CHAPTER 6

Ian Burton and T. R. Lee

WATER SUPPLY AND ECONOMIC DEVELOPMENT:
The Scale and Timing of Investment

Defining the Problem

Water is a peculiar commodity but nonetheless a commodity, and like all commodities, subject to rules of supply and demand. The position of water as a vital fluid essential for the existence of man and society obscures its larger role as an economic commodity. Unfortunately, the discussion of the development of the water resource too often assumes emotional overtones stemming from its elemental role in human life. Such an attitude can be perceived lurking within the policy adopted towards the provision of water supplies in underdeveloped countries. There is no doubt that these countries have a universal need for new and improved water supply systems. Urban water supply is undeniably a necessary part of the infrastructure required to attain the goal of social and economic development, the raising of the level of living. But, there is also a need for an evaluation of the nature of the role of urban water supplies in the development process and of the priority which should be given them amongst the multitude of necessary services and activities the underdeveloped countries so critically lack.

Ostensibly, the present policy adopted towards urban water supply is predicated upon the recognition of the role of a safe water supply in controlling the occurrence of certain diseases. The waste and human misery caused by such diseases as cholera, typhoid, and dysentery does not, however, excuse the water supply planner from the responsibility of establishing the extent of the need for water supply. It is not enough to accept that a safe water supply is a good thing.

Authors' Note: An earlier version of this paper was presented at a World Health Organization Inter-Regional Seminar on Integration of Community Water Supplies Into Planning of Economic Development, held in Geneva, September 19-28, 1967 (CWS/WP/67.8). The views expressed in this revised version are the responsibility of the authors alone.
If urban water supplies are to play their optimum role in the development process, changes in the demand for water as economic growth proceeds and per capita incomes rise must be understood. Patterns of water use and demand will alter as a society moves from being predominantly rural to more urban, and from smaller to larger cities, as well as with improvements in housing and increases in income.

There are a number of investment programs in public water supply. These include the Community Water Supply Program of the World Health Organization, bilateral aid programs in which a developed country aids a developing country directly, and the independent efforts of the developing countries themselves. While it is not possible to estimate accurately the total world expenditure on community water supplies for developing countries, limited evidence suggests that on a global basis, expenditures are low in relation to most definitions and estimates of need, and are probably not keeping pace with the growth of the population to be served. This state of affairs persists, even though international agencies report that funds are available if sound and "bankable" projects can be found. Estimates of investment in community water supply from all sources would serve as a guide to policy formulation. These should be compared with up-to-date estimates of need, and of population now served.

It is perhaps fair to say, in the absence of very precise information, that the view that we are failing to grapple with the problem on a sufficiently large scale is mainly expressed by community water supply engineers and public health officials. An outsider might be excused, therefore, for attempting a more skeptical scrutiny on the problem and for asking to what extent more piped water supplies are really needed. There is no doubt that modern piped water supply systems will eventually have to be built for all cities in the developing countries. What is in question is the scale on which systems should be built in the next decade or so, and the strategy of timing investment in community water supply in relation to the expanding economies of the countries themselves.

In theory, benefit-cost analysis might be used to show the extent of social benefits in relation to costs of public water supply systems. Where social benefits are found to outweigh costs by a substantial margin, governments and international agencies should have greater confidence in deciding to invest. The benefits of community water supply in economic terms may be either in promoting economic development and a rapid rate of growth, or in improving the welfare of the citizens. Both economic development and improved social welfare are high on the lists of priorities of the developing countries.

Experience with the benefit-cost analysis in the developed nations is not encouraging. Even in such fields as hydroelectric power development, flood control, and navigation, great difficulties have been encountered in attempting to reach agreement on estimated benefits. These difficulties are likely to be compounded in the developing countries and in relation to public health where the benefits are of a less tangible kind. Some studies have been made in developing countries which have shown very favorable benefit-cost ratios. In
Venezuela, for example, the total annual benefits to be expected from the provision of public water supplies in rural areas were estimated at 170 million bolivars, while the total annual cost was estimated at only 22 million bolivars, a ratio of over 7 to 1. The high benefits were based mainly on an estimate of 75 percent of the value earnings lost due to premature deaths. In another study in Puerto Rico, the benefit-cost ratio was found to be much smaller, although the major component again turned out to be the mortality benefit.

Continuing and intensified efforts are needed to improve techniques of measuring the benefits from community water supply in developing countries, but the problem is likely to remain with us for some time without very satisfactory solutions being reached.

A partial list of benefits for community water supply projects has been given by John Logan,¹ as follows:

(1) Health:
   (a) Basic physiologic need for water;
   (b) Reduction in costs of medical care;
   (c) Increased efficiency in human-energy utilization due to reduction in illness and debility;
   (d) Reduction in time losses due to illness;
   (e) Increased manpower availability.

(2) Economic development:
   (a) Attraction and growth of commerce and industry;
   (b) Contributions to production efficiency;
   (c) Tourism;
   (d) Improved food production.

(3) Public cleansing;

(4) Fire protection;

(5) Savings in cost and time over use of primitive water supply facilities;

(6) Encouragement of stable urban development;

(7) Increase in property values.

To these benefits, most of which could be approximately measured, can be added a range of other intangible benefits such as improvement in receptivity to new ideas and a faster learning rate by healthier students, a higher standard of public morale, perhaps contributing to greater political stability, and the incentive effect of the promise or realization of an improved standard of living.

It may be assumed that all these benefits do contribute in a direct or indirect way to economic development. The dialectic of community water supply engineers and public health officials tends to emphasize this view by ascribing to water supply a necessary role in economic development. Thus John Logan states: "It can be argued that, if health is fundamental to development, water supply is fundamental to health, and therefore water is a key to development."² Similarly, Abraham Horowitz is quoted as saying,
If a single program were chosen which would have the maximum health benefit, which would rapidly stimulate social and economic development, and which would materially improve the standard of living of the people, that program would be water supply with provision for water running into or adjacent to the house.\(^3\)

Such statements are even translated into an either/or choice, particularly in political speeches. The problem becomes transformed into the issue as to whether health is something which must first be earned by economic development, or if rather it is not a prerequisite without which economic development is impossible. The framers of such dichotomous choices intend to leave us no choice—we are clearly meant to choose health first. “Health first and economic development later” is quite misleading, however. The real issue is rather one of quantity—how much health can we afford at each stage of economic development? Or, how much health is really a necessary prerequisite for economic development? Such questions raise fundamental issues of choice. We all recognize that India could spend more money on the health of its population and less on steel production or running a national airline or building dams. But we do not really know what the returns would be from an additional rupee spent in any one of these areas. In the absence of a comparative and operational economic technique for measuring the marginal return to investment in all these and other areas, our decision makers must make value judgments in the light of what they think the people want and what they think will be best for the country in the long run (sometimes irrespective of what people want now). We all acknowledge the right of societies to make choices for themselves in these matters. The Americans have a high rate of per capita ownership of automobiles because evidently that is what people want, or, as Kenneth Galbraith would say, are persuaded by advertising that they want. On the other hand, automobile ownership is much lower in the Soviet Union, but they do have more doctors and more hospital beds per capita than the Americans.

The decision making problem faced by the developing countries, therefore, is primarily one of priorities, and this is related strongly to a value judgment about the type of society they wish to build. The choices can be clarified and exercised more effectively, however, if there is a clear understanding of their consequences. While it is often not possible to ascribe a precise quantitative or monetary value to particular choices, the consequences can often be described qualitatively in general terms. An improved benefit-cost analysis would help in formulating decisions by reducing still further the areas in which choice has to be exercised with a very hazy knowledge of the likely outcomes.

In the absence of a reliable and operational economic technique ready for immediate use in evaluating investment in community water supply, there are three things that might be done. The first is to search the economic development literature for theoretical guidelines about the level and timing of investments in community water supplies. The second is to ask what happened to community water supply investment in the developed countries at a comparable stage in
their evolution, and what possible relevance this might have; and, thirdly, to examine the actual situation among the developing countries in terms of level of supply and level of development.

**Economic Development and Social Overhead Capital**

A water supply system is part of that category of economic activities subsumed under the heading of the social infrastructure, or social overhead capital. These are activities which in themselves are not directly productive but are the necessary basis for the successful growth of productive activities. The term "social overhead capital" is normally applied to such disparate categories as education, electricity, the transportation system, health services, systems of administration, as well as to various aspects of water development, among which urban water supplies are only a part. Attitudes towards the place of social overhead capital in the economic growth process vary considerably. The need for social overhead facilities is one which cannot be disputed, but debates on their importance leave room for considerable doubt and uncertainty.

A number of questions have been raised about the level of investment that should be made in social overhead or infrastructure facilities. The breakdown of gross fixed investment in an advanced economy as estimated by Lewis is shown in Table 1.

Social overhead investment, including housing, commonly accounts for over half the total of all investment. This is so in an advanced economy with a large existing stock of social overhead capital. In an underdeveloped economy, this stock does not exist and one might expect a policy of heavy initial investment in the social infrastructure.

There is reason to believe that the proportion (of social overhead investment) is particularly high in the first decades of development and declines thereafter. This is because initial development calls for the establishment of a framework of utilities, and though it is necessary to spend money on maintaining and improving and extending the framework, it is possible that these later expenditures are relatively not so heavy as those which have initially to be made.

Such investment is characterized by a lengthy gestation lag between the

<table>
<thead>
<tr>
<th>Table 1. Gross Fixed Investment in an Advanced Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sector</strong></td>
</tr>
<tr>
<td>Housing</td>
</tr>
<tr>
<td>Public Works and Utilities</td>
</tr>
<tr>
<td>Manufacturing and Agriculture</td>
</tr>
<tr>
<td>Other Commercial</td>
</tr>
</tbody>
</table>

Figure 1. Percentage of Gross Domestic Product Devoted to Gross Domestic Capital Formation and Percentage of Urban Population with House Connections ($n = 39; r = 0.259$)

original investment and the beginning of a return. The very nature of the activities undertaken accounts for this lag. It is most marked in education but holds for all types of social overhead investment. The contribution of these activities is, in addition, very dependent upon the development of the related productive activities. Investment in social overhead facilities is largely made in the public sector due to these long gestation periods and the size of the individual projects. In India, public investment in this sector accounted for 88 percent of the total in the period 1951 to 1960. Investment in water supply is normally entirely within the public sector in all countries.

In the West the development of urban water supplies showed what can be described as a permissive sequence—permissive in the sense that the expansions to the systems were made with little attempt to evaluate the benefits to be gained from an increased consumption of water. Water for domestic supply was, and still is to a very large extent, not treated as an economic commodity. Such an approach is in every case of doubtful validity or wisdom but is particularly so in the underdeveloped countries with their shortages of capital and high rates of return on investments.

There is a strong priority basis, therefore, for the argument that the expansion of water supply facilities will be closer to an optimum rate if the amount of water supplied is kept at a level sufficient for the prevention of waterborne diseases. This argument is found in the economic development literature; Hirschman stresses that social overhead capital investment is largely facilitative, and directly productive, and has agreed that it might be better to allow a shortage of overhead capacity. Where a shortage is experienced,

it is bound to lead to attempts to remedy it on the part of those who suffer from it or who stand to gain from its elimination. In situations where motivations are deficient it therefore seems safer to rely on development via shortage than on development via excess capacity. In other words, if we endow an underdeveloped country with a first-class highway network, with extensive hydro-electric and perhaps irrigation facilities, can we be certain that industrial and agricultural activity will expand in the wake of these improvements? Would it not be less risky and more economical first to make sure of such activity, even though it may have to be subsidized in view of the absence of adequate transportation and power, and then let the ensuing pressures determine the appropriate outlays for SOC and its location? As examples of this type of sequence, one may cite the development of Japan, Turkey and, to a considerable extent, of the U.S.S.R. It is not surprising, given the differences of opinion amongst economists about the role of social overhead capital investment, that no significant relationship appears between the percentage of the gross domestic product devoted to gross domestic capital formation and percentage of urban population with house connections (Figure 1). The data used are very crude but they do suggest that the high priority accorded water supply has not resulted in a high provision of supply systems.
Experience Among the Developed Nations

The analogy between past events in developed countries and the developing world today is weak because the situations differ markedly in several respects. Foremost among these are the facts that population growth in those nations which transformed their economies early was not generally so rapid as it is in many developing countries today, and that the improvements in public health and hygiene were introduced incrementally as they became known, whereas today, the developing countries have the benefit of all modern medical knowledge and only lack the funds and trained personnel to apply it fully. One consequence of this situation is the urge in many developing countries to attain present standards of the developed countries immediately, including present design standards. The first nations to develop, having no such models to follow, were able to make progress deliberately, but without widespread pressures for the attainment of (present) high standards at once.

Also, in a sense Hirschman's "development by shortage" is a closer approximation to what took place in the developed countries than "development by excess capacity." In proposing Western standards and levels for the developing countries, it is often asserted that provision of safe and adequate amounts of potable water in Western cities resulted in dramatic improvements of public health, and that it is necessary to do the same in the cities of the developing world today. While there is no question that waterborne diseases are a significant factor in public health, it is also clear that they are not the only factor. There are many other disease factors, including flies, human artifacts, and people themselves. The elimination of water as a source of disease may be a necessary condition for improvement of public health, but it is not a sufficient condition. As long as sewage collection systems are inadequate, and as long as food remains exposed and habits of personal hygiene remain unchanged, then disease will continue to be spread, no matter how good the water supply.

While it is true that these conditions were also obtained in many cities of the developed world, two factors are different. First, other environmental conditions were improved at the same time as water supply, whereas in the developing countries there is a strong impetus to improve water supply conditions quickly and to let other improvements follow. Second, the tropical climate of many of the cities in the developing countries is more conducive to the spread of disease by non-water vectors than is the climate in more temperate latitudes. It is by no means safe, therefore, to assume that equivalent improvements in water supply will produce equivalent improvements in public health. The climatic and environmental differences strengthen the case for caution in the avoidance of over-investment in community water supplies on the basis of assumed public health benefits. These may not be realized unless the water supply program is accompanied by improvements in other aspects of the environment, and by changing patterns of behavior.
Non-economic Criteria

Would it then follow that the developing countries should make no effort to provide public water supplies? There may be those who would support such a view. There are perhaps two reasons for opposing it. One is that unless water is publicly supplied in some cases at least, and on some occasions, people may not be able to obtain the minimal quantity of water for survival. When people are starving to death, we do not usually ask what the benefits are of giving them enough food to stay alive—rather we do what we can to provide the minimal food requirements. Insofar as a community water supply system constitutes a safeguard against drought, or the destruction of a community by fire, it may be justified on non-economic grounds or without resort to economic arguments. Clearly, however, the amount of water that needs to be supplied to permit survival is very small and will not normally require a piped system. Distribution by truck could be relied upon to meet this need.

A second argument is based on welfare considerations. It merely states that no country is so poor that it cannot provide its citizens with some welfare or some social services. Every country recognizes the need to provide roads, electric power, hospitals, schools, and water. The question is rather how much of each and of what kind? Where economic criteria are not available to give answers to this question, there are four other alternative ways of arriving at an answer. These may be categorized as (1) experienced judgment and rules of thumb; (2) strict financial criteria; (3) popular demands; and (4) minimal standards. At the present time the first three of these criteria are all used to some extent in some places. The fourth is as yet little used.

(1) Experienced Judgment: This type of criterion is most widely used in the engineering aspects of community water supply. When pushed to explain the reasons behind engineering design choices, the professional sanitary engineers responsible often talk about “sound engineering judgment and experience.” Undoubtedly this is an important criterion. The major drawback of this approach is that it tends to become quickly codified into strict and arbitrary rules which are followed faithfully and often unquestioningly by other engineers who come after and who may be less gifted or more overworked. The rules then tend to become embodied so deeply in institutional practice that they become obstacles to change and continue to be applied in inappropriate situations.

(2) Financial Criteria: Under the conditions of great capital shortage which prevail in the developing countries, there is a case to be made for the argument that community water supplies should only be provided up to the ability of the community to pay. This “banker’s approach” to the problem, superficially at least, offers promise of a sound and workable criterion. The challenge is to demonstrate that the system can be operated effectively and that revenues can
be collected in sufficient quantity to cover operating and maintainance costs and pay off the capital debt, including service charges. Its weakness is that it demands too much too soon at a low level of economic development. Such a policy is all right for the middle income countries of Southern Europe, or parts of Latin America, but for the majority of underdeveloped countries it imposes an insuperable obstacle. It is not surprising, therefore, that developing countries do not strictly enforce financial criteria for investment in water supply systems. It is recognized that the financial return on the investment may be long delayed even though considerable social benefits may accrue in the meantime. The external financial agencies, however, both international and unilateral, are wont to insist on sound financial status of a project before making an investment loan. This is, of course, perfectly reasonable from a banking standpoint. It goes a long way towards explaining why investment in community water supply projects with the help of external support has remained very small in most of the developing countries, and has been concentrated in the “middle income” countries.7

(3) Popular Demands: Another way to allocate limited financial resources in social overhead capital is to follow Hirschman’s advice and seek “development via shortage.” According to this philosophy, money would be expended in those areas where need was proven, rather than in advance of need. A danger of this method for community water supply is that the ill effects of inadequate water supply (ill health and higher death rates) may not be ascribed by the population to the water problem. On the other hand, there is evidence to show that where popular demands are respected, a high priority is given to community water supply among other environmental improvements. In interviews with bustee dwellers in Calcutta, for example, one of the authors found that water supply improvement was the first-choice improvement for a majority of the population over alternative improvements in drainage, street paving, lighting, and even housing space.8 There are indications that Calcuttans are not alone in their assignment of a high priority to water supply.

The indications of popular choice are therefore on the side of a high priority for community water supply. Since water supply is evidently highly desired by the population, and since it can be supplied relatively cheaply compared with other social services, there appears to be a strong political argument for according some level of community water supply a high priority in social overhead capital investment.

(4) Minimal Standards: The criterion of popular demand points to some provision of community water supply. The criterion of experienced judgments leads to a warning to avoid over-investment and the results of applying strict financial criteria suggest that this method will have to be modified if much investment is to take place. In view of these cautions and in view of the absence of other economic guides to the level of investment, an answer seems to lie in
the direction of making investments subject to the requirement that they be at a minimum level commensurate with the attainment of the task they are intended to perform. In other words, community water supply systems should be designed so that they operate effectively at the lowest possible cost that makes possible an acceptable level of improvement in public health. All other investment should be regarded as luxurious frills to be delayed until a later time. The crucial question that emerges from this conclusion is, What level and type of community water supply can be designed to meet the minimal standard criteria proposed? Before considering this issue, an examination of current practice as indicated by some aggregate statistics seems necessary.

THE CURRENT SITUATION

To what extent are community water supply systems regarded as a prerequisite for economic growth and to what extent are they regarded as a consequence of economic growth? Accepting the conclusion previously reached that a minimal amount of water should be provided as a social service, and that beyond such a level it should be regarded as a public utility, we may examine existing policy on the basis of the relationship between the level of per capita gross national product and the per capita level of water consumption. The former is taken to be an indicator of the level of economic development. The authors recognize the comments that are being raised about such a simplistic measure of a very complex phenomenon.

It is possible to postulate a relationship between GNP per capita and investment in water supplies as shown by the theoretical curve in Figure 2. The curve shows three phases of the relationship.

Phase I represents the period in which water supplies are needed for public health requirements and as a minimal social service. In this phase there is urgent need for urban water supplies, and it may be expected that investment levels would be high. This corresponds to the period of high initial investment in social overhead capital that development economists generally agree is a prerequisite for growth.

Then follows Phase II in which minimal public health and social service needs have been met, and there is a transfer over to treating water supply as a public utility subject to strict financial criteria. In this phase per capita income would be expected to rise while investment in water supply would be stable in absolute terms, and would fall as a percentage of GNP. During Phase II, additional and extended systems would be made highly dependent on ability to pay and collect, and to administer and manage the system. This phase would correspond to the Hirschman strategy of “development by shortage.” Water would not be supplied as a free or subsidized commodity.

Phase II is likely to be prolonged, but it is eventually terminated when the society has accumulated a greater basis of wealth. Per capita income is now much higher, and without any change in policy more water will be demanded by
the population at a higher price for non-productive purposes. Phase III thus presents a level of investment now found among the highly industrialized nations.9

There is some evidence to suggest that the pattern of investment has not been following the theoretical curve in Figure 2, but in some countries has approximated the curve marked "Present Policy." A higher level of investment has been attained than might appear necessary from the previous discussion. This probably arises from an eagerness in the developing countries to attain advanced standards as quickly as possible; from the use of experience, rules of thumb, and sound engineering judgment as developed and used in the more developed countries; and from a public health concern to ensure that absolutely all hazards to public health are removed from community water supplies. Such policies are advocated by public health officials and sanitary engineers, and where applied can lead to over-investment in community water supply and a misallocation of resources. On the other hand, those countries that are in the Phase I period might find themselves subjected to strict financial requirements that they cannot meet, and even minimal supplies might be neglected.

These differences between countries might also be found between cities within one country where some regions have lagged behind others in pace of development. The statistical evidence to support this point of view is not very
strong, due mainly to data deficiencies. There are no readily available data on investment in community water supplies in developing countries. It is, therefore, necessary to find surrogate measures. One of these might be per capita water consumption.

Figure 3 shows an almost random scatter of per capita consumption levels in relation to GNP per capita. It demonstrates that a wide variety of levels of per capita consumption are found at essentially similar levels of income. There are, however, a lot of deficiencies in the data. To name a few of them, the observation of consumption are for urban supply systems, whereas the GNP data are for whole countries; some observations distinguish between domestic and total use, while others do not; some figures include industrial water use, others do not; many observations are estimates of total amount supplied, divided by population served, and are not based on metering; the percentage of water loss is not uniform, and is not accounted for; there is a bias towards countries with a dry climate; and the data do not show how the water is consumed and how much is supplied through house connections.

There appear however to be two quite distinct groups of consumers of water, those with house connections and those with access only to street supplies of differing sorts. Detailed studies of patterns of water demand in developing countries show that the demand for residential water supply is a function of accessibility to water, housing conditions, the level of income, and water using habits.\textsuperscript{10} Accessibility to water appears to be the most significant factor

![Figure 3. Per Capita Water Consumption and Per Capita Gross National Product](image-url)
Figure 4. Percentage of Urban Population with House Connections and Gross Domestic Product Per Capita (U.S.$)

influencing the level of water consumption. There remains, however, a large range in the per capita level of consumption within the two basic groups of households. The demand for water is far from constant even within households with a kitchen, bathroom, and flush toilet.

If it can be established that access to piped supplies meets the minimum public health standard, then it can be argued that this should be done on a free basis. This would correspond to Phase I of the curve of Figure 2. Further expansion by the provision of house connections would be made strictly dependent on financial criteria or the ability to pay and collect.

Such a strategy of the timing and scale of investment in community water supply raises several further problems. How many street taps or standpipes are needed in relation to population, to ensure that contamination of water supplies does not occur, or rarely occurs, between the source and its point of use? What is the relationship between distance to standpipe and per capita use? Can the rate at which house connections will be demanded be forecast accurately, and allowed for in design?

It is claimed that only by bringing the water supply directly into the house or courtyard can all contamination be avoided. What level of risk remains to public health when all urban populations have access to street supplies and can this risk be kept to an acceptable level? The future rate at which house connections will be demanded is important for system design. Small diameter pipe along a street intended to supply street taps, might quickly have its capacity exceeded, if house connections become common. Figure 4 provides an approximate guide, and for particular cities estimates might be improved on the basis of local forecasts of rise in income level. Even if more applications for house connections were received than could be provided, however, the deficiency would be less severe than where urban populations have no access to piped supplies. Development via shortage would operate and those desirous of having house connections would be asked to pay at a rate sufficient to cover the long-term marginal cost of water supply, and not simply the cost of installing a new house connection. This might also be an appropriate point at which to install meters and charge for the amount used.

Such a system would subsidize water use by those having access to street supplies only, and it would place a heavier cost on those with house connections. In so doing, the policy would recognize two distinct kinds of water supply. First, water supply as a public service for social welfare reasons and to obtain most of the public health benefits that contribute to economic development, and second, water supply as a public utility to be supplied through house connections as and when it can be afforded on the basis of long-term marginal cost pricing.

If water supply is accorded a high priority in the developing countries, and if systems are built, as appears to be the case, irrespective of the rate of saving, then the danger of over-investment is further substantiated. Such a conclusion is borne out by Figure 5. The highest correlation that we have been able to find with percentage of population served by house connections is the percentage of
Figure 5. Percentage of Urban Population with House Connections and Percentage of Population Living in Towns of 100,000 and Over (n = 72; r = 0.752)

population in cities of over 100,000. In other words, if you want to know what
the water supply conditions are like in any given country, the best predictive
variable is neither the level of national income, nor the rate of saving, but simply
the degree of urbanization.

Are these findings equally applicable to all social overhead investments? Some
evidence to the contrary is provided in Figure 6. Electricity generation shows a
more direct relationship to gross domestic product per capita than provision of
water supplies. It thus appears that new electricity generating capacity grows
step by step in keeping with increasing GDP per capita. That water supply does
not follow such a pattern is indicative of the recognition of water as a priority
public service. However, electricity is paid for by amount used, whereas this is
rarely the case with water. A danger to be avoided in public water supply
systems, therefore, is letting the public service argument proceed beyond the
criterion of minimal supply.

A NEW STRATEGY FOR COMMUNITY WATER SUPPLY
IN DEVELOPING COUNTRIES

This paper has attempted to present a case for viewing community water
supply in a distinctive way. It has been suggested that the relationship between
the level of water consumption and living conditions is such as to suggest that
large increases in water consumption can be expected only with a general
improvement in the living environment. This close connection between the level
of consumption and living conditions suggest that if water supply is planned in
isolation from the wider effort to raise the level of urban housing conditions
then serious benefit allocation problems will arise.

The raising of urban living conditions is tied very closely to progress in overall
economic development. The existing low level of the living environment is a
reflection of the economic poverty of the society. The dramatic repercussion of
poor living conditions on the widespread occurrence of certain diseases may have
to be accepted until the productive level of the economy is raised. Specifically,
in the planning of water supply systems the emphasis should be placed on
providing a skeletal but widespread system rather than attempting to raise levels
of supply. The tendency of existing policy is the reverse in that standards are too
often set rather arbitrarily based upon Western experience and the system
designed around these standards.

If this new approach to system design is to be instituted, we need more
precise estimates of the level of consumption from public standpipes. We also
need estimates of the effect on standpipe consumption of such variables as
frequency of standpipes, or number of people served per tap, standard of
housing or density of occupancy and level of income, education and family size.
It is also necessary to know the relationship between disease incidence and type
of water supply. In particular, studies are needed to find ways of achieving
substantial improvements in public health by reliance on public street taps only.
Figure 6. Gross Domestic Product Per Capita (U.S. $) and Electricity Generation Per Capita (Kilowatt Hours) (n = 56; r = 0.823)

Can an acceptable standard of public health for developing countries be attained without or with very few house connections? This is a crucial question. If an affirmative answer can be found, then the public health benefit from community water supply and their contribution to economic development can be obtained at minimal cost and without resort to the construction of a large-scale expensive Western type system.

The importance of income and living conditions in influencing the level of water consumption accords with the hypothesis that the need for residential water supply varies with the level of economic development. It suggests that the planning of water supply systems should stress the widest coverage of the population rather than the raising of levels of consumption. There is the possibility of over-investment in water supply if the emphasis is placed on raising levels of consumption. The demand for water must be given an important place in the planning of water supply systems. A lower level of supply could lead to a higher level of total welfare. If this line of thinking is correct, then there are severe deficiencies in the present arrangements for financing community water supplies on international or bilateral bases. Frequently these arrangements require financial soundness as a basis for investment. This criterion should be removed when water supply as a social service is under consideration and replaced by a social and economic soundness criterion.

Since present institutional arrangements do not permit this, present institutional arrangements need to be changed, or at least supplemented, with other arrangements. In practice, this probably means that new loan funds are required from individual countries, or from international agencies or groups of countries on a long-term, low interest rate basis. In offering such loans, the strict financial criteria of ability to pay and ability to collect would not be applied. Rather, the key questions would relate to the effectiveness of the systems designed in relation to their costs and to the proviso that they are minimal systems. Considerably more thought needs to be given to the design of minimal systems. This would be a useful exercise for the developing countries to attempt in relation to their own expenditures, and it might help set a pattern that external financing agencies might be persuaded to follow.

For community water supply of the public utility sort, beyond the level of social service, the present arrangements and criterion of strict financial viability still suffice. Under such arrangements, not a lot of construction seems likely in the next decade, but this is of lesser importance, provided strong efforts are underway to ensure that all urban populations in developing countries have access to piped supplies from street taps. One possibility is that the two kinds of financing could be tied together. For example, an external-aid agency might come to a long-term agreement with a developing country whereby an initial loan would be made on very "soft" terms for a minimal community water supply system. The agreement might also provide that a fuller "hard" loan would be made for improvements of a public utility kind and that these would be priced at such a level as to pay off both loans. At the present time, some
urban populations are being denied access to public supplies of water because there is insufficient demand for house connections. In the future, the growth in numbers of house connections could be more heavily used to help pay for the system which supplies people through standpipes. But in many cases, this cannot be done immediately. The provision of water supply as a social service should have priority over the provision of a public utility.

Recent studies of the water supply industry in developed countries have demonstrated that it has often been run on unsound financial and economic grounds, which may have resulted in a misallocation of resources. Policies are now under critical review, and are likely to be reshaped in the near future. Let us not make the mistake, however, of assuming that the latest ideas in the developed countries are automatically appropriate in the developing countries. There is a great temptation among experts to advocate the latest ideas in the latest terminology. In attempting to devise a policy for community water supply in the developing countries, it may be a good time to be a little old fashioned.

NOTES

2. Ibid.
9. This argument is elaborated in Lee, ibid., pp. 19-37.