentrated largely on high priority, productive projects in the fields of transportation, electric power, industry and agriculture. Loans to governmental or private borrowers are made on conventional terms at the going interest rate (at present 5½%) for periods usually not exceeding 25 years. However, the Bank lends only when funds are not available from other sources.

More recently it became apparent that funds were needed for countries which were nearing or already had reached their safe borrowing limit. Therefore, in September 1960, the International Development Association (IDA) began operations, making credits available to governments of member countries for 50 years, free of interest, with a service charge of 3/4 of 1%. IDA funds come wholly from the capital subscriptions of its members.

IDA is able to invest in both productive projects and social service projects such as education, water supply and sewerage systems. IDA funds for revenue producing projects are reloaned to the enterprise on terms similar to those for Bank loans.

As at December 31, 1962, IDA had made 33 credits totaling \$367 million in 17 member countries, five of whom had not previously had Bank loans.

It should be noted that the same staff serves the Bank and IDA, and the same standards of appraisal apply, irrespective of the source of funds.

Before we look at a project in detail, our economists study the whole economy of the country involved in order to form a judgment about the relative priorities of the development needs of the different sectors. One of the most important problems is the balance between "economic" or "productive" projects and "social" projects which may be urgent and beneficial, but which do more to raise levels of consumption than to promote economic activity. In many of the countries in which we work it is evident that the highest priority should be given to the development of the basic services such as transportation and power, or to the development of agriculture and basic industry.

It is not that "social" projects are in any way undesirable in themselves; it is rather that they often represent the fruits of progress rather than the means for achieving progress. The community can afford to build and support such facilities only if through productive investment it can achieve expanding income and over-all economic development.

I have been using the word "projects" rather frequently. Bank and IDA funds are almost always made available for specific, definable purposes or projects. A project may be a single road or for a program for the construction of several roads; it may be for a dam and power plant; a program for land reclamation or for a steel mill.

In appraising a project, we in the Bank and IDA do not take the relatively narrow viewpoint of the commercial lender. We do expect to be repaid on time of course, but equally important we are interested in the execution of the project and in its successful operation to the maximum benefit of the people it is intended to serve. We therefore do not confine our examination to the project itself, we are interested in all the circumstances surrounding it.

In addition to the project having a high priority for the borrowing country, we have to satisfy ourselves that its feasibility has been completely demonstrated, that it is complete in itself and that its proposed financing plan is sound. In practice this means that we investigate each project from six different aspects, economic, technical, managerial, organizational, commercial and financial.

I won't say more about the techniques of appraisal today, but for any of you who would be interested, I would be glad to send you copies of papers on the subject.

By using the terms "project" and "technical appraisal", I have given a hint that engineers have a place in the works of the Bank and IDA. I can go further and say that without engineers the Bank and IDA would most certainly be very different organisations from what they are today.

Engineers are important to the Bank and IDA in several ways. In the first place, we have on our staff a number of engineers of various nationalities, experienced in a wide range of engineering fields.

Secondly, from time to time we engage consulting engineers to assist our staff in appraising projects either to meet a peak in our work-load or to provide specialized advice on problems where our own staff is not experienced.

Thirdly, and perhaps most important, are the engineers employed by our borrowers to perform services connected with their projects -- from feasibility studies through design, supervision of construction and start-up. These are the engineers who conceive such projects as the Kariba Dam in Rhodesia. This dam is creating a reservoir 130 miles long to supply a power station with an ultimate capacity of 1,500 megawatts.

A great deal of credit is due also to the engineers of the contractors who construct the projects, who are able to meet major crises and still complete construction according to schedule. Referring again to the Kariba Dam, the annual peak flow of the Zambesi River had averaged about 220,000 cubic feet per second over a period of years. In the first year of construction the peak flow during the flood season rose to about 300,000 cubic feet per second, the highest recorded. But this was only a sample. In the second year the peak flow rose to about 600,000 cubic feet per second, or double the normal wet-season flow over Niagara Falls. Although there was damage at the site, the contractors were able to overcome this and complete the construction on schedule.

Now, what do we expect of engineers? For our own staff, they should have had extensive experience in their own field; they must be able to review designs and flow sheets, make capital and operating cost estimates; make a judgment of the borrowers' management and organization, spot possible problems before they arise and so on, but most important, in order to work effectively with economists and financial analysts, they must have an awareness and understanding of the economic and financial implications of engineering decisions. The engineers of my own division are familiar with the techniques of market analysis and can run-out profit and loss, cash flow and balance sheet projections almost as rapidly as the financial analysts.

Consulting engineers working for us or for our borrowers should also have this same awareness of economic and financial considerations. Unfortunately, too often we find that such engineers don't have this economic or financial awareness.

The value of engineering services connected with Bank and IDA projects has been estimated to approach \$100 million a year. The total amount spent on engineering services for all projects in the developing countries must be several times this amount.

The need is not only for a great volume of engineering, but also for the very highest quality of services.

It must be recognized that in working in underdeveloped countries, the environment is completely different from that of the United States or Europe. Business ethics and practices may be unfamiliar. Problems of culture and custom, even religious habits must be taken into account. Per capita income is lower. In such circumstances one cannot rely on the routine use of rules of thumb which are second nature in design work in a developed country.

In working abroad the engineer must be more than an engineer. He must concern himself with his client's best interests. From the very outset in negotiating a contract he must be sure that its terms permit him to do all the things necessary for the project. To accept a contract where the client, without adequate preliminary studies, instructs you to design a 100 mgd. treatment plant, assuming an adequate

water supply, may be far from serving the client's best interest. The client may need only 30 mgd. The engineer must be prepared to give a client unwelcome advice, to recommend rejection of a project which has no merit or to recommend changes to be able to develop a project which will meet the client's legitimate needs.

Another problem the engineer will be faced with in designing such projects as a water supply and distribution system is how far ahead to build. In this country you may design without hesitation for 20 to 40 years to come. You can count on the project being financed at a low rate of interest, and on the city being able to afford the corresponding debt burden. The situation is quite different in the underdeveloped countries. The uncertainty about future demand, the poverty of the people, the fact that local interest rates may be as high as 12% or even 18%, must all be taken into account. The people simply cannot afford to pay now for facilities that may not be fully used for 15 or 20 years.

In bringing you this brief story of the engineers' role in an organization, of which I am extremely proud, I have had to gloss over or even ignore facts and details which are necessary for a complete understanding. Perhaps I can summarize by saying our aim is to assist in bringing about an increase in the standard of living in the less fortunate regions of the world. We believe that this may best be accomplished by helping people to help themselves. Although we have been criticized, we do not feel that we are being unduly severe in our appraisals -- certainly no more critical than good management should be in examining its own project. We are interested in providing financial assistance for sound projects, but we are not interested in providing finance beyond that necessary to accomplish the sound aims of a project.

Most developing countries need so many things -- roads, schools, power, housing -- that usually their legitimate needs are in excess of their financial means. By careful planning and control of one project, it is often possible to save considerable money -- money which can then be used for other essential investment needs. It is here, in the careful planning, that the engineer has much to contribute to the work of the Bank and IDA.

Thank you.

copy to Paris

File with Mr. Armstrong's speech in English-Spanish;
6/14/66 - permission given by Mr. Armstrong to publish
in Bulletin d'Information (quarterly bulletin of information
related to urban and town-planning problems) published by
BCEOM (Bureau Central d'Etudes pour les Equipments d'Outre-Mer)
Paris; especially for African countries
BANQUE INTERNATIONALE POUR LA RECONSTRUCTION
ET LE DEVELOPPEMENT.



FINANCEMENT DES RESEAUX D'EAU
ET D'ASSAINISSEMENT.

Walter J. ARMSTRONG.

Présenté le 19 Avril 1966.

Séminaire sur l'eau potable et
l'assainissement - MEXICO, D.F.

18-22 Avril 1966.

Secretaria de Recursos Hidraulicos
Jefatura de Agua Potable y Alcantarillados.

Mesdames, Messieurs,

J'espère que vous excuserez mon pauvre espagnol mais il y a près de 15 ans que je n'ai guère eu l'occasion de pratiquer cette langue.

C'est un plaisir pour moi d'être avec vous cette semaine pour participer à l'étude des problèmes d'alimentation en eau et d'assainissement du MEXIQUE.

La Banque Mondiale a, derrière elle, vingt années d'intervention. Durant cette période, elle a consenti aux pays membres un ensemble de prêts totalisant environ 125 Milliards de pesos(1). Le MEXIQUE a reçu des prêts totalisant presque 8 Milliards pour l'énergie, les transports et le développement agricole.

A ce jour, nous avons consenti 11 prêts, d'un total Mille quatre cent Millions de pesos, pour des projets d'alimentation en eau et d'assainissement intéressant 15 cités dans 10 pays. Deux d'entre eux seulement concernent des pays d'Amérique latine : l'un pour la cité de Managua (Nicaragua) qui est en voie d'achèvement, et l'autre pour Caracas (Venezuela) qui a été approuvé ces jours-ci.

Ce pays (le MEXIQUE) a crû rapidement ces vingt dernières années dans tous les secteurs. Une part importante de cette croissance résulte des investissements substantiels réalisés tant par le Gouvernement que par les entreprises privées. Malgré cela, de considérables investissements devront être faits dans l'avenir.

Les projets d'approvisionnement en eau et d'assainissement donnent lieu à une sévère compétition lors des demandes de financement du fait qu'un besoin de fonds existe pour beaucoup de types de projets : écoles, routes, énergie électrique, habitation, industrie, hôpitaux etc., tous importants pour la croissance harmonisée d'un pays.

(1) - 1 peso mexicain = 0,40 Franc français.

Qu'est-ce que cela signifie pour les ingénieurs et pour les cités qui doivent préparer des projets d'alimentation en eau et d'assainissement ?

On doit distinguer deux aspects :

- 1.- Les communautés elles-mêmes doivent se préparer à supporter le coût des opérations. C'est-à-dire que les tarifs doivent être calculés pour couvrir les dépenses d'exploitation, l'amortissement des prêts et procurer un surplus pour financer des extensions futures;
- 2.- Les projeteurs et administrateurs doivent considérer la nécessité de faire que leurs projets soient assortis aux besoins réels de la communauté, c'est-à-dire que les services prévus doivent s'accorder avec la capacité de paiement des intéressés.

A considérer les installations d'alimentation en eau et d'assainissement de divers pays, j'en suis arrivé à la conclusion que beaucoup d'ingénieurs ne s'efforcent pas de présenter des conceptions économiques. Chaque projet doit être conçu en tenant compte du lien et de ses nécessités propres : revenus, équipements, coutumes, disponibilités en eau.

Une autre considération économique importante est à évoquer : jusqu'à quel point doit-on construire pour le futur ? Il est certes nécessaire de disposer de plans pour le futur et d'établir un programme d'action à long terme (1) qui, naturellement, devra être reconsidéré et révisé périodiquement.

Cependant, on ne peut réaliser d'un seul coup tous les équipements qui seront nécessaires pour répondre à la croissance des 25 années à venir. Le prix de l'argent en particulier doit être considéré comme un facteur déterminant. Dans nombre de pays en voie de développement, ce prix atteint au moins 10 à 15 % l'an, d'après les taux d'intérêt pratiqués localement.

(1) - "Long-range master plan" en Anglais.

Dans de telles circonstances, à moins que les installations ne puissent être utilisées à pleine capacité dans un délai de cinq à dix ans, l'investissement est d'un coût excessif (et l'argent aura été gaspillé en sur-investissement). En termes économiques, dans beaucoup de cas, il sera plus intéressant de doubler les installations dans un délai relativement court que de les réaliser d'un coup tout de suite.

La Banque espère que les projets pour lesquels des prêts seront sollicités seront bien conçus sur cette base du point de vue technique. Les ouvrages projetés devront être réalisables par étapes afin d'éviter des plans qui se projettent trop dans l'avenir, c'est-à-dire qui impliquent immédiatement une demande de capital pour l'ensemble du projet. Nous sommes, par ailleurs, intéressés par des plans qui évitent le recours à des techniques ou installations spéciales d'exploitation difficile. Les techniques employées doivent être adaptées aux conditions qui présideront à la réalisation et à l'exploitation des réseaux.

D'une part, nous estimons que, trop souvent, on utilise des techniques dépassées : c'est ainsi que les lits de filtration sont encore conçus pour 120 m³/jour/m² - (2 gallons par pied carré et par minute) alors que des vitesses de filtration, deux fois plus élevées, sont déjà utilisées de façon satisfaisante en maints endroits. Mais, d'un autre côté, nous voyons des installations particulièrement complexes proposées là où la filtration lente (sur sable) serait la solution indiquée. Concevoir économiquement n'est pas facile, cela signifie que bien des conceptions traditionnelles auront à être écartées; un travail approfondi sera nécessaire car, à chaque instant, l'ingénieur devra réfléchir sur les besoins légitimes à satisfaire et la possibilité d'y parvenir sans gaspiller les deniers publics.

De première importance pour l'appréciation d'un projet par la Banque est la solidité et la compétence de l'organisme qui aura à construire et exploiter le réseau. Trop souvent la lenteur à résoudre les problèmes d'alimentation en eau et d'assainissement est imputable à l'absence d'un organisme ayant la compétence et le désir de réunir les moyens d'étudier et de réaliser les projets. Etablir de telles institutions est, dans nombre de cas, une tâche extrêmement difficile. La communauté elle-même doit manifester le désir de disposer d'un organisme efficace avant qu'il ne puisse être créé. Il ne suffit pas d'avoir des projets, il faut les moyens d'exécuter et d'exploiter les ouvrages, et je suis persuadé que nous tous connaissons des cas où les réseaux et leur exploitation sont déficients par l'absence d'une bonne organisation.

Le dernier point que je désire évoquer, mais peut-être le plus important, est la nécessité d'une politique bien définie, tant de la part de la Municipalité que du Gouvernement fédéral, au regard des tarifs et des autres éléments qui affectent directement la solidité financière de l'institution qui entreprend le projet.

La position de la Banque Mondiale, sur ce point, a été très bien définie par l'un de ses Présidents, dans les termes suivants :

" De nos jours, l'expansion de la fourniture de Services publics
" essentiels est l'un des impératifs de la croissance économique
" dans tous les pays sous-développés. Au cours de la prochaine
" décennie, des milliers de Millions de dollars de capitaux de-
" vront être trouvés pour ces activités. Il est clair qu'il n'y
" a pas de moyen pratique de réunir cet argent à moins qu'il ne
" provienne de ces Services eux-mêmes, par la voie d'une rémuné-
" ration adéquate à la charge des usagers ... Par tarifs ade-
" quats, nous entendons ceux qui procureront les fonds, non
" seulement pour couvrir le coût réel de ces Services, mais
" encore pour constituer les provisions telles que chaque année
" il soit possible de financer des extensions qui seront inévi-
" tablement nécessaires pour satisfaire la croissance future.
" Aussi bien, nous n'avons pas fait de distinction (dans la dé-
" fense de tarifs appropriés) entre les équipements publics et
" les équipements privés.

" Je crois que l'insistance de la Banque en faveur d'une solide
" politique financière s'est trouvée justifiée par les faits
" dans nombre de pays membres. Partout en Amérique latine, et
" dans bien d'autres parties du monde sous-développé, les fonc-
" tionnaires, chargés de trouver des capitaux pour le développe-
" ment, se débattent pour faire reconnaître ce principe simple
" que les Services collectifs utilitaires doivent se financer
" par eux-mêmes.

Encore que cela ait été dit à propos des tarifs de l'énergie électrique, cette position traduit très précisément le raisonnement sur lequel s'est fondée la politique qui a guidé, dès le départ, la Banque Mondiale (et l'IDA) dans l'octroi de prêts pour la construction ou l'amélioration des réseaux d'eau et d'égouts.

Nous sommes convaincus que l'une des plus importantes contributions que nous puissions apporter aux activités de ce type est d'encourager et de défendre avec insistance une bonne gestion et une bonne politique financière. A moins que les organismes, chargés de l'eau et de l'assainissement, ne fonctionnent sur la base d'une administration bien conçue et bien gérée, et ne soient guidés par une politique qui les mette en mesure d'étendre leurs réseaux autant que l'accroissement des besoins le requèrera, nous ne serons pas sur la voie de la solution du vrai problème.

THE INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT



FINANCIAMIENTO DE LOS SISTEMAS
DE AGUA POTABLE Y ALCANTARILLADO

FINANCING WATER SUPPLY AND SEWERAGE PROJECTS

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FINANCIAMIENTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO

Señoras y señores:

Espero que ustedes me perdonen por mi pobre español; han pasado casi 15 años durante los cuales no he tenido muchas oportunidades de practicar este idioma.

Es un placer para mi estar con ustedes esta semana, participando en el estudio de los problemas de abastecimiento de agua y alcantarillado en México.

El Banco Mundial apenas completa 20 años de operación. Durante este lapso de tiempo se hicieron préstamos a sus países miembros totalizando aproximadamente ciento veinticinco mil millones de pesos. México ha recibido préstamos por un total de casi ocho mil millones de pesos para energía eléctrica, transporte y desarrollo agrícola.

Hasta la fecha el Banco ha hecho once préstamos, totalizando mil cuatrocientos millones de pesos para proyectos de abastecimiento de agua y alcantarillado en 15 ciudades de 10 países. Solamente dos de éstos se concedieron a países latinoamericanos: uno para la ciudad de Managua, Nicaragua, que está casi terminado y el segundo para Caracas, Venezuela, que fue aprobado el jueves pasado.

Este país ha crecido rápidamente en los últimos 20 años en todos los sectores. Una parte importante de este crecimiento es el resultado de grandes inversiones realizadas por el gobierno así como por las empresas privadas. También ellos tienen que hacer inversiones fuertes en el futuro.

Los proyectos de abastecimiento de agua y alcantarillado sufren una competencia muy severa en los pedidos de financiamiento, pues existe una necesidad muy aguda de fondos para muchos tipos de proyectos: escuelas, carreteras, energía eléctrica, vivienda, industrias, hospitales, etc., todos importantes para el desarrollo equilibrado de un país.

¿Cuál es el significado de esto para los ingenieros y para las ciudades que deben preparar proyectos de abastecimiento de agua y alcantarillado?

Cabe destacar dos aspectos:

1. Las propias comunidades deben estar preparadas para cargar con el costo del proyecto. Esto quiere decir que las tarifas deben ser calculadas para cubrir costos, amortización de deudas y proveer un remanente para financiar expansiones futuras;

2. Los proyectistas y administradores deben tener en cuenta el hecho de que los proyectos sean adecuados a las necesidades reales de la comunidad, esto es, el tipo de servicio a ser provisto debe estar de acuerdo con la capacidad de pago de la comunidad.

Al observar sistemas de abastecimiento de agua y alcantarillado en distintos países, llegué a la conclusión que muchos ingenieros no se esfuerzan para producir diseños económicos. Cada proyecto debe ser diseñado teniendo en cuenta la localidad y sus necesidades propias.

Otra consideración económica importante es ¿hasta qué punto se debe construir para el futuro? Ciertamente es necesario hacer planes para el futuro y desarrollar un plan de acción a largo plazo que, naturalmente, deberá ser reconsiderado y revisado periódicamente.

Asimismo, no se pueden construir de una sola vez todas las facilidades que serían necesarias para satisfacer el crecimiento en los primeros 25 años. El valor del dinero, en particular, debe considerarse como el factor más importante. En muchos países en desarrollo el dinero vale un mínimo de 10% a 15% al año, según las tasas locales de interés. En tales circunstancias, a menos que las instalaciones puedan ser utilizadas completamente en un período de cinco a diez años, la inversión representará un gasto excesivo. En términos económicos en muchos casos será más barato construir instalaciones dobles en un período relativamente corto, que construir las de una sola vez de inmediato.

El Banco espera que los proyectos, para los cuales le sean solicitados préstamos estén bien hechos bajo el punto de vista técnico. Las obras a construir deben realizarse por etapas, a fin de evitar diseños que se proyecten mucho en el futuro, es decir, que impliquen una demanda inmediata del capital necesario para la obra completa. Estamos también interesados en los diseños que evitan técnicas especiales o equipos de conservación difícil. Las técnicas empleadas deben adaptarse a las condiciones bajo las cuales el sistema será instalado y operado.

Encontramos que normas de diseño anticuadas siguen siendo utilizadas. Se diseñan lechos filtrantes para 120 metros cúbicos por día por metro cuadrado, a pesar de que velocidades de filtración dos veces más altas están siendo empleadas satisfactoriamente en muchos lugares. Por otro lado, vemos diseños muy sofisticados propuestos para localidades en las cuales filtros lentos serían la solución indicada. Diseñar económicamente no es fácil; significa que muchos conceptos tradicionales pueden ser hechos a un lado. Será necesaria una mayor reflexión, pues frecuentemente el ingeniero debe meditar sobre las necesidades legítimas a satisfacer y como es posible satisfacer estas necesidades legítimas sin despilfarrar el dinero público.

De importancia fundamental para la apreciación que el Banco hace sobre el proyecto es la solidez y la habilidad de la organización que irá a construir y operar el sistema. Frecuentemente la lentitud en la solución del problema de abastecimiento de agua y alcantarillado se debe a la falta de una organización con la habilidad y el deseo de llevar a cabo las medidas necesarias a la planeación y ejecución de los proyectos. Establecer tales instituciones en muchos casos es un proceso extremadamente complicado. La comunidad misma debe alimentar el deseo de disponer de una organización eficiente antes que sea posible crearla. Los proyectos no pueden ejecutarse u operarse por sí mismos; estoy seguro que todos ustedes conocen casos en que los sistemas y la operación son deficientes por falta de una buena organización.

El último punto que deseo tocar, tal vez el más importante, es el de la necesidad de una política bien definida, tanto por parte de la municipalidad como del gobierno federal, en relación a tarifas y otros asuntos relacionados directamente a las finanzas de la institución que desarrolla el proyecto.

La posición del Banco Mundial en este aspecto fue muy bien definida por uno de sus presidentes al decir:

"En la actualidad un suministro creciente de servicios públicos esenciales es un requisito para el desarrollo económico en todos los países subdesarrollados. En la próxima década serán necesarios muchos miles de millones de pesos para estas actividades. No hay sencillamente ninguna manera práctica de conseguir estos fondos; a menos que una gran parte de ellos sea producida por los propios servicios, mediante el cobro adecuado de los servicios a los usuarios. Por tarifas adecuadas queremos referirnos a aquellas que proporcionen fondos, no solamente para cubrir el costo real de los servicios, sino también para retener de los ingresos una suma tal que en cada año pueda financiar expansiones que inevitablemente serán necesarias para satisfacer el crecimiento futuro... Ahora bien, no hemos hecho distinciones entre instituciones públicas o privadas".

"Creo que la insistencia del Banco en una sólida política financiera ha sido evidenciada por los acontecimientos en muchos de los países miembros. En toda América Latina y en muchas otras partes del mundo subdesarrollado, los funcionarios encargados de buscar capitales para el desarrollo están, en realidad, luchando para conseguir un reconocimiento del principio simple que las utilidades deben pagarse por sí mismas".

A pesar de que esto se dijo en relación a tarifas de energía eléctrica, esta opinión refleja precisamente el razonamiento básico de la política que desde el comienzo ha guiado al Banco Mundial en los préstamos para construcción y mejoramiento de sistemas de agua potable y alcantarillado.

Estamos seguros de que una de las contribuciones más importantes que podemos hacer en actividades de este tipo es estimular e insistir en una buena política administrativa y financiera. A menos que los servicios de agua y alcantarillado funcionen bajo una administración bien concebida y ejecutada, y sean dirigidos por una política que permita expandir los sistemas a medida que las necesidades aumentan, no estaremos resolviendo el problema real.

19 de abril de 1966

FINANCING WATER SUPPLY AND SEWERAGE PROJECTS

Ladies and Gentlemen:

I hope you will forgive me my poor Spanish, but it has been almost 15 years since there has been much opportunity for me to practice it.

It is a pleasure for me to be with you this week and to consider together the important problem of providing adequate water supplies and sewerage service for Mexico.

The World Bank is now completing 20 years of operation and during that time has made loans totaling about M\$N 125.0 billion to its member countries. Mexico has received loans totaling almost M\$N 8.0 billion for power, transportation and agricultural development.

To date we have made 11 loans for M\$N 1.4 billion for water supply and sewerage projects in 15 cities in 10 countries. Only two of these are in Latin America--one in Managua, Nicaragua is nearing completion and the second for Caracas, Venezuela was approved last Thursday.

Mexico, over the last 20 years, has grown rapidly in all sectors. Much of this growth has resulted from the large investments made by the government and by private businessmen. Large investment must continue to be made in the future.

Water supply and sewerage projects face severe competition when they look for financing because there is a tremendous need for funds for all types of projects--schools, roads, power, housing, industry, hospitals. All are important to the balanced growth of a country.

What does this mean to the engineers and to the cities hoping to build water and sewerage projects? It means two things:

- 1) The communities themselves must expect to bear the cost--by this I mean rates must be adequate to cover operating costs, amortization of debt and provide a surplus to finance further expansion; and
- 2) The designers and managers must see to it that projects are suited to the real needs of the community--that is to say, the type of service to be provided must be suited to the ability to pay.

In observing water supply and sewerage works around the world, I have come to the conclusion that many engineers make little or no effort to make economic designs. Each project must be designed for the particular location and taking into account the particular needs of this location--income, facilities, habits, and water availability.

Another important economic consideration is how far ahead should one build? Certainly one needs to plan ahead and develop a long-range master plan, which of course must be reviewed and revised periodically. However, one cannot afford to install at one time all the facilities which would be required to take care of growth for the next 25 years. The value of money in the particular should be the primary determining factor. In most developing countries money is worth a minimum of 10%-15% per year as measured by local interest rates. In such circumstances, unless facilities can be fully utilized within a five to ten year period, money will have been wasted in over-investment. In economic terms, in many cases it will be cheaper to build duplicate facilities within a relatively few years than to build them now.

The Bank expects that projects for which it is asked to lend money, will be well engineered, and that the works to be constructed are staged to avoid over-design and unnecessary tie-up of capital. We are also interested in design which avoids complicated engineering or equipment which is difficult to service. The techniques employed should be adapted to the conditions in which the system is to be installed and under which it must operate.

We find outmoded standards still being used. Filter beds are still being designed for 2 gals. per sq.ft. per min., whereas rates of double this figure are working satisfactorily in many places. On the other hand, we see highly sophisticated designs being applied in places where a slow sand filter might be more appropriate. Designing economically is not easy. It means that many traditional concepts may have to be discarded and it means more work because at every step of the way the engineer must stop to think what the legitimate needs are which must be satisfied and how the engineer can satisfy these legitimate needs without wasting the public's money.

Of fundamental importance in the Bank's appraisal of a project, is the strength and ability of the organization which is to build and operate it. All too often lack of progress in coping with the problem of providing adequate water and sewerage systems has been due to the lack of an organization with the ability and desire to take the steps needed to plan and execute the projects. To establish such institutions is often a most difficult step and the community itself must have the desire for an efficient organization before one can be created. Projects are not self-executing or self-operating and I am sure that you all know of cases where systems and operations are deficient because of the lack of an effective institution.

The last point on which I wish to touch, but perhaps the most important, is the need for policies on the part of both the municipality and the national government with respect to rates and other matters directly affecting the financial strength of the institution carrying out the project. The World Bank's position on this point was well stated by one of its presidents, and I quote:

"A steadily expanding supply of essential public services is a requisite of economic growth in all underdeveloped countries today. Over the next decade many thousands of millions of dollars in capital for these services must be found. There is simply no practical way to raise this money unless a substantial part of it is generated by the utilities themselves through adequate charges to the users of their services. ...

.....
By adequate rates, we have meant rates which enable utilities not only to cover the real cost of their services, but also to retain out of earnings, substantial sums each year to help finance expansions which inevitably will be needed to sustain future growth. And we have made no distinction in advocating adequate rates between privately-owned and publicly-owned utilities."

"I feel the Bank's insistence on sound utility finance is being vindicated today by events in many member countries. All over Latin America and in many other parts of the underdeveloped world, officials charged with the job of finding capital for development are themselves struggling to get a recognition of the simple principle that utilities should pay their way."

While this was said about power rates, this statement accurately reflects the reasoning behind the policy which from the first has guided the World Bank and the IDA in making loans for the construction and improvement of water and sewerage systems.

We believe that one of the most important contributions which we can make on projects of this type is to encourage and to insist on good management and good financial policies. Unless water and sewerage organizations function under sound management, and are guided by policies which place them in a position to expand their systems as the need for their services grows, we are not tackling the real problem.

April 19, 1966