PLANNING FOR RURAL DRINKING WATER SUPPLY IN KERALA : A CASE STUDY

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Dissertation submitted in partial fulfilment of the requirement for the award of the degree of Master of Philosophy in Applied Economics of the Jawaharlal Nehru University, New Delhi.

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I hereby affirm that research for this dissertation titled 'Planning for Rural Drinking Water Supply in Kerala : A Case Study' being submitted to the Jawaharlal Nehru University for the award of Master of Philosophy in Applied Economics was carried out entirely by me at the Centre for Development Studies, Trivandrum.

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Trivandrum,
25.12.'88.

Certified that this dissertation, the bonafide work of Shri N. Niyathi, has not been considered for the award of any other degree by any other University.

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CHAPTER I

INTRODUCTION

1.1 Importance of Safe Drinking Water

Use of water increases with increase in population and standard of living. Supply of safe drinking water to households is therefore a real and growing problem. Water becomes a severe problem particularly during summer. During summer, water reservoirs fall below levels, ground water levels decline and it threatens the structure of the local economy. Moreover, the quality of water available in lakes, streams, and underground are becoming unfit for use due to pollution and contamination. Here one has to understand the difference between pollution and contamination[1]. Contamination is the presence in water of bacteria from the intestinal tract of warm-blooded animals including men. Presence of such bacteria carry human disease germs which are invisible to the naked eye. Pollution on the other hand is an undesirable quality of water caused by dirt, silt, organic matter, minerals, acidity and alkalinity. Both pollution and contamination are health hazards. Therefore with increase in population and industrial and agricultural activities, it has become necessary to prevent the available water from pollution and contamination.

Economic development is the overall goal of a developing society. The goal will have to be facilitated by good water supply in many ways - visible as well as invisible. In all societies among the public utility services, water supply is very crucial. While economic development facilitates good water supply, the latter in turn facilitates economic development through better health and increase in labour productivity.

The influence of water supply on economic progress is recognised more and more by economic planners. Although it is difficult to establish a quantitative relationship between the extent of pipe water supply and the rate of economic growth, economists would agree that without safe water supply no lasting economic development can take place[2]. Public health and water supply are not an end in themselves but rather basic investment to provide the services needed to support directly productive activities.

Development of water supply demonstrates unmistakably that such facilities not merely satisfy the felt needs but serve as a springboard for every activity which improve material and mental wellbeing of the people. It is useful to recall here the World Health Organization's remarks on water supply that water supply should be looked upon as an instrument which builds up the economic wellbeing of the nation rather than merely satisfying a health requirement[3]. In 1980, the WHO observed that in developing countries, only 29% of rural people have access to water supply[4]. It stresses the need for increased investment in water supply.

Education, health and water supply are the important sectors in social services. Among them water supply and health are complementary services. Safe drinking water would normally improve health status and reduces the need for investment in health. Many diseases like cholera, gastroenteritis, diarrhoea, amoebic dysentery, etc., are caused mainly through poor quality of drinking water. It is estimated that through providing safe drinking water, outpatient attendance and hospital admission can be reduced by 50% or more, saving lot of avoidable expenditure on drugs, nursing care and loss of mandays of work[5]. Therefore, in order to control water-affected diseases, relatively greater stress has to be given to preventive aspects of health care such as safe water supply than on curative aspects such as treat-

ment of diseases.

Availability of drinking water improves the health status of the people which bring indirect economic benefits like better labour productivity, reduces the risk of water--borne diseases like cholera, amoebic dysentery, gastrointestinal and diarrhoeal diseases. Most of these diseases causing death and disabling sickness and especially infant death are transmitted through dirnking water taken from unsafe sources. Poor health caused through these water-borne diseases bring down production, diminish productivity of an infected worker and absence from work to care for the sick. Water-borne diseases avoided, therefore, is as real a benefit as a gain in production. Health authorities and economists have estimated that the cost of sickness and premature death caused by water affected diseases are many times the cost of providing for safe drinking water supply[6]. The benefits are lowered morbidity and mortality rates, longer proportion of the population in the work force, higher work efficiency, higher domestic savings and investment.

It has been reported that in the world as a whole diarrhoeal diseases, caused mainly through water, account for about five million infant deaths annually (WHO, 1964). Reports from Srilanka, Cuba, Japan, Kuwait and Pakistan show that the incidence of water related diseases have markedly declined after improving water supply conditions. In Japan, cases of intestinal communicable diseases in 30 rural areas reduced by 72% and death rate of young children and infants by 23% after installation of safe water supply (Ibid). In Uttar Pradesh in India, the incidence of death due to cholera was reduced by 74%, dysentery by 23% and diarrhoeal diseases by 43% after providing drinking water (WHO, 1966). Nearer home in Kerala an expert team studying the outbreak

of cholera in 1983, in Kuttanad, a water-logged region, found that the cause of the disease is the lack of protected water[7]. All these show that availability of safe drinking water reduces the incidence of water affected diseases and improve the health status of the community.

Water supply system brings many spin-off benefits. Spin-off benefits are economic activities which begin to increase or decrease due to water supply. Spin-off activities using water bring varied economic benefits - garden watering and irrigation, improved hygiene of livestock, fish farming, processing of agricultural products, and other rural industries. Some activities sometimes may not increase due to water supply but would become cheaper or more profitable. Employment involved in the collection of water charges, production and servicing of pipelines and other water supply installations are other spin-off benefits associated with water supply.

Time saving is an indirect economic benefit of protected water supply. Of course, the value of time saved is increased, in the economic sense, only if the time saved for collecting water is put to productive use directly or indirectly.

One factor of direct and important economic effect is labour and materials entering into water supply construction programmes. It affords employment for local people. It also serves to stimulate the growth and development of national industries that may have a great impact upon the future economy of a country.

1.2 Sources of Rural Water Supply

In rural areas of the developing countries there

are three possible sources of water for daily domestic use. They are: (i) rain water, (ii) natural surface water from rivers, streams and lakes and (iii) ground water stored in the earth's crust. Traditionally, ground water is the main source of water used for domestic purposes in Kerala. With the introduction of public drinking water supply projects the second source, i.e. natural surface water, is being increasingly used for meeting the demand for drinking water.

We may briefly discuss the three main sources of drinking water and its use.

Rain Water

Rain water is collected and stored in ponds in rural Kerala and used for bathing of humans, animals, and irrigating agricultural fields. In U.S.A., rain water is collected in cisterns and it is widely used for domestic purposes. But rain water is very rarely used in Kerala. Where ground water is difficult to obtain or unsatisfactory, rain water is collected and used. Cisterns have to be boiled, chlorinated, or otherwise sterilised before used for drinking. Kerala state is blessed with an incidence of 3015 m.m. annual average rainfall, more than three times the national average of 1000 m.m. The south west monsoon (June-September) contributes 75% of annual rainfall. Last 40 years studies show that the variation of rainfall is about ±40% in the total precipitation. It shows that rain harvesting can be used as a potential source for drinking water supply.

Natural surface water

Natural surface water from rivers, lakes and ponds,

are used extensively for water supply. When surface water is used for domestic purposes it is treated by filtration, and chlorination. Water so treated remove all impurities and make it safe for drinking. Kerala is rich in surface water. There are 41 west flowing and 3 east flowing rivers. Most of the west flowing rivers originate from the western ghats and drain into the Arabian sea. The total run off of all the rivers of the state amounts to 79041 mm^3 (2756.12 TMC). The total surface rivers water resources of the state is computed as 42773 M^3 (1510.50 TMC). More than 91% of the river flows are wasted into the sea. In the lower catchments near the coast, run off can neither be stored nor diverted for any beneficial use. In the midland and highland regions the entire run off can be utilised through storage reservoirs for use during summer.

Ground Water

Ground water from springs and open dug wells are the principal sources of water in rural areas in Kerala. But the quality of such water depends upon the nature and condition of the soil and rock through which it passes. If the ground water contacts very little soluble materials, that water will be soft. Because of the filtering action of the soil water becomes pure and clean. Source contamination from human settlements, industries, and agricultural practices also create problems.

1.3 Studying Drinking Water Supply in Rural Areas: Aspects of Planning and Evaluation

Rural water supply is a public utility service which is not directly productive. Therefore research into its appraisal and evaluation methodology pose several pro-

blems. The measurement problem in a field like water supply is our limited understanding of the concept. The problem cannot be tackled at a general level but has to be analysed with reference to any given situation.

Two main approaches are possible in the analysis in Rural Water Supply System (hereafter, RWS). They are (i) **Macro Analysis** and (ii) **Micro Analysis.** These two approaches are complementary in nature. While the macro approach would help clarify the position, importance and linkage of water supplied to other major economic sectors, the micro approach would help in classifying issues in the planning and implementation of RWS projects. The macro analysis of RWS would provide information on water sector policies and its relation to other sectors. The micro analysis on the other hand, will provide a comprehensive analysis of individual projects in terms of choice of technology, selection criteria and organisation. A review of past experience through a micro analysis would help improve the design of future projects. Even though technical specifications are available, very little information exist about investment criteria, organisational aspects and the environment. An analysis of existing RWS problems would help in the identification of problems which are considered important for the success of future RWS projects.

In the following paragraphs a brief discussion of the main issues in planning and evaluation of RWS projects is presented. First we discuss the macro level issues followed by issues at the micro level.

1.3.1 Macro Level Aspects of Planning RWS

(i) Allocation and utilisation of scarce investible resources

Rural water supply like other social services

involves heavy costs. The small investments are scattered over a large area implying organisational problems which require efficient management. It therefore requires a clear definition of responsibilities between various organisational levels and functioning communication system. Rural water supply system can consist of the improvement of water point, the sinking of a well, equipped by a hand pump or a motor pump or it might consist of a distributional system with a number of stand pipes and house connections.

For continuous expansion of RWS it is necessary that the programme fits into national/state priorities and development planning. The integration of RWS into national/state plan is important (i) to assure the necessary funding of the programme (ii) to assure that RWS investment is part of a general development strategy and (iii) to assure that RWS investment are problem-oriented and that necessary political support is necessary for its continuation and expansion.

Rural drinking water schemes are supposed to have a number of socio-economic and development benefits. However, none of these benefits have statistically been proven. Case studies or evaluation studies have not been undertaken in Kerala to assess the benefits, if any, of RWS schemes. The only tentative conclusion that can be drawn is that the expected benefits do not occur automatically or necessarily from an investment on RWS.

(ii) Selection criteria for identifying villages.

Selection and identification of RWS schemes are the central issues in planning water supply system. Even though there may exist several criteria for selecting villages for executing water supply shcemes, selection of the best criteria would determine the success of the scheme.

Some strategies will have to be chosen for selecting villages for RWS[8]. Such strategies will have different effects on the success of the RWS. Success can be achieved through a variety of selection criteria: (i) village chosen according to a growth point strategy have greater chances of success (ii) villages chosen according to a worst-first strategy have no less chances of success (iii) village chosen according to perceived and expressed needs have greater chances of success (iv) village chosen according to a maximising strategy for a given investment have greater chances of success. It is therefore important to examine the influence of the various strategies on the operational success of the RWS and to identify the possible policy implications, if for instance, it can be shown that RWS executed under a worst-first strategy have clearly less of a chance to be successful than RWS executed under a growth-point strategy.

Investigation division of the Kerala Water Authority is responsible for identifying the villages for water supply projects. Officers of this Division visit the proposed project's catchment area and investigate the source of water and various aspects of physical distribution. The criteria recommended by the Government of India in 1980 is being followed for selecting the village[9]. Investment strategies like growth point strategy, worst-first strategy, perceived and expressed needs and maximising strategy are seldom examined for selecting villages even though these strategies have different effects on the success of the rural water supply projects. In some cases, local bodies/people from area having water problem submit application to the Kerala Water Authority for executing a water supply scheme. In such cases also officers of the Investigation Division visit the area and investigate the water source and the real water problem. Based on this investigation, project reports are

prepared. In cases of more applications, no prioritisation is followed in order to select the village for executing water supply projects. Investigations are largely on water source and physical distribution of pipe line. Water sources are selected based mainly on potential source yield. Based on the source yield and geography of the area, suitable type of technology is selected. However, if the water sources and catchment areas possess homogeneous characteristics it is possible to adopt uniform technology. While selecting the technology to be developed, neither cost effective nor maximisation of benefits is followed. It is mainly due to technical problems like geography of the project area, water source etc. In other words for each water source and geography of the catchment area, separate technology has to be followed. However, in formulating RWS scheme the following technological considerations are recommended in order to fix priorities[10].

(a) First priority for schemes which require no treatment and pumping.

(b) Second priority for schemes which require no treatment but do require pumping.

(c) Third priority for gravity schemes with simple treatment.

(d) Fourth priority for schemes which require both treatment and pumping.

However it is understood that no cost effective studies have been conducted to substantiate the above recommendations.

Some criteria are necessary for selecting the village. But all the criteria may not have the same weightage. For instance criteria such as scarcity and quality may have a higher weightage. In some states in India some

criteria have been proposed and for each criterion percentage weightage has been proposed as follows:

TABLE 1.1

Proposed criteria for selecting Rural Water Supply Schemes

Sl. No.	Proposed Criteria	Proposed percentage weightage
1.	Scarcity	30
2.	Quality/Health benefits	15
3.	Investment cost per capita	5
4.	Ease of execution	5
5.	Potential for Socio-economic development	5
6.	Regional concentration of activities	5
7.	Manageable location	5
8.	Physical benefits	5
9.	Reliability of sources	15
	Total	90%*

* Ten percent weightage is given to externally aided projects which in turn is based on the donors suggestion.

Source: Kerala Water Authority.

In line with the above criteria Kerala Water Authority has proposed an appraisal approach for taking up new water supply projects. In the proposed criteria (Table 1.2) after site visits to the proposed project area and study of project documents, it is proposed to establish an objective ranking. While ranking the schemes for fixing priority, different weightage are proposed to be attached to each criteria based on their relative importance. These weightages

will be reviewed to suit local conditions. (See Table 1.2).

TABLE 1.2

Proposed criteria for selecting Rural Water Supply Schemes in Kerala.

Sl. No.	Criteria
1.	Water scarcity
2.	Water quantity and expected health benefits
3.	Availability of water source and reliability
4.	Investment cost per capita
5.	Cost of alternative water sources.
6.	Physical benefits to the target population
7.	Potential for socio-economic development
8.	Organisational capacity at the receiving end.
9.	Ease of execution.
10.	Institutional capacity.
11.	Financial absorption capacity.
12.	Co-operation and communication between different levels including beneficiaries.
13.	Management capacity for implementation.
14.	Availability of alternative funding.
15.	Impact through concentration of activities in the region.

Source: Kerala Water Authority

If the proposed criteria are strictly followed for identifying villages for executing drinking pipe water, in future it can provide maximum benefits to the people

and minimise the investment cost.

Cost recovery and financing of the system also need emphasis while identifying projects. Here planners have to understand that schemes with house connections will recover most of the costs while schemes with public stand points will fail to recover at least a share of the total costs. Therefore more funds will have to be earmarked in the state budget for taking up new rural water supply projects and to meet the expenses for maintenance. It is good to understand that systems which do not collect enough charge to cover operation and maintenance have a lower rate of success.

(iii) Issues in choice of technology: The need for cost minimisation.

Resource is the major constraint for investment in drinking water supply. Therefore, before we go in for selecting a technology for executing a rural water supply scheme, its cost effectiveness has to be assessed. The problem here is to know whether the adaptation of RWS to a lower technological level and to simple and cheap system will increase the chances of success. If possible projects can use local materials and skills. Also the Water Agency should understand that in a labour surplus economy the importance of labour intensive and hand operated (hand pump) RWS cannot be under estimated. In order to test this argument it is therefore necessary to study the cost break down. The local participation is important for reducing the construction cost of the water supply system. Location and the lay out of RWS schemes has to be taken into account as far as possible, while one selects an investment strategy. Here the following factors will have to be examined[11]. (i) Struct-

ural Security, (ii) Economy of design and operation (iii) Functional efficiency and (iv) Easy accessibility. The structure has to be located outside flood zone area, contamination and drought free.

It may be hypothesised that low cost, easily maintained, and operated water supply system using local materials and labour have greater chances of success[12]. In a situation where scarcity of capital is a problem for taking up new water supply projects, the possibility of executing low construction/head cost water supply system have better chancesof success. However, the technology for water supply must be acceptable, affordable and it must work.

(iv) Organisational Issues

The organisational structure of the RWS influence its capacity to provide the intended services and to maintain the system in an efficient way. The organisational structure is important for the following reasons (i) RWS consists of a large number of schemes scattered all over the state. Therefore co-ordination of activities is important to avoid mismanagement (ii) Cost of the system is significantly influenced by standard designs and materials and the economies of scale for particular services are important.

The Water Agency is not decentralised enough to be able to serve in rural areas. There is little devolution of authority from top to down. The Kerala Water Authority, formerly the Public Health Engineering Department, is the Apex Body which implements the water supply schemes through its lower level offices. The head of the Authority is the Chairman and below him is the Managing Director. The Autho-

rity is divided into two zones, South Zone and North Zone and one Chief Engineer is in charge of each Zone. Below the Chief Engineers there are Superintending Engineers and under them there are Divisional Offices. An Executive Engineer is in charge of Divisional Office. Below the Divisional Offices are the Sub-divisional Offices. Assistant Engineer/ Assistant Executive Engineer is in charge of the Sub-Divisional Office and they are the lower level executive officers. These officers often hesitate to serve in rural areas because of the lack of better living condtions. Therefore the office management become less efficient. The needed data/information are not collected and made available. This is sometimes one of the major drawbacks of non-decentralisation of powers. If the local body is also associated with the formulation and implementation of the RWS, this sort of inefficiency can be minimised.

Water supply schemes are executed by the Kerala Water Authority. Local participation is not involved in the execution of the projects. The work contractor hires labourers from the area for manual works. Of the total investment cost, nearly 55% is on pipe, 15% on material and 30% on labour. In some cases local bodies donate land freely for the construction of the reservoir tank and infiltration well. The annual maintenance costs are met by the local bodies which include labour and materials.

(v) Financial Aspects

Investment in public goods/utilities augment the welfare of the people. It includes mainly sectors like water supply, sanitation, rural electricity. However, during the

early plan periods plan outlay for water supply had been low in the State budget because of the scarcity of resources.

Implementation of water supply schemes require heavy capital investment. Finance for water supply schemes are mobilised mainly from three sources viz., domestic loans and/or grants, international loans/or grants and revenue from the state budget.

In the early years of independence, local bodies were involved in the financing aspect of water supply schemes.Accordingly, for urban water supply schemes entire expenditure was initially met by State Government. On the completion of the scheme 50% of the cost was treated as loan to the local body and 50% was treated as grant-in-aid. The loan amount had to be repaid in 20 instalments along with interest.For rural water supply schemes only 25% of the cost was realised from local body in 20 instalments. However, the local bodies had to meet the entire maintenance costs. But now capital expenditure in water supply is not met by the local body.

In Kerala at present, finance for water supply is raised from internal and external sources. Internal financefor water supply schemes are from Central Government, LIC and State Government. Central Government gives 100% central assistance to rural water supply schemes under Accelerated Rural Water Supply Scheme. During the Seventh Five Year Plan, outlay earmarked under Accelerated Rural Water Supply Scheme is Rs.150 crores. Out of the State Government finance for water supply scheme, 50% is loan and 50% is grant. Interest rate levied by the Government for loan was 14% in 1986-87 as against 13.5% in 1985-86. The loan amount has to be repaid in 10 annual instalments.

Liberal Policy of LIC in granting loan to water supply has been giving a big push to water supply system in Kerala. LIC Loan assistance was first given to urban water supply only. Later LIC began to give loan assistance to RWS also. LIC loan is 50% of the estimated cost. LIC allows 25% of the additional cost caused by inflation. Every year Water Authority has to submit expenditure statement of the LIC loan. In 1984-85 when Public Health Engineering Department was converted into Kerala Water and Waste Water Authority, (now Kerala Water Authority), the total loan outstanding for repayment to LIC was Rs.26.16 crores. Table 1.3 shows the amount sanctioned by LIC for water supply schemes in Kerala over the last three years.

TABLE 1.3

LIC loan for drinking water supply in Kerala

(Rs.crores)

Year	Urban Water Supply	Rural Water Supply	Total
1984-85	3.44	1.47	4.91
1985-86	3.85	1.58	5.43
1986-87	4.44	1.56	6.00

Source: Kerala Water Authority

Interest rate is subject to revision. LIC levied 10% interest for RWS loan and 9.75% for urban water supply in 1985-86. In 1987-88 the interest rate has been raised to 10.25% for RWS and 10.5% for urban water supply. Repayment instalments for RWS and urban water supply are different. While for RWS loan, number of repayment instalments are

25, for urban water supply it is 22. For both the schemes interest has to be repaid half yearly and loan on yearly basis. Interest rates are calculated on reducing balance. If the repayment is not effected on due date, 2.5% penal interest is levied.

External assistance for Rural Water Supply Schemes are in the form of World Bank aid and bilateral assistance. Bilateral assistance are from Netherlands and Danish Governments. There are now 18 externally aided water supply schemes in Kerala Out of it 7 schemes are World Bank aided, 8 schemesare Netherland aided and three are Danish aided. In late 1960's Kerala State had obtained assistance from UNICEF for water supply schemes. The pattern of assistance was supply of raw materials such as pipes, pumpsets, and laboratory equipments. World Bank aided schemes are purely loan-based. World Bank gives loan directly to Central Government and Central Government transfer it to State Government. Water supply schemes aided by World Bank willl have to be completed within five years. Repayment of loan starts by sixth year. The repayment of loan is in equal instalment along with interest. For Netherlands assisted water supply schemes the entire capital cost of the project is covered by Netherlands Government. The external aid donors insist on charging water rate in order to make the water supply scheme self-supporting.

Water rate is the basic revenue on which the entire financial viability of the water supply scheme works. When water rate collected from water users are inadequate to meet the capital and maintenance and operation costs the difference has to be met as state subsidy. Water rate in Kerala is not fixed on the basis of any scientific calcula-

tion.There are two types of customers, domestic and nondomestic customers. For nondomestic customers water rate is double the domestic rate. Water rate will vary from project to project depending upon the type of technology used. Water rate vary marginally for urban water supply schemes. For instance in Trivandrum city water rate is 75 paise per 1000 litres (1986-87) as against 45 paise per 1000 litres in Muvattupuzha urban water supply. But for RWS water rate is 50 paise per 1000 litres throughout the State irrespective of the cost of the project. In rural areas most of the people are poor. Therefore the question is, is it possible to collect water rate? Moreover, most of the area is covered by only public taps. Here one has to understand that water supply schemes with house connections can recover most of the costs than schemes with public stand points. Under such circumstances, is it possible to levy collective price from the water users or from the local body? At present the entire maintenance expenses are incurred by local bodies.

1.3.2 Micro Level Aspects of Planning of Rural Water Supply

(i) Economic and Social Environment of Villages

It is necessary that the rural population must have an understanding of the value of the rural water supply system. This can only be possible if the investment is adapted to the village situation and corresponds to the people's priority. For instance, water supply project in villages where other basic needs are already satisfied have greater chances of success[13]. Therefore it is necessary that the water supply system is adapted to the needs of the people. In order to ensure this it is necessary that local authori-

ties facilitate the execution of the rural water supply projects and look into the maintenance and operation of the system. Moreover, water supply projects for which the initiative come form the village people may have greater chances of success. In sum, one may say that before executing a water supply system in any village it is necessary to understand the economic and social environment of that village and if possible, scheme' will have to be implemented with local support and people's participation utilising the local resources, labour and materials. The capacity of the village to pay ater rate, if imposed, has also greater chance of success. But this aspect has only limited scope under rural water supply since household water connections in Kerala are at present very rare.

The value attached to pipe water by village people influence the chances of success of the rural water supply. However, without an indepth local level study it is extremely difficult to judge it. Distance of alternative water sources, reliability of alternative water sources, hygienic conditions around water sources, water supply regulations, and local participation are the major indicators which would influence the success of the rural water supply system. When the distance to alternative water sources are greater the villagers would attribute higher value to the water supply system. Again, if the unreliability of alternative water sources are greater, villagers will attribute higher value to pipe water. If more care is given to water sources like fencing, cleanliness, etc. people will give more value to pipe water. Villagers have clear preferences for specific sources which mostly relate to colour, taste and brackishness. Villagers

will take into account only perceived qualities. Hence, if local participation is encouraged in the construction and maintenance of the water supply system people will give more value to pipe water.

(ii) Choice of Technology at the Micro level

In a welfare state investment on public utility services, have to be increased with every increase in population. More money will have to be earmarked for health and education. At the same time state will have to find money for investment in income generating sectors as well. With the limited investment resource at the disposal of the state, therefore such technology will have to be devised for RWS which will absorb more labour and less capital. It is also necessary to improve managerial efficiency in order to ensure cost effectiveness of investment. Therefore, in a capital scarce economy it is necessary to select a technology which uses more labour and local materials.

The selection of technology for rural water supply has a bearing on the construction, operation and maintenance of the rural water supply schemes. Labour intensive, hand operated systems are preferable to capital intensive, automatic system. But before we go in for low cost technology of this type especially when we face resource constraint a comparative analysis of maintenance and operation expenses and the cost of break-down among these technologies is necessary to assess the advantages. It is assumed that if the construction cost/head is lower, the degree of success is

greater. This is based on the assumption that lower cost schemes are less dependent on outside assistance and correspond to the ability of the villages to maintain the schemes by their own means. It is hypothesised that water supply projects which use local materials and skills have greater chances of success[14]. This hypothesis can be established only if information on local materials and involvement of local skills are mobilised through surveys and studies. In Kerala such surveys and studies have not been undertaken by the Kerala Water Authority. In selecting a RWS village cluster approach can be experimented if better surface water sources are available. It will, in some cases, reduce the initial gross capital investment. In this case a water supply scheme benefiting more than one panchayat can be identified. In Kerala, some externally aided rural water supply schemes - World Bank aided, Netherlands aided, and Danish aided - are experimenting with this type of technology. Its major constraint is that its success depends upon the water source yield. There are at present eleven such comprehensive water supply schemes under different stages of completion in Kerala.

However, no cost effective studies are conducted to substantiate the above observations. In hard rock area, it is possible to adopt tube sources and in cases where surface water is the source it would be economical to use a comprehensive scheme covering a group of villages, with a common source, treatment plant and transmission main. However, this type of technological considerations are seldom examined, while selecting a rural water supply scheme.

The most commonly followed types of water supply

schemes are hand pumps and pipe tap connections i.e. public taps and house connection taps. Under dispersed type of settlement, households are evenly scattered and therefore the distribution network will have to be elaborate in order to ensure reasonable accessibility to households. But under nucleated type of settlement, distribution network is more easy because households are clustered. In the later case the problem can be solved by constructing more public taps in nucleated area. In Kerala context, households are scattered evenly and therefore in order to ensure reasonable accessibility to public water taps, the water supply distribution system will have to be elaborate, covering more area.

The most common source of water for rural houses in Kerala is wells. A water well may be defined as a whole or shaft sunk into the earth's crust to depth below free water level or into deep water bearing strata for the purpose of obtaining ground water. There are four common types of wells, namely, dug wells, driven wells, bore wells and drilled wells. Isolated families traditionally obtained the water needed for domestic uses from dug wells. A hole of 3 to 6 feet in diameter is dug into the earth until water is obtained. The hole is then walled up. Driven wells are common when water is in porous strata and shallow depths. Such wells are not possible where the soil is full of stones or water bearing strata is below bed-rock. Bore wells are bored with special boring equipment in regions where the soil down to the water bearing stratum is free from stones. Drilled wells go deep and penetrate more than one water bearing strata. Therefore drilled wells provide stronger flow and are less affected by droughts. In Kerala there

are 14944 bore wells of which 12867 (86%) are exclusively used for drinking purpose[15]. Other sources of drinking water in the rural areas of Kerala are river, tank, hand pump and tap. Table 1.4 shows sourcewise use of drinking water in Kerala.

TABLE 1.4

Source-wise Use of Drinking Water - Kerala (1981)

Sl. No.	Source of drinking water	No. of Households* (Lakhs)	Percentage of Households
1.	Wells	29.56	81.75
2.	Tap	2.17	6.00
3.	Hand Pump/Tube Well	0.09	0.25
4.	River/Canal	1.08	2.99
5.	Tank	1.95	5.39
6.	Others	1.31	3.62
	Total	36.16	100.00

* It excludes institutional and houseless households.

Source: Census of India 1981, Series 10, Household Tables, Part VIII - A & B.

It shows that the main sources of water for drinking in Kerala are surface water and ground water. Surface water includes ponds, canal and lake water. For large water supply schemes, mostly urban water supply schemes, surface water is the source. The reliability of surface water is greater. However, surface water needs treatment as it would contain more impurities. For small water supply projects (RWS) ground water is the source. Information on source-wise water supply schemes are not available. Therefore, it is impossible to tell which is the most common source of water for pipe water.

Assessment of alternative water sources, namely, ground water, surface water, and rain water is essential for selecting the most suitable source based on technical and financial considerations. While selecting the source, cost is an important factor but water quality and safe yield are no less important. Sources which do not require treatment generally prove most economical unless development costs are very high[16]. This requires resource survey which requires extensive technical resources. However, new assessment technologies such as satellite imaging now available in developed countries may expedite ground water surveys and reduce cost of investigation[17]. When ground resources decline and become uneconomic to exploit, the water agency has to ensure greater use of surface water.

Water treatment before distribution depends upon the water source. Surface water is treated before distribution, as such water will contain impurities. Two types of water treatment is mostly followed in Kerala, viz. (i) water treatment machine (ii) infiltration gallery. The former type of treatment is followed in big urban water supply

schemes using surface water. This type of treatment is costly as a water treatment machine unit cost above Rs.4 lakhs. It removes the mud and other such items contained in the water. Usually such machines are used when the daily water supply exceeds 10 lakh litres. Small water supply schemes using surface water is treated through infiltration gallery well. However, all types of water is disinfected by using chlorine before supply. If ground water is the water source, the infiltration process is only chlorination. If the water contains excess iron, airation is done before distribution. But it is not costly. In case water treatment machine is not used, the cost of water treatment is very low.

The success of a rural water supply system mostly depends upon the number of customers served, percentage of water facilities served, number of public taps/private taps and the use of pipe water. If a rural water supply sytem can serve water to majority of people in the catchment area through a well designed distribution system the project will prove successful. In Kerala only a few rural water supply schemes give house connections. Under the Accelerated Rural Water Supply Scheme the Government of India have recommended not to sanction house connection but only public taps. Under RWS Schemes where public taps are envisaged, the recommended distance between two public taps is 150 metres. In other words, no person shall walk more than 150 metres for drinking water.

(iii) Maintenance Aspects

Maintenance and operation of rural water supply system is a major problem. There are 1611 completed rural

water supply schemes (1987-88) in Kerala. All these schemes are maintained and operated by the Kerala Water Authority. Until Seventh Plan less importance was given to maintenace and operation. But since the Seventh Plan Government of India has recommended to earmark 10% of the Plan funds for maintenace of rural water supply schemes under minimum needs programme. Concentration of powers at state level in Kerala Water Authority pose several problems in the allocation of funds for each rural water supply scheme based on needs for maintenance.Formation of water committee at village level is considered important for the maintenance of the water supply scheme. The water committee may have some responsibilities in operation, maintenance and upgradation of service and extension of system and its effects are more easily observable. The local bodies from its own revenue meet the entire expenses on maintenance of rural water supply schemes. But these local bodies have no say in the maintenance of the water schemes.

(iv) Criteria for Evaluating Benefits

Reasonable access to drinking water is considered one of the basic needs. What one means by 'reasonable' is partly a definitional problem. Safe drinking water is only beneficial if the population understand that they derive some benefits.

More often rural drinking water projects are justified by their assumed impact on the living conditions of the poorest. It is despite the fact that the expected results of rural drinking water projects have not been scientifically verified. The most interesting research in rural water supply

is obviously the testing of whether the hypothesised benefits are actually occuring and which variables are important for the achievement of the objectives. There are basically three types of research, possible to measure the impact of rural water supply schemes. They are:

(i) Retrospective Time Series Study:

This type of study can be undertaken where reasonably accurate base data have been recorded for some years. There are no rural water supply schemes available for which time series data exist other than physical inputs and output. (Quantities of water produced, number of people served etc.) Scope for such studies in rural water supply in Kerala context are therefore very limited.

(b) Cross Sectional Impact Studies:

This type of study attempts not only to determine the effects of improved water supplies but also to investigate casual links. They require extensive and delicate surveys. They are costly and time consuming.

(c) Long Range Longitudinal Studies of Health Impact:

This study is considered as the most conclusive means of attempting to measure all the effects of water supplies and to identify casual linkages. It requires an experiment design and periodic surveys. The 'Minas Gerais Study in Brazil' is one major longitudinal study of this type[18].

The purpose of rural water supply projects is obviously not the output alone i.e. the supply of water. It is useless to discuss the question of impact as long as the output cannot be measured. This seems to be the case in many rural water supply projects. Impact studies undertaken conclude that the water schemes studied failed to provide reasonable access to safe water that is used by the rural population[19].

The measurement of the success of the rural water supply system is of course, a problem area. The measurement of the success of the water suypply system is essential to establish wehther the desired water supply objectives are satisfied. The success system directly observable are (i) number of customers served (ii) percentage of water facilities actually working (iii) number of break-downs and duration of breakdowns, and (iv) nature and extent of the use of the water supply facilities. This list appears to give a reasonable coverage of the physical output aspects of the water supply system. However, measurement of these indicators would present much problem. The usefulness of the first success indicator is as a relative measure of the proportion of the population who are served by the system within its catchment area. The question here is whether everyone is within reasonable reach of the water posts and therefore could be served. In order to find answer to this question it is necessary to study the distance of the family to the new water posts. The second and third success indicators raise the problem of water posts which are out of order due to break-down and the duration of the break-down. Here, the number of break-downs and its repairs depend upon the response of the local people/local body. Only a local

level study can examine this problem. Presently this is one of the most useful indicators of success. Esimation of the number and proportion of people using pipe water and purpose to which the pipe water is used is a difficult problem. An evaluation study of rural water supply schemes in Punjab, 1976, have experienced several such problems[20]. It appears necessary to carry out fairly indepth village case study in order to gain such reliable information.

In any case, accessibility is a major consideration in the distribution of pipe water. If the distance to alternative source of water is greater, village people will attribute higher value to pipe water. In Kerala almost all the houses have conventional type family wells in rural area at 20 - 30 feet depth. Since it is ground water, its quality is good. Therefore, people usually prefer pipe water only when wells go dry during summer. Therefore, the location of public water posts and its coverage are crucial problems in the distribution of pipe water. Here the reliability of pipe water determines the value which people attribute to it, as we shall see later in our case study.

(v) Project Implementation and Management

RWS schemes are executed by Kerala Water Authority. Engineering personnel of the Authority supervise the water supply works. Local bodies or local people are not involved in the construction works. However, if local people are also allowed to involve in works connected with RWS, the system can be made more effective because local people will develop a sort of awareness. Since local bodies meet the maintenance expenses of RWS, their involvement in constru-

ction works will make the scheme more successful. Also by involving various community organisations, a greater number of people are involved with potential for building a community consensus and commitment to development activities. Formation of a local committee is therefore considered important for the construction of the water system and necessary to guarantee popular involvement in the project. Moreover, the existence of a local committee seems to be important for the organisation and execution of self help. Such a committee can involve in the choice of level of service of water system, input into design specification and responsibility for collection of local contribution to construction costs etc. The local committee can also take up the responsibilities like collection of fees, determination of rates, management of the system, operation and maintenance, upgradation of service and extension of system.

(vi) Financial Implication at the Project Level

As we shall see in Chapter 2 below, investment on RWS has been on the increase, particularly since the Sixth Five Year Plan. On an average, annually state government have invested Rs.480 lakhs for RWS in Kerala during the Sixth Five Year Plan. Government have to find funds for new RWS and for operating costs. Therefore, it is necessary to examine the costs and returns of the RWS. When we invest public money on RWS we expect some returns. The returns that we expect are the revenue from water charge. In Kerala it is the accepted policy of the government to charge rural water supply at the rate of 50 paise per 1000 litres irrespective of the investment cost. House connections for RWS are very rare. Therefore water rate collection do

not in any way meet the expenses. The crucial problem in RWS at project level is therefore to examine whether each RWS project can be made viable to generate revenue sufficient to run the scheme on no-profit no-loss basis. Unless this type of approach is considered regarding RWS, government will find it difficult to find more fund for extending RWS. At project level itself the Water Authority must therefore take measures for cost minimisation and revenue maximisation by utilising locally available resources.

Investment on RWS generates employment in rural areas. Cost on wage labour is estimated at 30% of the total expenditure on RWS. It shows the magnitude of employment generation potential. Construction works for RWS can mobilise the local labour resource. National Rural Employment Programme (NREP) directed towards employment generation and asset creation envisages schemes like minor irrigation, housing, soil and water conservation, rural roads and construction of school buildings. RWS is a community asset. Therefore, there is scope to link RWS construction works also with National Rural Employment Programme.

(vii) Nominal and Effective Coverage of Drinking Water Supply

A study on Water Supply System need to make a distinction between nominal coverage and effective coverage. The nominal coverage depends upon number of RWS schemes, number of household connections, number of public taps etc. Factors which have a bearing on effective coverage are accessibility, reliability, adequacy of supply, people's response towards pipe water, and quality of water. For instance,

if public taps are installed at inaccessible distance and water supply is inadequate and irregular and quality of water is poor, people hesitate to fetch pipe water. Under such circumstances effective coverage of pipe water is low. Water pricing will also affect effective coverage. In rural area if water is priced and if majority of the people lack ability and willingness to pay water rate, utilisation of pipe water comes down leading to less effective coverage. Therefore, without assessing the effective coverage of water supply it is difficult to judge the physical efficiency of the RWS system. In order to enhance effective coverage of RWS majority of households located in the catchment area of the RWS must derive the benefits of drinking water. In other words coverage become effective when adequate drinking water in sufficient quantity is provided for drinking, culinary, domestic and other household purposes.

Scope and Objectives of the Study

In the above discussion, we have attempted to delineate the major issues and policy considerations involved in planning for rural water supply. This in effect provides us with a broad framework of questions relevant for critically assessing the functioning of any rural water supply scheme in a micro setting. In particular, one can see how the macro and micro aspects of policy match only through a case study approach which constitutes the core of the present study. Its major objectives are therefore as follows:

First, as a background to the case study, we shall review the progress of rural water supply schemes in Kerala vis-a-vis all India and a few states in terms of the magni-

tude and trend of plan investments and the corresponding extent of coverage achieved, in terms of the proportion of villages/population covered by protected water supply.We shall also examine the approach to water supply policy followed in Kerala to see whether a well-defined set of objectives underlie the investment of scarce financial resources (Chapter 2).

Second, to examine the working of a particular rural water supply scheme in terms of the socio-economic conditions of the users, the distribution benefits, the extent of effective coverage in terms of accessibility, regularity and adequacy of supply, health benefits, etc. This will be contrasted with the situation in another village without any protected water supply scheme to see in what ways and to what extent has the scheme tackled the problem of protected water supply in the village covered by the scheme (Chapters 3 and 4).

Third, to examine the financial implications of the working of the public water supply scheme by working out the magnitude of implicit subsidy involved and hence to raise the question whether the magnitude of benefits due to the provision of protected water free of cost justify the subsidy (Chapter 5).

Finally, we shall attempt to spell out the policy implications of the study from the point of view of evolving a more effective and efficient rural water supply programme (Chapter 6).

Notes and References

1. Health Authorities make the following distinction. Contamination is the presence in water of bacteria from the intestinal tract of warm blooded animals including men. Pollution is any undesirable quality of water other than contamination. Dirt, silt, organic matter, minerals, acidity and alkalinity are causes of pollution, (Bright 1976).
2. Although it is difficult to establish a quantitative relationship between the extent to which piped water is supplied to urban settlements and the rate of economic growth, economists agree that without sound water supply no lasting economic development can take place (WHO, Geneva, 1964).
3. World Health Organisation, 1966, Geneva.
4. Again in 1980 estimates showed that in Developing Countries only 29% of people in rural areas and 71% in urban areas have access to drinking water (WHO, 1987, Geneva).
5. Sandy Caisneross, 1986, Evaluation for Village Water Supply Planning.
6. Ibid.
7. An Expert Team studying the outbreak of cholera in Kuttanad early in 1983 has found that the cause of the disease is lack of protected water in the area. Government of Kerala, 1983, Report of the High Level Committee on Social Infrastructure and Social Services.
8. There exist four basic strategies to chose the village in a Rural Water Supply programme. It is expected that these strategies have different effects on the success of the project. (Duncan Miller, 1978).
9. Government of India, Planning Commission, 1980, Sixth Five Year Plan.
10. Government of Kerala, 1983, Report of the High Level Committee on Social Infrastructure and Social Services.

11. Government of Punjab, 1976, Evaluation Report on the Survey of Rural Water Supply Schemes in Punjab.
12. Duncan & Miller, 1978.
13. Ibid.
14. Ibid.
15. Government of Kerala, 1986, Study on Bore/Tube Wells in Kerala.
16. Duncan Miller, 1978.
17. WHO, 1987, Geneva.
18. Frank H. Lanson & Nicholas R. Burnett, 1973.
19. Ibid.
20. Government of Punjab, 1976, Evaluation Report on the Survey of Rural Water Supply Scheme in Punjab.

CHAPTER 2

RURAL WATER SUPPLY IN KERALA IN NATIONAL PERSPECTIVE

Before we proceed to explain the Rural Water Supply coverage and problems in Kerala it is necessary to review the water supply coverage at national level, growth of RWS under Five Year Plans and to reemphasise the distinction between nominal and effective coverage in this connection.

2.1 Rural Water Supply in India under Five Year Plans

The objective of Rural Water Supply schemes are uniform throughout India but the technology and the strategy followed in each state are obviously different. Wide variety of climatic and geographic conditions and sources of water, surface and underground, permit states to adopt a variety of solutions, partly taking into account local needs and conditions. All states aim at water supply coverage to maximum population with special consideration to under privileged community and problem areas. However, it is true that the type of RWS system required vary from state to state. It is therefore necessary for the state goverments to work out suitable engineering (technology) solution along with details regarding requirement of funds, materials and equipments, staff and maintenance arrangements. Identifying drinking water problem villages at national level based on uniform criteria and the measurement of national water supply coverage in rural areas, in effect, fail to focus on specific drinking water supply problem. For instance regional imbalance in respect of potable water supply appears to be glaring. At national level when 93% villages and 56% population are covered by drinking water supply we mean only nominal coverage. The statistics do not fully portray the hardship and

inconvenience that is experienced by the rural poor, particularly women and children, in areas where water is scarce, inadequate and polluted[1]. In order to ascertain the real benefits which people derive from RWS it is therefore necessary to measure the effective coverage. But such studies of RWS from the viewpoint of effective coverage are few. Therefore with the available statistics we understand only the extent of nominal coverage, but this is essential to analyse the gap between nominal and effective coverage.

Systematic approach to provision of water supply in India started only with the commencement of Five Year Plans. It was in the First Five Year Plan period that Public Health Engineering Organisations were set up at the Centre and in States. Most of these organisations however were not adequately staffed[2]. Water supply schemes in the first plan did not make much progress on account of shortage of materials, inadequate transport facilities and absence of public health engineering staff[3]. In 1954, under the Ministry of Health, a National Water Supply and Sanitation Policy was launched by the Goverment of India. The objective of the policy was to assist states in the implementation of urban and rural water supply schemes. During the succeeding Five Year Plans funds were earmarked for water supply and emphasis was placed on providing water to areas suffering from water scarcity/salinity and water-borne diseases. Government of India gave grants-in-aid to States for rural water supply. During the First Plan, states received Rs.6 crores from Centre as grants-in-aid for RWS. Until the Third Plan Rural Water Supply schemes were taken up as part of the programme for community development, local development works and welfare of backward classes.

The first step towards identifying problem villages from the point of view of the quality and accessibility

of drinking water was taken in the Third Plan. Special Investigation Divisions were established in all states under Central scheme to identify the problem villages. The villages were categorised as:

(i) Those which do not have an assured source of drinking water within a reasonable distance of 1.6 Kms.

(ii) Those which are endemic to diseases like Cholera, guinea worms, etc., and

(iii) Those where the available water has an excess of salinity, iron, fluoride, or other toxic elements.

Based on this categorisation, about one third of the villages were identified as problem villages. During the Third Plan, Rs.106 crores were spent for water supply and sanitation as against the earmarked outlay of Rs.105 crores.

During the Fourth Plan (1969-74) bulk of the plan outlay on RWS was spent in problem villages. In 1971-72, 1.52 lakh villages (28%) in India out of 5.50 lakh villages were identified as without safe and assured source of drinking water. The Union Goverment started a new Centrally Sponsored Scheme in 1971-72 under which grants were allocated to state goverment to accelerate the RWS. Plan outlay earmarked for water supply in the central sector was Rs.406 crores in the Fourth Plan as against Rs.105 crores in the Third Plan. Despite all these efforts until the end of Fourth Plan (1973-74) emphasis was more on urban water supply. For instance, out of Rs.855 crores spent for water supply

by Centre and States until 1973-74 (Fourth Plan end)[4] only Rs.299 crores (35%) was spent for RWS. It shows that Rural Water Supply programme was not given high enough priority in the national planning process.

In the Fifth Plan considerable emphasis was laid on ensuring a minimum standard of living to the poorer sections of the community. As a part of this approach, it was proposed to raise the minimum level of social consumption like education, health, nutrition, drinking water, housing and rural electricity. Considering the vital importance of drinking water in the rural areas, rural drinking water was included under the Minimum Needs Programme (MNP). One of the national objectives under MNP was to provide drinking water facility to all villages experiencing water scarcity. Plan outlay of Rs.931 crores was earmarked towards this end in the Fifth Plan out of which Rs.329 crores (35%) was under Minimum Needs Programme. Under Accelerated Rural Water Supply Scheme (ARWS) started in 1977-78, another Rs.100 crores was earmarked for RWS. The standard recommended for ARWS scheme was design period of 10 to 15 years and a per capita supply of 25-40 litres of water per day and not to give house connection. By the end of Fifth Plan Rs.1092 crores was expended on water supply and sanitation in India.

2.1.1 Sixth Five Year Plan

Water Supply programme during the Sixth Plan was developed based on a 10 year perspective with respect to 'International Drinking Water Decade 1981-91'. As part of it the Union Government formulated a criteria in 1980 for identifying the problem villages (See Table 2.1). According

to the new criteria, 2.31 lakh villages were identified as problem villages for drinking water. It shows that 40% of the inhabited villages in India were facing water problem. Out of the total identified problem villages, 69% were not having drinking water within a distance of 1.6 km. or 15 metres depth, 20% villages were caused by excess salinity causing health hazards and 11% villages were prone to disease like cholera, guinea worm etc. In other words 69% of the problem villages were facing water scarcity and 31% were facing health problem.

In many states, the proportion of problem villages was much greater than the all India figure of 40% in 1980: in Kerala, for example, more than 90% of inhabited villages were problem villages (Table 2.1).

Sixth Plan earmarked an outlay of Rs.3922 crores for water supply and sanitation. However, high priority was accorded to RWS in identified problem villages under two schemes viz., MNP and ARWS. An outlay of Rs.2007 crores (51%) was set apart exclusively for RWS in the Sixth Plan. Out of it Rs.1407 crores (70%) was in the state sector under MNP and Rs.600 crores (30%) was in the central sector under ARWS. Again in 1982-83 RWS was brought under revised 20 Point Programme and Ministry of Finance introduced a new Incentive Bonus Scheme in order to accelerate the programme of RWS. As part of it, Rs.75 crores was provided during 1983-84 and Rs.50 crores during 1984-85 to states.

TABLE 2.1

Identified problem villages and problem villages covered with water supply as on 1 April 1985

Major States	Total number of inhabited villages 1981	Problem villages uncovered as on 1 April 1980			Total (2 to 4)	Problem village covered during 1980-85	Problem villages uncovered as on 1 April 1985	Col.7 as % of Col.1
Assam	21,995	4,467	9,740	1,536	15,743	8,654	7,089	32.2
West Bengal	38,024	12,818	9,360	3,065	25,243	15,628	9,615	25.3
Haryana	6,745	952	2,488	--	3,440	2,122*	1,318	19.5
Rajasthan	30,968	9,321	7,009	3,473	19,803	16,043*	3,760	10.8
Punjab	12,342	367	1,400	--	1,767	537*	1,230	10.0
Gujarat	18,114	4,219	1,099	--	5,318	4,492*	826	4.6
Orissa	46,553	15,420	2,499	5,697	23,616	22,357*	1,259	2.7
Maharashtra	39,356	11,220	841	874	12,935	12,016*	919	2.3
Madhya Pradesh	71,352	24,909	21	14	24,944	23,845*	1,099	1.5
Bihar	67,546	11,526	3,455	213	15,194	14,172*	1,022	1.5
Kerala	1,219	1,011	122	25	1,158	1,142*	16	1.3
Uttar Pradesh	1,12,566	19,237	1,640	7,619	28,505	27,143*	1,362	1.2
Andhra Pradesh	27,379	5,217	2,355	634	8,026	8,094*	112	0.4
Karnataka	27,028	13,352	1,936	168	15,456	15,443*	13	--
Tamil Nadu	15,831	3,981	1,343	1,325	6,649	6,649*	--	--
All India	579,132	157,895	46,662	26,327	230,784	192,024	38,748	6.7

* Includes partially covered problem villages.

Criteria - I Villages which do not have the source of drinking water within a distance of 1.6 Km. or within a Depth of 15 metres (in hilly areas the elevation difference between the habitat and the source was not to exceed more than 100 metres).

Criteria-II Villages where the existing water source contained excess salinity, from fluoride and other toxic elements hazardous to health; and

Criteria-III Villages where the existing sources of water supply were prone to cause, diseases like Cholera, guinea, worms, etc.

Source: Centre for Monitoring Indian Economy (1987), Basic Statistics Relating to Indian Economy, Vol.II States.

By the end of the Sixth Plan an amount of Rs.2601 croes was expended on RWS both by Centre and states. Out of it state sector expenditure under MNP was Rs.1566 crores, (60%) Central Sector expenditure under ARWS was Rs.919 crores (35%) and Rs.116 crores (5%) was under Incentive Bonus Scheme. In terms of population nominally covered by drinking water Sixth Plan made great achievement. During the period 1980-85, 138 million rural people were covered by RWS. It shows that by April 1985, in India 300 million (56%) rural people are nominally covered by drinking water. The extent of progress made can be seen from the fact that more than 80% of problem villages as identified in 1980 were at least partially covered by protected water supply between 1980 and 1985 (Table 2.1).

When we talk about the nominal coverage of RWS it is necessary to understand the difference between nominal coverage and effective coverage, which we have mentioned earlier. Although official statistics show that 93% inhabited villages and 56% rural population are covered by drinking water in India, it refers essentially to nominal coverage, in terms of the number of RWS schemes, number of water taps including house connections, etc. It does not explain the real benefits with respect to accessibility, quality and quantity of drinking water. In other words, provision of one source of drinking water in a village will not necessarily deliver the real benefits to the entire rural population. Therefore in order to assess the real benefits which people derive from RWS it is necessary to measure the distance from the house to the water post and the quantity of water used. The more the distance from the house to the

if majority of the people in the village do not obtain adequate quantity of water with good quality one cannot say that coverage of water supply is effective. Therefore, the official statistics which mention the coverage of RWS is only nominal coverage and not effective coverage.

We move one step closer to the notion of effective coverage when coverage is measured in terms of the percentage of population covered. Thus the proportion of rural population covered by drinking water in India was only 56% in 1985. But, in this respect there are glaring regional imbalances among the major states, rural water supply coverage ranged from 83% of population in Karnataka to 24% in Punjab. Among the major states, six states are below the level of national coverage (See Table 2.2)

TABLE 2.2

Percentage of Population covered under Potable Water Supply as on March end 1985

Major States	Potable Water Supply	
	Rural	Urban
Andhra Pradesh	71.4	52.1
Assam	71.4	37.5
Bihar	77.8	59.5
Gujarat	79.7	83.2
Haryana	57.8	69.1
Karnataka	82.9	91.2
Kerala	40.8	64.5
Madhya Pradesh	62.7	79.7
Maharashtra	51.0	97.1
Orissa	82.0	38.1
Punjab	23.8	71.2
Rajasthan	58.7	56.0
Tamil Nadu	46.8	83.8
Uttar Pradesh	28.3	70.1
West Bengal	52.5	63.7
All-India	56.2	72.9

Source: Centre for Monitoring Indian Economy (1987) Vol.II. Basic statistics relating to Indian Economy.

Thus the gap between the proportion of villages covered and the proportion of population covered as note above, is at least a partial reflection of the gap between nominal and effective coverage.

Statewise distribution of problem villages nominally covered by drinking water by the end of the Sixth Five Year Plan shows that Kerala's performance was no less substantial. As on April, 1985, when 7% of problem villages at national level are not covered by drinking water, in Kerala it is only 1.3%. The percentage of problem villages uncovered by drinking water is 25% in West Bengal, 10% in Haryana, 11% in Rajasthan, 10% in Punjab and 5% in Gujarat (See Table 2.1)

On the other hand, in Kerala nominal coverage in terms of population covered by pipe water is below the national average. At all India level 56% of rural and 73% of urban population has been nominally covered by drinking water as on March 1985. As against it, only 49% of rural and 65% of urban population in Kerala have been covered by pipe water. The highest nominal coverage has been in Karnataka where 83% of rural and 91% urban population have been covered by pipe water. Gujarat stands second with 80% rural and 83% urban population covered by pipe water (See Table 2.2).

2.1.2 Seventh Five Year Plan 1985-1990

The RWS during the Seventh Plan is also in line with the objective of 'International Drinking Water Decade 1981-1991' which aims to provide adequate drinking water

facilities to the entire population. According to Seventh Plan document, although the major areas of the rural population have been now provided with potable water suply as a result of the massive effort during the Sixth Plan Period there are still a sizeable number of problem villages[5]. Till Sixth Plan end RWS under MNP was restricted to identified problem villages. Seventh Plan, however, has recognised the need for extending drinking water to all villages under MNP. Due to resource constraints, however, priorities are recommended.

With this objective, major policy changes recommended for RWS at national level from past plans are (i) redefinition of problem area and (ii) revision of per capita norm for RWS. However, due to resource constraint, RWS in non-problem villages are decided to be taken up only after all already identified problem villages are covered by at least one source of water. Seventh Plan document states: 'Once the task is completed and every village is provided with at least one source of water supply, water supply facilities will have to be further expaned in order to provide for adequate water supply to the villages'[6]. It shows that steps to improve 'effective coverage' of RWS will be taken up only after all villages are covered by at least one source of water supply. As part of it, source of water supply will be asured within a distance of 0.5 Km. and a per capita supply of 70 litres per day.

The outlay earmarked for RWS under MNP in the state sector is Rs.2253 crores (65%) and Rs.1201 crores (35%) in the central sector. Thus the total outlay earmarked for RWS in the Seventh Plan is Rs.3454 crores at national

level.

2.2 Rural Water Supply in Kerala under Five Year Plans

At the time of the commencement of the First Five Year Plan (1951-56) there was no separate agency for the execution of water supply schemes in Kerala. In April 1956, the Goverrnment of Kerala created a Public Health Engineering Department for carrying out water supply programmes and sanitation works. But water supply works wer mainly confined to urban areas and neglected the rual areas. Even the urban water suply schemes taken up were inadequate and expansion works were slow and could not keep pace with rapid growth and expansion of towns[7]. Trivandrum, Alleppey, Ernakulam and Calicut towns had protected water even at the beginning of the First Plan. But among the fifteen states in respect of urban water supply, Kerala was ranked 13th in 1961[8]. Only about 24% of the urban population had at that time water supply facility. Rural Water Supply schemes on a modest scale were implemtned from Second Plan (1956-61) onwards. During the Second Plan period, 48 RWS schemes were completed in Kerala and an expenditure of Rs.31.32 lakhs was incurred as against 12 RWS completed during the First Plan.

As mentioned earlier, during the Third Plan (1961--66), a Special Investigation Division was established to assess the water supply situation. The Investigation Division identified the problem villages based on the quality and accessibility of water.

The Special Investigation Division found that all the villages in Kerala were suffering from scarcity

of drinking water especially during summer. A large portion of the rural coastal region was affected by salinity and harmful minerals.

Dwelling units in Kerala are scattered almost uniformily over the entire geographical area of the state with a population density of 655 per sq.km. which is three times above the all India average of 216 per sq.km. The state is divided into three geographic regions, namely, low land, midland and highland. The three regions are distinctly marked by different soil types, vegetation and living conditions of the people. Intensity and duration of water problem varied between the regions. The low land is mostly coastal area. Soil here is mainly sandy loam and water is affected by salinity and harmful minerals and therefore unfit for drinking. People in the coastal region draw rain water collected in shallow ditches and ponds. This water is dangerously polluted and causes diseases like cholera and gastroenteritis. Low lying areas (during monsoon) become water-logged causing pollution while during summer water becomes more saline. In these regions open draw wells are not useful owing to presence of salinity and harmful minerals.

In the midland region soil is mainly laterite and ground water is used for domestic purposes. But ground water is available only at a reasonable depth and its quality depends upon the nature and condition of the soil through which water passes. Owing to the filtering action of the soil, water becomes clear. Almost every rich, middle and lower class family has one open draw well. In Kerala 82% households use wells as the source of drinking water (See Table 1.1 in Chapter 1). However, most of the wells in

midland region go dry during the summer months, March - May. People near perennial rivers using river water also face water scarcity during summer as the rivers become dry. Even in places where ground water is available, poor people, marginal farmers and agricultural labourers, may not have the financial ability to dig open draw wells.

The high land region of the state is sparsely populated and the land is laterite and rocky. Ground water is available only at a considerable depth. People here face acute scarcity of drinking water for nearly nine months a year. The streams from which people take water also go dry during summer. Harijans and Tribals living in this region therefore face acute scarcity of water. They are also unaware of the health hazards caused by the use of polluted water.

The Investigation Division identified that 99% of the panchayats in Kerala had been facing drinking water scarcity of varying duration and intensity. Of the 963 panchayats then in Kerala, 953 had problem of water scarcity. The Investigation further revealed that all the panchayats in six districts had drinking water problem (See Table 2.3).

TABLE 2.3

Panchayats Facing Drinking Water Problem (1971-72)

District	No. of Panchayats	Panchayat having scarcity of water (Nos.)	Percentage of Panchayats
Trivandrum	79	79	100.0
Quilon	101	101	100.0
Alleppey	94	92	97.8
Kottayam	70	70	100.0
Idukki	47	46	97.8
Ernakulam	86	85	98.8
Trichur	94	94	100.0
Palghat	89	89	100.0
Malappuram	91	87	95.6
Kozhikode	89	89	100.0
Cannanore	123	121	98.3
Kerala	963	953	99.00

Source: Fifth Five Year Plan, Government of Kerala 1974-79
Minimum Needs Programme, 1973.

The duration and intensity of water problem differ from region to region. Of the total panchayats, 11% faced water scarcity for the whole year. All these panchayats were located in the coastal area and hilly regions. In 75% panchayats water scarcity was for 3 to 6 months a year. In 21% panchayats scarcity was for only 3 months (See Table 2.4). The analysis shows that coastal and hill districts are prone to drinking water problem. For instance in Alleppey district while 90% of the rural people were having drinking

water problem for 9 months a year, in Trivandrum district 85% of the rural people were facing water problem for 3 to 6 months only. During summer majority of the panchayats in the hill districts of Kottayam, Idukki were facing water problem. In North Kerala, in districts like Malappuram, Kozhikode and Cannanore, 85% of the people were suffering from lack of drinking water for 3 to 9 months a year[9].

TABLE 2.4

Distribution of panchayats with water problem according to duration of scarcity (1971-72)

Number of months during which there is scarcity	Number of panchayats	Percentage of panchayats
No water scarcity	10	1.1
1 Month	1	0.1
2 Months	25	2.6
3 Months	204	21.2
4 Months	154	16.0
5 Months	185	19.2
6 Months	180	18.7
7 Months	35	3.6
8 Months	56	5.8
9 Months	9	0.9
10 Months	2	0.2
11 Months	..	..
12 Months	102	10.6
Total	963	100.0

Source: Government of Kerala, Fifth Five Year Plan, 1974-79, Minimum Needs Programme, 1973.

The 1971-

The 1971-72 Investigation further revealed that 71% of the Panchayats in Kerala had no protected water supply. In 64 panchayats (7%), 1 to 10% people benefited from water supply. In another 84 panchayats (9%) nearly 11 to 20% people derived the benefits of water supply. Only in 3 panchayats 91-100% of people derived the benefits of water supply. Details regarding the distribution of panchayats served by protected water supply and percentage of population benefited are given in Table 2.5.

TABLE 2.5

Distribution of panchayats served by protected water supply and percentage of people benefited (1971-72)

% of population served by protected water supply	No. of panchayats	% of panchayats
0	683	70.9
1 - 10	64	6.6
11 - 20	84	8.8
21 - 30	55	5.8
31 - 40	29	3.0
41 - 50	18	1.9
51 - 60	13	1.3
61 - 70	6	0.6
71 - 80	7	0.7
81 - 90	1	0.1
91 -100	3	0.3
Total	963	100.0

Source: Government of Kerala, Fifth Five Year Plan 1974-79 Minimum Needs Programme, 1973.

In Kerala under MNP an amount of Rs.92 lakhs was earmarked for rural water supply in the Fifth Plan. Out of it Rs.80 lakhs (87%) was earmarked exclusively for ongoing rural water supply schemes as the emphasis during the Fifth Plan was on completing the ongoing projects.

2.2.1 Sixth Five Year Plan

The RWS in Sixth Five Year Plan was in line with the 'International Decade for Drinking Water 1981-1991'. According to the norm fixed by the Union Government in April 1980 (See Table 2.1) there were 1158 problem villages in Kerala. As part of the national plan RWS were implemented under MNP and ARWS. The Sixth Plan of Kerala emphasised the importance of rural water supply. The target was to provide drinking water in all problem villages. Under Minimum Needs Programme an amount of Rs.4591 lakhs was earmarked. The objective was to provide at least one source of drinking water in every village identified as a scarcity or health problem village. The expenditure incurred was only Rs.2403 lakhs (52%). Under ARWS outlay earmarked was Rs.2722 lakhs. But the expenditure was Rs.3388 lakhs (125%). By the end of Sixth Plan, out of 857 RWS schemes completed, 654 (76%) were in problem villages, and 203 (24%) were in non-problem villages. Under Accelerated Rural Water Supply scheme 109 schemes benefiting the harijan colonies and 49 schemes benefiting tribal colonies were also completed.

2.2.2 Seventh Five Year Plan

Water Supply Schemes for the Seventh Plan is also prepared with the target of 'International Decade of Drinking

Water 1981-1991'. The target as envisaged in the Seventh Plan is to cover entire population by basic minimum need of drinking water supply. The total plan outlay earmarked for water supply in Kerala is Rs.10890 lakhs in the Seventh Plan in the state sector. Out of it Rs.9530 lakhs (88%) is earmarked for rural water supply. Out of Rs.9530 lakhs, LIC aided Rural Water Supply schemes under Minimum Needs Programme will share Rs.850 lakhs (9%). For World Bank aided RWS schemes an amount of Rs.4650 lakhs (49%) is earmarked. For Netherlands and Danish aided bilateral assistance schemes under MNP an amount of Rs.2400 lakhs (25%) is earmarked, Rs.2000 lakhs (21%) for Netherlands aided and Rs.400 lakhs (4%) for Danish aided schemes. Plan outlay earmarked for ARWS schemes (Central Sector) is Rs.15000 lakhs.

The physical target in the Seventh Plan is to provide drinking water in 1158 problem villages to 105 lakh population in state sector. The target under ARWS in central sector is to aprovide drinking water to 568 problem villages with 66 lakh population partially covered, by taking up additional water supply schemes.

It shows that in the State's Seventh Plan, efforts has been made to provide funds for the ongoing RWS schemes, MNP schemes, World Bank assisted and Bilateral schemes. Under MNP and 20 Point Programme out of Rs.95.30 crores earmarked for rural drinking water to problem villages, in 1985-86, the first year of the Seventh Plan: Rs.929 lakhs (10%) was spent, Rs.1347 lakhs (14%) in 1986-87 and Rs.2440 lakhs (26%) in 1987-88. It shows that by the end of the first three years of the Seventh Plan Rs.4715 lakhs or nearly 50% of the total outlay for the Seventh Pl7n has been spent

on RWS. The anticipated expenditure in 1988-89 is estimated at Rs.2943 lakhs (31%). As a result of it, drinking water has been provided nominally to 115 lakh people additionally during the first three years of the Seventh Plan as against the Seventh Plan target of 171 lakh people. In other words 67% of the physical target has been achieved within first three years.

Thus, increasing importance is being accorded to Rural Water Supply schemes in Kerala: whereas no separate outlay was earmarked for rural water supply during the first three Five Year Plans, We find that the share of the rural component in total plan outlay/expenditure on water supply has increased substantially (Table 2.6).

TABLE 2.6

Plan Outlay and Expenditure on Rural Water Supply - Kerala

(Rs.lakhs)

Plan Period	Approved Plan outlay (Rural Water Supply)	% to total outlay on water supply	Plan expenditure on Rural Water Supply	% of plan expenditure on rural water supply to total expenditure on water supply
1. Annual Plan	NA	NA	215.0	NA
2. Fourth Plan	260	32.89	450.12	18.20
3. Fifth Plan	673	18.84	1173.39	36.28
4. Annual Plan	3106.50	57.24	1025.27	58.35
5. Sixth Plan	4591.00	59.58	2402.60	49.74
6. Seventh Plan	9530.00	86.80	4716.00 **	49.49

* It includes urban & rural water supply.

** Three years

Source: Government of Kerala, Five Year Plans.

2.3 Rural Water Supply in Kerala - Comparison with all India and other selected states.

Although in the earlier plans the share of plan outlay on water supply was at low levels in Kerala it began to improve faster since the Fourth Plan. When Kerala State earmarked 61% of its total plan outlay on water supply during the Fifth Plan at all India level the share was only 2.4% Table 2.7 below shows Kerala State's share and all India share of plan outlay and expenditure on water supply under successive Five Year Plans.

Kerala State stood above national level in terms of plan outlay and expenditure on water supply. However when compared to few states for which data are available. Plan outlay earmarked for water supply in Kerala is low: Andhra Pradesh earmarked 7.3% of States total plan outlay on water supply during the Seventh Plan, Karnataka State earmarked 5.5% and Kerala State earmarked only 5.2%. As against this during the Sixth Plan Karnataka had earmarked only 4.7% of total plan outlay on water supply when the share was 8.3% in Rajasthan and 5% in Kerala (See Table 2.8).

TABLE 2.7

Percentage share of Plan Outlay and Expenditure - All India and Kerala

%

Sl. No.	Plan Period	Plan Outlay		Plan Expenditure	
		All India	Kerala	All India	Kerala
		% of Plan Outlay on water supply to total Plan Outlay	% of Plan Outlay on Water Supply to State total plan outlay	% of plan expenditure on water supply to total plan expenditure	% of plan expenditure on water supply to state's total plan expenditure
1.	Third Plan	1.3	3.3	1.5	2.8
2.	Annual Plans	1.5	NA.	1.6	3.3
3.	Fourth Plan	2.6	2.9	2.9	6.7
4.	Fifth Plan	2.4	6.1	2.8	6.7
5.	Sixth Plan	4.0	5.1	NA	4.1
6.	Seventh Plan	3.6	5.2	NA	2.9

Sources i. Column 3 & 5 Centre for Monitoring Indian Economy 1988, Vol.I

ii. Govt. of Kerala, Five Year Plans.

TABLE 2.8

Share of State's Plan Outlay on Water Supply To Total Plan Outlay

States	Sixth Plan (%)	Seventh Plan %
1. Karnataka	4.70	5.52
2. Nagaland	7.35	8.34
3. Andhra Pradesh	..	7.30
4. Rajasthan	8.26	..
5. Kerala	5.10	5.18

Source: Compiled from States Plan documents.

2.4 Expenditure on Rural Water Supply and Expenditure in Social Service Sector in Kerala

Investment on Social Services Sector is largely intended to augment the welfare of the people. It meets the social consumption needs like education, health, water supply, rural electricity, sanitation, etc. Within the social service sector protected water supply play a very crucial importance as safe water is one of the very basic needs. However, in the early plan periods importance of water suply was under estimated. This can be seen from the low share of plan outlay on water supply. Out of the total plan outlay on Social Service Sector, share of water supply was at low level during the early years of planned development. Plan outlay on water supply began to increase slowly only after Third Plan and now (Seventh Plan) the share of water supply out of the total Social Service Sector plan outlay is 26%, as against 6% during Third Plan, 15% during Fourth Plan

and 29% during Fifth Plan. It shows that the share of plan outlay on water supply under successive Five Year Plans has been growing slowly. However, the share of plan expenditure on water supply to total expenditure on Social Service Sector as a whole has been decreasing continuously after the Fifth Plan. Share of plan expenditure on water supply decreased from 32% during the Fourth Plan to 11% during the Sixth Plan. Table 2.9 below shows the plan outlay and expenditure on water supply and social service sector.

Water Supply is one of the crucial basic social needs. Therefore, its importance could neither be under estimated nor neglected. As mentioned in the introduction good water supply facilitates economic development through better health and increases in labour productivity. Of the total plan outlay on social service sector the share of water supply was 6%, share of health was 35% and share of education was 48%, during the Third Plan. The share of water supply rose to 15% during the Fourth Plan while share of health declined to 21% and education to 37%. Water supply shared a higher level of plan outlay during the Sixth Plan. It was 27% as against 12% for health and 17% for education Table 2.10 shows the percentage share of plan outlay and expenditure on health, education and water supply.

In aggregate terms plan outlay on water supply increased from Rs.225 lakhs in the Third Plan to Rs.10890 lakhs in the Seventh Plan, nearly 48 times increase. Plan outlay on health during the same period increased by less than 4 times, that is, from Rs.1350 lakhs to Rs.5290 lakhs.

TABLE 2.9

Plan Outlay and Expenditure on Water Supply and Social Service Sector (Kerala)

Sl. No.	Plan Period	Plan Outlay		% of Plan Outlay to Water Supply	Plan Expenditure		
		Social Service Sector	Water Supply		Social Service Sector	Water Supply	% of Plan Expenditure to Water Supply
1.	Third Plan	3826.44	225.00	5.88	4170.29	511.69	12.27
2.	Annual Plan	2542.93	NA	NA	2660.74	474.29	17.82
3.	Fourth Plan	5044.75	760.00	15.06	7765.48	2462.97	31.72
4.	Fifth Plan	12159.00	3573.00	29.38	11023.40	3234.16	29.34
5.	Annual Plans*	23619.00	5427.00	22.97	10295.25	1757.31	17.07
6.	Sixth Plan	29359.00	7905.00	26.92	45085.20	5104.07	11.32
7.	Seventh Plan	40975.00	10890.00	26.57	..	..	..

* Original Sixth Plan 1978-83.

Source : Government of Kerala, Five Year Plans.

TABLE 2.10

Percentage share of plan outlay and expenditure on Water Supply, Health and Education

Sl. No.	Plan Period	Share (%) in total social service sector Plan Outlay			Share (%) in total social service sector Plan Expenditure		
		Water Supply	Health	Education	Water Supply	Health	Education
1.	Third Plan	5.88	35.28	48.25	12.27	38.0-9	48.27
2.	Annual Plans	..	30.94	47.90	17.82	18.60	55.26
3.	Fourth Plan	15.06	20.69	37.39	31.72	11.06	38.79
4.	Fifth Plan	29.38	10.27	19.57	29.34	8.55	26.68
5.	Annual Plans	22.97	12.49	17.38	17.07	10.95	24.57
6.	Sixth Plan	26.92	12.25	17.11	11.32	11.53	26.23
7.	Seventh Plan	26.57	12.91	17.81	..	..	..

Source: Government of Kerala, Five Year Plans.

Plan outlay on education increased from Rs.1846 lakhs to Rs.7300 lakhs, showing nearly 4 times increase. With respect to plan expenditure, education exceeded water supply and health. For instance, while plan expenditure on education increased nearly 6 times between Third and Sixth Plans, plan expenditure on health increased 3 times and for water supply 5 times (See Table 2.11).

TABLE 2.11

Plan Outlay and Expenditure on Health, Education and Water Supply

Sl. No.	Five Year Plans	Water Supply		Education		Health	
		Outlay	Expenditure	Outlay	Expenditure	Outlay	Expenditure
1.	Third Plan	225.00	511.68	1846.62	2013.01	1390.00	1588.49
2.	Annual Plan	NA	474.29	1218.25	1470.48	786.82	495.62
3.	Fourth Plan	760.00	2462.97	1886.25	3012.65	1044.00	859.21
4.	Fifth Plan	3573.00	3234.16	2380.00	3051.55	1249.00	942.18
5.	Annual Plan	5427.00	1757.31	4106.00	2529.99	2950.00	940.57
6.	Sixth Plan	7905.00	5104.07	5025.00	11629.28	3595.60	5198.08
7.	Seventh Plan	10890.00	..	7300.00	..	5290.00	..

Source: Government of Kerala, Five Year Plans.

Safe water is unavoidable and essential in human life. The share of plan outlay on water supply in the State's aggregate plan outlay therefore need increase over the successive Five Year Plans. While the State's aggregate plan outlay increased from Rs.17000 lakhs in the Third Plan to Rs.21000 lakhs in the Seventh Plan, Plan outlay on Water supply increased from Rs.225 lakhs to Rs.10890 lakhs. It shows that while state's aggregate plan outlay increased

12 times during this period, Plan outlay on water supply increased 48 times. It is a healthy progress. The share of plan outlay on water supply which was 1.32% of the States total plan in the Third Plan rose to 6.3% during the Fifth Plan and decreased to 5.2% during the Seventh Plan. But the share of plan expenditure on water supply which was 2.8% in the Third Plan rose to 6.7% in the Fifth Plan and declines to 4.1% in the Sixth Plan.

2.5 Rural Water Supply in Kerala in terms of Nominal and Effective Coverage

As mentioned earlier unless a distinction is made between nominal and effective coverage of water supply, it is difficult to assess the real benefits that people derive from water supply. When official statistics say that 87% villages and 50% population are covered by RWS, it need not mean that the entire population derive real benefits from water supply with respect to accessibility, adequate quantity and quality. In the case of urban water supply where house connections are common, it is possible to estimate the effective coverage on that basis. But for RWS where house connections are very rare calculation of effective coverage poses several problems. The policy of the State Government is that persons shall not walk for more than 150 metres for drinking water. Therefore, the distance between two public water taps is fixed at 150 metres in rural area. The isolated hamlet type settlements are rarely seen in Kerala. Instead Kerala's villages are continuous and households are scattered. The distribution net work will have to be therefore elaborate in order to ensure reasonable accessibility to water points. Location of public water posts its coverage per household, and quantity and quality of pipe water are the crucial problems in the assessment of effective coverage.

The Kerala Water Authority calculate that 250 persons use a public water post. Therefore such a calculation gives only a picture of nominal coverage. Analysis of physical achievement under Five Year Plan below therefore gives only the nominal coverage of RWS.

As seen earlier, although Kerala state has been spending sizeable amount on RWS under successive five year plans even the nominal coverage of RWS has been only around 41% (in terms of population coverage) by the end of Sixth Plan (Table 2.2). But the State official statistics indicates that 50% of rural population have been nominally covered by RWS[10] by the end of the Sixth Plan.

In 1981 census, the State had 1219 rural villages. Number of rural water supply schemes then were 883 as against 579 in 1975-76. The number of RWS schemes increased to 1611 in 1985-86. It shows that in 10 years (1976-86) number of RWS schemes increased nearly 3 times. On an average, therefore during this period, 103 RWSS were constructed annually. Table 2.12 shows the growth of RWS schemes in Kerala since 1975-76.

TABLE 2.12

Growth of Number of Rural Water Supply Schemes (Cumulative)

Sl. No.	District	Year							
		1975-76	1976-77	1977-78	1978-79	1980-81	1984-85	1985-86	% increase in 1985-86 over 1975-76
1.	Trivandrum	54	58	62	64	78	123	145	168.5
2.	Quilon	41	45	52	57	69	118	122	197.7
3.	Pathanamthitta	-	"	"	"	"	6	7	"
4.	Alleppey	56	58	63	68	79	165	166	196.4
5.	Kottayam	84	87	92	101	112	148	156	85.7
6.	Idukki	16	16	10	21	29	64	73	356.2
7.	Ernakulam	53	54	62	68	89	184	202	281.1
8.	Trichur	58	54	62	68	89	184	202	194.9
9.	Palghat	65	66	71	75	84	147	162	149.2
10.	Malappuram	28	29	39	40	58	112	127	353.6
11.	Kozhikode	49	54	57	60	72	101	103	110.2
12.	Wayanad	-	"	"	"	"	7	13	"
13.	Cannanore	75	83	87	97	117	157	162	116.0
14.	Kasargod	-	"	"	"	"	"	2	"
STATE		579	609	663	722	883	1423	1611	178.2

Source: Government of Kerala, Economic Reviews.

Highest growth rate is noticed in Idukki (356%) followed by Malappuram (353%) and Ernakulam 281%. The lowest growth rate is noticed in Kottayam 86%

Even though there are 1158 identified problem villages in the State, 1157 RWS are in operation as on 1985-86. But only 6 villages are fully covered by RWS while 1158 'problem villages' are only partially covered with drinking water facility[11]. In the Sixth Plan, under the state sector, the target was to provide drinking water to 56 lakh population but only 34 lakh (61%) people in the problem villages were covered by drinking water. The central sector target in the state was to provide drinking water to 16.15 lakh people during the Sixth Plan through ARWS. But only 10 lakh (62%) people in the problem villages were given drinking water. It shows that physical targets are not realised. It happened so because instead of concentrating entirely on identified problem villages for providing drinking water, non-problem villages were also covered in a big way. For instance, during 1980-83, 208 RWS in non-problem villages were completed benefiting 40 lakh people. Even from Central assistance under MNP, funds are diverted to implement water supply schemes in non-problem villages. It shows spill-over works of water supply schemes in the identified problem villages based on the problem village criteria are overlooked.

Physical achievements with respect to nominal coverage during the Sixth Plan was high. Percentage of villages covered by RWS which was 63% in the first year of the Sixth Plan increased to 87% by the end of the plan (See Table 2.13).

TABLE 2.13

Village Covered by RWS in the Sixth Plan 1980-85

(Cumulative)

Sl. No.	Year	% of villages covered by RWS
1.	1980-81	63.2
2.	1981-82	66.6
3.	1982-83	75.2
4.	1983-84	81.7
5.	1984-85	87.4

Source: Goverment of Kerala, Economic Reviews.

Scheduled Castes and Scheduled Tribes, the weaker sections in the society, living in rural areas find it difficult to dig wells due to poverty. They are prone to face drinking water problem especially during summer. Out of the 4553 identified harijan habitats in the State, 3129 (69%) are located in problem villages (See Table 2.4). Out of them 1056 (34%) habitats are not covered by water supply. During the Sixth Plan 495 harijan colonies and 49 tribal colonies were covered by drinking water. In the Seventh Plan additional sources/water collection points for enabling the poor to obtain access to safe water is separately provided.

Out of the total identified harijan habitats in problem villages highest numbers are in Ernkaulam (20%) followed by Quilon (16%). Out of the total harijan habitats in the problem villages 30% do not have water supply facility. Most of the Harijan colonies are situated in remote

rural area. It would become therefore technically difficult to extent the coverage of rural water supply scheme to such far off colonies. Open dug wells facilities are therefore provided in such harijan colonies.

TABLE 2.14

Harijan Habitats Facing Water Supply Problems

Sl. No.	District	No. of SC habitats identified	No.of SC habitats located in problem villages	No. of SC habitats in problem villages & not coverd with water supply
1.	Trivandrum	516	331	171
2.	Quilon	578	485	2 2 1
3.	Pathanamthitta	244	244	22
4.	Alleppey	339	297	30
5.	Kottayam	183	134	79
6.	Idukki	120	120	84
7.	Ernakulam	675	629	224
8.	Trichur	326	268	..
9.	Palghat	393	..	..
10.	Malappuram	468	311	122
11.	Kozhikode	275	..	..
12.	Wayanad	30	..	..
13.	Cannanore	251	188	41
14.	Kasargod	155	122	62
	State	4553	3129	1066

Source: Government of Kerala, Special Component Plan for Scheduled Castes, 1987-88.

In Kerala according to the norm fixed by Government of India there are 1158 problem villages. Out of it 1011 (87%) villages do not have source of drinking water within a distance of 1.5 Km. During the 6th Five Year Plan 1142 problem villages have been covered by drinking water partially. It shows that only 1.3% villages are uncovered by drinking water in Kerala as against 6.7% village at all India level. When compared to other states Kerala's position is better. For instance in West Bengal 25% villages, in Haryana 19.5% villages and in Punjab 10% villages are still problem villages uncovered by drinking water (See Table 2.1). But in terms of nominal coverage of population, position of Kerala is below the all India average (See Table 2.2).

The target in the Seventh Plan is to provide drinking water to 170 lakh population. Out of it 105 lakhs (60%) will be under MNP in the State sector and 65 lakhs (38%) will be under ARWS in the Central sector. In the base year of the Seventh Plan, 1142 villages under MNP and 328 villages (29%) under ARWS are covered by RWS. By the end of the Seventh Plan number of RWS schemes are proposed to be 1726 in Kerala. It shows that some villages may have more than one source of RWS.

As said earlier only 6 villages are entirely covered by RWS. Other villages are only partially covered. But even these six villages do not explain the extent of effective coverage with respect to accessibility, quantity and quality. Effective coverage, it should be noted can be analysed only through an evaluation study among the beneficiaries. Because, as we have said earlier, construction of a RWS scheme need not necessarily distirbute real benefits to the entire population. Therefore, in the case study an attempt has been made

to assess the extent of effective coverage with respect to accessibility, quantity and quality of water.

2.6. Rural Water Supply Problems and Policies in Kerala

Having reviewed the progress of RWS in Kerala vis-a-vis all-India which gave us an idea about the extent of annual coverage achieved, in this section we shall discuss the issues and problems undergoing the broad financial outlays involved in the formulation of policy regarding rural water supply, both in general terms as well as with particular reference to Kerala.

2.6.1. Rural Water Supply Problems

Problems associated with planning for Rural Water Supply are numerous and complex. Resource constraints, underestimation of project costs, lack of suitable low cost technology, poor maintenance of existing water supply system, absence of a suitable water pricing policy, organisational problems, identification of villages for execution of RWS, centralisation of power at State level, are the major problems facing the rural water supply system in Kerala. In a welfare society, State has to earmark more money for social services like education, public health, water supply, social security schemes etc. Therefore little money is left for earmarking for water supply although it is a basic need. The Plan outlay earmarked for water supply has been less than 7% of state total plan outlay (See Table 2.7). Therefore Government resort to interest bearing institutional finance and external assistance. Assistance from external agencies largely depend on the availability of suitable projects

which are fundable/bankable according to the international lending agencies. Such agencies naturally insist on rigorous and critical analysis of schemes put up for funding. The lending agencies often lay down various preconditions and press for tariffs, costly feasibility studies, and technical consultants, elaborate periodical reports, etc. Once the water supply scheme is commissioned and people begin to use water, water agency has to start to repay the loan instalment along with interest. Water agency has also to meet the maintenance costs. Unless sufficient returns come from the water supplied, Goverment would find it difficult to earmark more money for taking up new water supply schemes. Perhaps it is the most serious problem now facing the water supply system in Kerala. Unless water charge is levied, such institutional finance will bring additional burden to State. It is the policy of the State Goverment to levy 50 paise per 1000 litres (1986-87) of water under RWS for house connection. But house connections are very rare. RWS cannot therefore generate income and cannot become self-supporting.

Poor maintenance of existing RWS system is a source of concern. Maintenance works are neglected partly because of lack of adequate funds and partly because of lack of suitable machinery and raw materials. As a result assets created for provision of water supply in rural areas at huge costs partially go waste or defunct. Project costs are under estimated and therefore the projects fail to be completed with the estimated cost. Insufficient distribution of plan outlay on many RWS schemes also leads to untimely completion of projects.

When a scheme suffers from resource constraint during the course of its construction, its works will prolong indefinitely and capital already invested will remain unutilised. Such instances generally occur when available scarce resources are unevenly and thinly spread over many schemes which eventually result in the non-completion of all the schemes due to shortage of finance. For instance based on the per capita cost[12] of rural water supply scheme in Kerala at Rs.150 to 200 the total investment cost required for providing pipe water to all the rural population by 1991 according to 'International Drinking Water Supply and Sanitation Decade' is estimated at Rs.546 crores. Accordingly investment required for rural water supply during Seventh Plan 1985-90 and first year of the Eighth Plan was estimated at Rs.465 crores. As against this estimate, the plan outlay earmarked for rural water supply in the state sector in the Seventh Five Year Plan is only Rs.95.30 crores (21%) including an outlay of Rs.150 cores under ARWS in the Central Sector. The total outlay earmarked is Rs.245.3 crores. It shows that outlay earmarked is only 53% of the requirement.

In many cases villages are identified for rural water supply schemes based on social and political considerations. In such cases also resources are thinly distributed over a large number of water supply schemes which are grossly insufficient. It also leads to non completion of RWS Schemes within the scheduled time.

Planning is based on a five year time horizon. But the financial aid is on a year to year basis in the annual budget. Allocation of funds on yearly budget has been held out to be the cause for serious delays in the progress of

schemes because of the uncertainty of annual provision to be expected and belated intimation of sanction which hinder advance planning[13]. Water Agency assess the schemes for the ensuing year by September/October and are incorporated in the State Plan. Departmental estimates are prepared by November/December and are incorporated in the respective demand for grants and are presented in the legislature. After the vote on account, funds are distributed to the Department. Until the information on sanctioned fund reaches the subordinate office there will be uncertainty regarding the required allotment. If there is undue delay in reaching the information in the subordinate office, there will be further delay in executing the works. This leaves the Water Agency very little time to plan for the project and procure necessary materials in advance.

No express objective for rural water supply has been adopted but estimates are that the cost of full coverage would be equivalent to Rs.390 crores. A programme of water supply developed along the lines now proposed would require an annual average capital investment of Rs.70 crores. In contrast average annual investment on rural water supply during the last Five Year Plan was Rs.19 crores. A mechanism for prioritising RWS scheme for construction is therefore necessary.

One of the problems likely to be encountered is that of assuring sufficient funds for surveys , feasibility studies , preliminary engineering and to provide for the construction, operation and maintenances expenditure for the new system. This problem will be accentuated as a consequence of the priority given to rural water supply which currently

do not produce any revenue at all. It is clearly conceivable that if no change in policy occurs, a pont will be reached where further assistance for new construction cannot be used with benefit because sufficient funds for operation and maintenance will not be available.

Present policies and institutional arrangements relating to rural water supply operations need major change if the pace of providing facilities for rural water supply in rural area is to be increased. Under the existing governmental organisation KWA is responsible for the design and execution of all capital works for water supply. Such works involve source and transmission facilities. The present policies and procedure are inappropriate, for resolving the problems of water supply. It is essential that all external sources of funds and technical assistance be co-ordinated and employed in confirmity with the selected course of action. In the Five Year Plans to implement a broad programme of economic development, the amount allocated for Rural Water Supply appears likely to be insufficient.

In order to reach the benefit of RWS to all regions and entire population, community involvement is essential at all stages viz., formulation, execution, and maintenance. In Kerala even though maintenance expenses are met by the local bodies, they have no voice in the control of the RWS. In other words water supply schemes are implemented from top to down and not from bottom to top. As a result the water Agency fails to get the co-operation and involvement of the local people who are the ultimate beneficiaries.

Kerala villages are continuous and households are scattered with a high density of population. Therefore the distribution network have to be elaborate in order to ensure reason-

able accessibility. The location of public taps and its coverage are problems of water supply distribution.

The statistical unit attached to Kerala Water Authority for collecting, analysing and consolidating data on water supply lack sufficient data on all aspects of water supply system in Kerala. In the absence of sufficient data it is difficult to calculate the cost of facilities, operation and maintenace for overall planning of water supply system.

2.6.2 Water Supply Policy

While preparing long range plan for rural water supply, requirements and objectives have to be established. Principal points to be considered while laying out the objectives are,

(i) assessment of the capital requirements of attaining the objectives and establishment of policies which assures that necessary funds will be forthcoming.

(ii) Effective coverage of population under water supply.

(iii) machinery to monitor whether the schemes are implemented without delay.

The best objective is to develop a water policy where the annual money requirement is known not only to complete works under construction but to embark on new works. It is not sufficient however, that projects should be classified for the purpose of fitting priorities as being included in First, Second, Third Five Year Plan, etc. The Department

must have its own rolling plan in which projects are dropped off as they are completed and new ones added so that at the beginning of each plan year a programme exists for the next year.

Preliminary engineering and feasibility studies should be initiated on systems of known high priority leading to projects which can be considered in the immediate future. In case, external assistance is needed both for project financing and technical studies, it should be solicited.

Initial survey studies of water supply are essential to assess the water problem in the rural area. It is also necessary to assess the real demand for water. With geography of high land, mid land and low land, large populaton evenly distributed would create economic and administrative problems. The externally aided water supply projects insist for such initial engineering, and feasibility survey before loan/aid applications are forwarded. For instance, when Jamaica approached an international lending agency for a loan to help finance metropolitan Kingston water supply scheme, the lending agency insisted for a comprehensive study of project and its justification before proceeding[14]. The proposed study coverd basically the objectives like (i) prime objective of the scheme (ii) breaking down the total project costs (iii) expected yield of water from the source and (iv) completion of the scheme. In order to obtain bilateral assistance from Netherlands for executing a rural water supply scheme to Kundara and the adjoining six panchayats in Kerala, a project report was prepared but no initial field survey was conducted in the projeects area to locate the problem area. Initial surveys are not only useful for

technical considerations but are useful to understanding people's requirements and response to pipe water. But such surveys need more money.

The overall success of the water supply system depend largely upon the strategy and objective followed under each Five Year Plan. It is hard to find any definite policy being followed in all these years prior to the commencement of the International Water Decade 1981-1991, not to sepak of the strategies evolved or the specific measures taken and pursued in any systematic manner. More often than not, schemes were taken up in various corporations, towns and panchayats more from considerations of convenience, political pressure and availability of funds. With the result, it canot be claimed that any rationale were normally followed for the development of the water supply sector. However, Kerala took a bold step in order to obtain substantial loan assistance from the LIC of India in order to venture on a massive water supply programme primarily in urban areas in early 1970s. Therefore, during the period 1971-1981, 33 urban water supply schemes and 955 rural water supply schemes were brought into operation in Kerala with a nominal coverage of 63% urban and 29% rural population.

Drinking Water Decade coincide with Sixth and Seventh Plans and first year of the Eighth Plan. It is since this 'Decade' that Central and State Governments began to apply some elements of rationality in approaching drinking water supply problems. As part of the 'Decade' Government of India recommended the targets to provide water supply facilities to the entire population urban and rural by 1991. Later, additional strategies were followed. They are (i) Augmentation of existing inadequate water supply schemes and (ii) fixation of priority in providing water supply to coastal areas and places of high altitude (problem villa-

ges). Steps are also initiated during this period for extension of water supply to Scheduled Caste/Scheduled Tribe habitats with special assistance under 20 Point Programme of Goverment of India. Design criteria as well as standard levels of service to be followed were laid down in the 'Drinking Water Decade'. As part of the Seventh Plan for Rural Water Supply schemes in Kerala the following priority considerations were recommended:

(i) First priority in Kerala for systems which need neither treatment nor pumping.

(ii) Second priority for systems which require no treatment but in which pumping is required.

(iii) Third priority for systems of gravity schemes with simple treatment.

(iv) Fourth priority for schemes which require both simple treatment and pumping.

Seventh Plan also proposed to adopt and follow comprehensive Rural Water Supply schemes covering a group of villages with a common source, treatment plant and transmission main. This proposal is based on the assumption that such water supply schemes will be more economical and advantageous. As part of the low cost technology it was recommended to use cheaper materials for pipes like A.C. and P.V.C. The standard design recommended were (i) design period of 30 years and (ii) per capita supply of 70 litres per day in cases of house connections and 40 litres per day in cases where house connections are not contemplated. But in the case of Centrally Sponsored Accelerated Rural Water Suply Schemes the recommended standards are a design period of 10 to 15 years and a per capita supply of 25 litres to 40

litres per day and not to give house connections.

The objective and strategy developed for the water supply during the Seventh Five Year Plan is to provide fund for spill over schemes, minimum needs programme, World Bank aided and bilateral assisted schemes. There are now 19 externally aided Rural Water Supply Schemes in Kerala at different stages of completion. Out of them 17 are World Bank aided, 8 are Netherland aided and three are Danish aided schemes. The plan outlay earmarked for these externally aided schemes during the Seventh Plan is Rs.7050 lakhs. All the World Bank aided schemes have started owrk in 1985. Danish aided RWS started work only in 1986. But in the case of Netherlands aided RWSS two were started in 1982 and six in 1985. But these two schemes are not completed.

CONCLUSION

From the above description, it follows that particularly, since the Sixth Plan Period, investment in rural water supply has risen significantly both in absolute terms as well as relative to total plan outlay and plan outlay on other social service sectors. This has resulted in a satisfactory level of nominal coverage achieved. But with the secondary data, it is not possible to say anything about the extent of effective coverage and hence the efficiency of operation of the water supply schemes. The next three cahpters will deal with this question on the basis of an analysis of one rural water supply scheme.

Notes and References

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Chapter - 3

KADAMPANAD RURAL WATER SUPPLY SCHEME: A CASE STUDY

In this chapter, we shall describe the salient features of the water supply scheme in operation in our study area, as well as the demographic and socio-economic characteristics and conditions of the population of the two villages, one served by the scheme and the other without any water supply scheme. This will provide us with the necessary background for analysing the water supply situation in the two villages in the following chapter as revealed by our survey.

Methodology of Data Collection

Formal as well as informal discussions were held with Members of the Panchayat, engineering personnel associated with the scheme and few local people to get the details regarding the scheme.

Household Survey method was followed for collecting data about the useres of the scheme. Random sampling method was used for the selection of the households and sampling unit was the household. Random numbers were used to select the sample unit. The data was obtained by questionaire method. Direct personal interview with head of the selected households were made and details were entered in the questionaire. Total number of households selected was 10% from each village. From village 1, covered with water supply, out of 413 total households, 41 households were selected. From Village 2, uncovered by water supply, out of 443 households, 44 households were selected. Thus total number of households included in the Survey are 85.

3.1 Project Profile

The Kadampand Rural Water Supply Scheme (KRWS) started in January, 1980 and was commissioned in July 1983. It is not aided by any agency. Land for the reservoir, approach road and well site was donated by the Panchayat to the Kerala Water Authority. The source of water is river flowing through the area. The scheme has one collection-cum-infilitration well and one reservoir. The reservior tank is constructed 1 3/4 K.M. away from the collecting well. The capacity of the reservoir tank is 4.4 lakh litres. The reservoir tank is on and elevated land. There are 103 public taps. Out of these, one tap is locked due to misuse by public and three taps are not in working condition. Household connection is not envisaged in the project. The objective of the scheme was to provide pipe water to the entire Panchayat. The Panchayat has 10 wards. Out of it, only 7 wards are now covered by water supply. On an average there are 14.7 public taps, and 447 households in a ward. It shows that one public tap serves on an average 30 households.

The total estimated cost of KRWS was Rs. 5.75 lakhs. The actual cost incurred was Rs.5.33 lakhs. The cost excluding the engineering personnel and pipe was Rs.2.57 lakhs. Out of the total cost 52% was on pipe, 36% was on wage labour and 12% was on other materials (See Table 3.1).

Table - 3.1

PARTICULARS OF THE KRWS

Sl. No.	Particulars		Estimated cost	%	Real costs	%
1	2		3		4	
1.	Cost of Departmental materials	(Rs.)	65,961	11.5	65,961	12.4
	i. Cement	"	29,115	5.1	29,115	5.5
	ii. M.S. Rods	"	18,746	3.3	18,746	3.5
	iii. Lead	"	17,680	3.1	17,680	3.3
	iv. Others	"	420	0.1	420	0.1
2.	Labour cost	"	2,34,132	40.7	1,91,755	36.0
3.	Total cost (1+2)	"	3,00,093	52.2	2,57,716	48.4
4.	Estimated cost of pipe		2,75,000	47.8	2,75,000	51.6
	Total cost		5,75,093		5,32,716	
5.	Capacity of the Reservoir		4.4 lakh litres			
6.	Size of the Reservoir tank					
	i. Length		40 feet			
	ii. Width		20 feet			
7.	Source of water		canal			
8.	Treatment		i. Infiltration well			
			ii. Chlorination			
9.	No. of public taps		103			
10.	Year of start of the project		1980			
11.	Year of completion		1983			

Four hours of continuous pumping will fill the reservoir capacity. However, the full reservoir capacity is sufficient to distribute water continuously only for six hours, if all the taps work simultaneously. This seldom happens. Source yield is a problem during summer as the canal would go partially dry. The daily water collection in the well during summer is only for 1½ hours pumping, that is 25% of the reservoir capacity. There is no checkdam near the infiltration well. In the project the ieda of check dam was not envisaged. It was when the source began to deplete that the problem of source yield arose and no measures have yet been taken into tackle it. Beofre the execution of the project no field survey was conducted to assess the water problem area and source yield. Hence priority could not be accorded to problem area.

The reservoir tank is also beset with problem. Since the reservoir tanks is at ground level, water distribution in elevated area is disturbed due to low water pressure whenever there occurs a fall in water level. Only if the water level in the reservoir is kept at three-fourth of the tank level, that water flows through all taps. The water is treated through chlorination before distribution.

The project works were executed by the engineering personnel of the Kerala Water Authority. The project is under the control of a sub-divisional office headed by an Assistant Engineer. Besides this KRWS there are four other RWS under this sub-division. But KRWS is the largest. There is one pump operator attached to KRWS. The maintenance works are attended to by the engineering personnel of the Kerala Water Authority. But the costs are met by the Panchayat.

It is generally believed that in rural areas the benefits of water supply are not evenly distributed and therefore people living in problem areas and who are badly

in need of water hardly derive its benefits. The case study is therefore mainly intended to bring out the general problems confronting the RWS, viz., the distribution aspects, source yields, accessibility, water quality, local people's response to drinking water, and also the socio-economic position of the people in general and the beneficiaries of pipe water in particular. This type of problem analysis will help to assess the nominal and effective coverage of RWS. However, before we start to study the problem of KRWS distribution, it is useful to analyse the socio-economic conditions of the people living in two villages covered in the case study. In the first few paragraphs some general characteristics of the Kadampanad Panchayat with respect to the taluk, district and Kerala are briefly discussed. In the later part some socio-economic characteristics of the people of the two villages selected for the case study, are discussed.

3.2 Kadampanad Panchayat Compared to District and Taluk

Since villages in Kerala are not clusters of houses in a given rural area, there is no natural boundary for villages. Officially,there are revenue villages and panchayats. The former number 1219 and the latter 1000. These are not co-terminus and there is overlapping of two administrative divisions. In this study, a Panchayat having one water supply scheme was selected. The panchayat selected for this study is Kadampanad, in Pathanamthitta district. This Panchayat is officially identified as problem village in respect of drinking water. Panchayat has 10 wards. For conveninece each ward is treated as a village. Out of the ten villages three villages are without pipe water and 7 villages are with pipe water. Out of the two villages selected for the study village-1 is having the largest coverage of water supply

and village 2 is having the largest number of families but uncovered with pipe water. Villages uncovered by water supply are away from the source yield. Average distance between the water source and uncovered village is around 5 kms.

Kadampanad panchayat was in Kunnathur taluk in Quilon district prior to the formation of the Pathanamthitta district in July 1983. With the formation of the Pathanamthitta district, the entire area of Kadampanad panchayat is tranferred to Adoor taluk in Pathanmthitta district. Since 1981 census population is considered in this analysis, Kadampanad is treated as part of Kunnathur taluk in Quilon district. In the newly formed Pathanamthitta district there are 56 panchayats and 2 Municipalaities.

Kadampanad panchayat is spread over 23.95 sq. Kms. There are 10 desoms/karas. Each desom/kara is separated as a panchayat ward. There are 4457 households. The population is 23,103 (1981 census) with 48.5% males and 51.5% females as aginst males 49.3% and females 50.7% in Quilon district. Scheduled Caste population is 17.12% as against 10.4% in Kerala. A comparative analysis of Kadampanad panchayat with district and taluk is given in Table 3.2. The density of population per sq. km. is 965 in the panchayat as against 654 in Kerala, 543 in Quilon district and 860 in Kunnathur Taluk. The literacy rate in the panchayat is 77% as against 70% in Kerala and 74% in Quilon district. Thus Kadampand Panchayat is a highly densely populated area with a high rate of literacy.

Table - 3.2

COMPARATIVE PICTURE OF POPULATION CHARACTERISTICS

Sl. No.	Particulars	District Quilon (Rural)	Taluk Kunnathur (Rural)	Panchayat Kadampanad (Rural)	% of (Col. 4 to col.3)
	1	2	3	4	5
1.	Area Sq. Kms.	4502.7	389.9	23.95	6.13
2.	Population per sq.km.	543.0	860.0	965	-
3.	No. of Inhabited villages	97	16	1	-
4.	No. of Desoms/Karas	745	114	10	8.7
5.	No. of Households	450835	64325	4457	6.9
6.	Population	2443530	335738	23103	6.9
	i. Male	1205256	164793	11199	6.8
	ii. Female	1238274	170333	11904	7.0
7.	Literacy rate (%)	74.1	-	7676.9	

Source: Census of India 1981 series 10 - Kerala, Generala Population Tables Part-A

The topography of the project area is generally undulating. Low lying areas are mostly paddy fields. Though the canal of a major irrigation project, Kallada Irrigation project, is passing through Kadampanad Panchayat, water has not started flowing.

3.3 General Socio-Economic Characteristics of the Panchayat

The people of the project area are mainly agriculturists factory workers and other workers. Paddy, cashew, coconut, tapioca are the main crops grow in the area. Most of the

people belong to the economically weaker sections of the society. The important industry in the area is cahsew factory. There is one cashew factory which employs nearly 1,500 women workers.

There are three High Schools, and 10 Lower/upper primary schools in the panchayat. There are three public markets, two branches of scheduled commercial banks and three primary agricultural co-operative societies. Physical infrastructure like roads, transport etc. are well developed. Passenger vehicles (bus) passes through all parts of the Panchayat. There are five post offices and one telephpne exchange. There is one primary Health Centre which cater to the public health and medical needs of the population. Besides the Primary Health Centre, there are two private hospitals with impatient facilities.

People in this area experience scarcity of drinking water especially during summer months. The depth of the wells located in the households in this locality ranges from 15 to 30 feet. The canal flowing through the locality is pallickal river. The Kallada river is flowing through the east-south side of the panchayat. But the river water is pollutted due to disposal from Punalur paper mills. The area covered by the panchayat has been identified as problem village for drinking water as per the criteria prescribed by the Government of India in 1980. Therefore the implementation of drinking water supply scheme in the panchayat area is important. It is a Special Grade Panchayat. The adjacent panchayats are Kunnathur, Poruvazhy, Adoor and Erath. Adoor is an urban town near the KRWS located in the M.C. Road.

The main source of drinking water in the rural area in the Kunnathur Taluk is well. Nearly 91% households depend on well water while 3% depend upon tap water and another 3% on river water. In Kerala 82% households depend on wells

for drinking water. Distribution of households by source of drinking water in Kerala State and Kunnathur taluk is given in Table 3.3.

Table - 3.3

SOURCE OF DRINKING WATER - KERALA STATE AND KUNNATHUR TALUK

Sl. No.	Source of drinking water	No. of Households* (lakhs) Kerala state	Kunnathur Taluk	% of Households Kerala	Kunnathur
1	2	3	4	5	6
1.	Wells	29.56	0.58	81.7	90.7
2.	Tap	2.17	0.02	6.0	3.1
3.	Handpump/Tube well	0.09	Neg.	0.3	Neg
4.	River/Canal	1.08	Neg	3.0	Neg
5.	Tank	1.95	0.02	5.4	3.1
6.	Others	1.31	0.02	3.6	3.1
	Total	36.16	0.64	100.0	100.0

* It excludes Institutional and houseless households

Source: Column 3 & 4 from census of India 1981, Series 10, Kerala, Household Tables part VIII - A & B.

Households and population covered by electricity is 24% and 26% respectively in Quilon district. As against this, in Kunnathur taluk only 21% of households and 22% of population are covered by electricity. Table 3.4 shows the households and population covered by electricity.

Table - 3.4

PERCENTAGE OF HOUSEHOLDS AND POPULATION HAVING ELECTRICITY

Particulars	Quilon district	Kunnathur taluk
1. Electricity Available		
i. No. of Households	10985	13355
ii. % of Households	24.4	20.8
iii. Population	624030	72685
iv. % of population	25.6	21.6

Source: Census of India 1981, Series 10, Kerala, Household Tables, Part VIII - A & B.

3.4 Socio-economic Condition in the Selected Villages

In this survey one of the intended objectives is largely to find out which socio-economic groups enjoy the benefits of rural water supply and to examine whether the deserving area and people especially the poor get the benefits of pipe water.

3.4.1 Distribution of Assets

Wealth is possessed through income, through asset or a combination of both. Assets generate income, the more the assets an individual possess the more the income he generates. In an agrarian economy, assets such as land or livestok are the keys to both prosperity and power. People generate income from land-based assets, though, in our study

village, due to higher density of population, percapita land holding has become low. However, income earners like teachers, traders who may not hold more asset/property are economically and socially powerful. These group of people in the rural society earn more income and attain better social status. Table 3.5 indicates the distribution of land holding in the two villages.

Table - 3.5

DISTRIBUTION OF HOUSEHOLDSAND LAND BY

SIZE-CLASS OF HOLDINGS

Sl. NO.	size-class	Village 1 No. of House-holds	% of House-holds	% of land	Village 2 No, of House-holds	% of House-holds	% of land
1.	10 cents and below	5	12.2	1.2	4	9.1	0.8
2.	11 - 50	13	31.8	9.5	21	47.7	20.7
3.	51 - 100	14	34.1	29.9	12	27.3	30.8
4.	101-200	6	14.6	27.2	5	11.4	25.2
5.	Above 200	3	7.3	32.2	2	4.5	22.5
	Total	41	100.0	100.0	44	100.0	100.0
Percapita land holding		19.9 cents			16.3 cents		
Average household land holding		90.8 cents			70.7 cents		

Source: Survey data

In village 1, average land holdings per family/household is 91 cents, where as in village 2 it is 71 cent. In Kerala 87% of holdings are between 0.2 hectares and one hectre. In village 1 families possessing land above 10 cents is 22% as against 16% in village 2. Out of the total households in village 1, 66% householdings are having land between 11 and 100 cents, where as in village 2, this category constitute 75%. Only 7% households have land above 200 cents in villagel as against 5% in village 2. In general we find that in village 1 whereas 44% of households have holdings no more than 50 cents as against 57% in village 2. Percapita land holdings in village 1 is 19.9 cents as against 16.3 cents in village 2.

Size wise distribution of land indicates that holding above 200 cents constitute 32% of total area in village 1 as against only 23% in village 2. On the other hand,in village 1 the bottom 44% of the households hold only about 11% of total land and in village 2, the bottom 57% of the households hold only about 21% of total land. Thus, the inequality of distribution of land is large in both the village, through it is relatively more in village 1 (See Table 3.5)

Livestock (animals only) is the other important asset in an agrarian economy. In village 1, 12 families (29%) out of 41 households selected have milk cows. In village 2 out of 44 households, 17 households (39%) have milk cows. It is interesting to note that 25% households having milk cows have land below 10 cents in village 1 where as in village 2 only 6 households below 10 cents have milk cows. In both the villages households possessing land above 200 cents do not possess milk cows or anyother livestock. In village 1 lower asset class maintain milk cows where as in village 2 middle class families maintain milk cows, and in both villages rich people have no livestock asset.

3.4.2 Income Distribution

Income orginates from asset and employment. Variations in asset and difference in occupations therefore bring difference in income and wealth. It is often quite difficult to obtain reliable data about income or assets because respondents are suspicious. It is based on these constraints that family income are assessed in the survey through direct and indirect questions. There are variations in average family income between two villages depending upon area of land and occupations. In village 1 the average annual family income is Rs. 4192 as against Rs.3743 in village 2. Percapita income also varies between two villages and is far behind state and district percapita income. In village 1 percapita income is Rs.919 where as in village 2 it is only Rs. 865, as against the state percapita income of Rs.2140 and district percapita income of Rs.2205 in 1985-86. Percapita income is low because (i) agricultural produce retained for self consumption has not been reported and (ii) Suppression of income due to suspicion. As regards variations in family income it ranges from Rs.250 to 52,000 in village 2 as against from Rs.500 to Rs.23,400 in village 1. It shows that the gap between lower and upper family income is very high in village 2. Family income consists of income from agricultural and non agricultural sources. In village 1, two families have no agricultural income and 23 families have no non-agricultural income. In other words, 56% of families depend exclusively on agriculture for income where as only 5% families depend exclusively on non-agricultural incoem. On the other hand in village 2, 64% families depend exclusively on agricultural income and 20% families depend exclusively on non agricultural income and 16% families earn income from both agricultural and non-agricultural sources. Thus dependence on agriculture for income is very high in both the villages.

Table - 3.6

INCOME DISTRIBUTION IN THE STUDY VILLAGE

Income Class (in Rs.)	Village 2 No. of Households	%	Village 1 No. of Households	%
Below 1000	8	18.2	4	9.8
1001 - 1500	14	31.8	14	34.2
1501 - 2000	7	15.9	6	14.6
2001 - 3000	2	4.5	7	17.1
3001 - 4000	4	9.1	1	2.4
4001 - 5000	4	9.1	1	2.4
5001 - 6000	1	2.3	2	4.9
6001 - 7000	1	2.3	-	-
7001 - 8000	-	-	-	-
8001 - 9000	-	-	-	-
9001 - 10,000	-	-	-	-
Above 10,001	3	6.8	6	14.6
Total	44	100.00	41	100.0
Average family income	3743.0		4192.0	

Source: Survey Data.

In village2, 18% families are having annual income below Rs.1000 as against 10% in village 1. Percentage of families having annual family income between Rs. 1001-1500

is 32% in village 2 and 34% in village 1. In other words nearly 50% of the families in village 2 are having family income below Rs. 1500 per year as aginst 44% in village 1. In village 2, 90% of families annual income is Rs.6000 and below as against 85% in village 1. Only 3% families have annual income above Rs.10,000 in village 2. In village 1, however 15% families have annual income above Rs.10,000. It shows that percentage of higher income families are relatively more in village 1.

3.4.3 Occupational Distribution

The panchayat is largely dominated by agricultural activities. Occupational distribution shows that more than two thirds are engaged in farm occupations. For instance, in village 1 farmers from 66% and in village 2 farmers from 71%. Coolies form 10% in village 1 and 16% in village 2. Percentage of salaried people (employed in govt. service) is 5% in both the villages. While self employed in trade in village 2 is 5% nobody is self employed in village 1. Table 3.7 indicates the occupational distribution and the dominance of farm occupation.

Table - 3.7

OCCUPATIONAL DISTRIBUTION

Occupation	Village 1		Village 2	
	No. of persons	% of persons	No. of persons	% of persons
1. Coolie	4	9.8	7	15.9
2. Farmer	27	65.9	31	70.5
3. Salaried	2	4.9	2	4.5
4. Self employed trade	-	7.3	2	4.5
5. Ex-Service	3	4.9	1	2.3
6. Carpenter/Mason	2	2.4	1	2.3
7. Pensioner	1	2.4	-	-
8. Gulf	1	2.	-	-
9. Others	1		-	-
Total	41	100.0	44	100.0

Source: Survey Data.

Occupation and family income are very much closely related. Annual family income tends to be high in those families whose income from non-agricultural occupations is high. For instance in village 1 six families (15%) have annual income above Rs. 10,000. All these families possess land above one acre and earn higher income from salary/pension. For example, an Ex-serviceman holding 6 acres of land earns an annual family income of Rs.23,400; Rs.11,400 from land and

Rs. 12,000 from pension. In another family, where the head is a government servant, having nine children, holds three acres of land and earn a family income of Rs.21,000; Rs.6000 from land Rs. 15,000 from salary.

In village 2, only two families have income above Rs. 10,000. In both the families there are salaried people. Therefore they earn more income from non-agricultural sources. In one family husband and wife are teachers. They hold three acres of land and earn an annually family income of Rs.52,000; Rs. 2000 from agriculture and Rs. 50,000 from salary. In another family holding 1.5 acres of land have one teacher and earn annual family income of Rs. 15300; Rs. 300 from agriculture and 15000 from salaroy. This shows that farm income from land is having limited scope for expansion. In otherwords, it is not possible to make more income from agriculture alone especially when percapita land holding is low. In village 2, a farmer holding 4 acres of land makes an annual income of Rs. 3000. Average income, in this case, from per acre of land is Rs.750 per annum, which is very low. It is worthwhile to note two interesting features here (i) salaried people hold more land but income from their land is relatively low (ii) Sometimes possession of more land might have enabled them to obtain a government employment and higher level of family income. Therefore they obtain better social status and higher income. Possession of more land and better employment therefore enable the rich people to generate more income which eventually lead to further inequality of income and asset.

In few families earning members are more than one. In village 1, in four families there are three earning members and in another four families there are two earning members. In village 2, in eight families there are two earning members, in three families there are three earning members and in one family there are five earning members. In other words in village 1 in eight families and in village 2 in 12 families

earning members are more than one. The family income depends upon the number of earning memebrs. In both the villages this is reflected. Families having more earning members, generally coolies (agricultural labours) are having relatively more income.

3.4.4. Distribution of households by caste/community

In village 1, Christains constitue 73% followed by SC/ST 10%. Hindu Nairs and Ezhavas constitutes 7% each. In village 2 Hindu Nairs constitue 43%, Hindu Ezhavas constitute 30.5%, Christians constitute 11% and SC/ST 9%. While Christians outnumber in village 1 in village 2 mixed distribution of all castes, exist. It is quiet interesting to observe the distribution of SC/ST between two wards. In both wards the proportion of SC/ST families to total families is around 9%. In total one may conclude that while Christian families outnumber in village 1 hindu families outnumber Christians in village 2. (See Table 3.8).

Table - 3.8

DISTRIBUTION OF HOUSEHOLDS BASED ON CASTE

Caste	Village 1		Village 2	
	Nos.	%	Nos.	%
Christian	30	73.2	5	11.4
Ezhava	3	7.3	13	29.5
Nair	3	7.3	19	43.2
SC/ST	4	9.8	4	9.1
Warrier	-	-	2	4.5
Achary	1	2.4	1	2.3
Others	-	-	-	
Total	41	100.0	44	100.0

Source: Survey Data.

3.4.5 Literacy

Literacy rate in both the villages are very high. In village 2, the percentage of illterates excluding children below 4 years is 8%. Whereas in village 1, illiteracy rate is 10%, (Table 3.9) as against 26% in the district, 23% in the Panchayat and 29% in the State. Illiteracy is only among oild parents. All children above four years is literate as they attend school. Distribution of illiteracy in terms of caste shows that illiteracy among SC/ST is 37% in village 1 as against 31% in village 2. Distribution of illiteracy between two villages based on caste is given in table 3.10.

Table - 3.9

LITERACY RATE

Literates	Village 1 (%)	Village 2 (%)
Literacy	89.8	91.6
Illiteracy	10.2	8.4
Total	100.00	100.00

Source: Survey Data.

Table - 3.10

CASTE WISE DISTRIBUTION OF ILLITERACY

Sl. No.	Caste	Village 1 (%)	Village 2 (%)
1.	Hindue Nair	15.8	31.2
2.	Hindu Ezhava	10.5	18.8
3.	Christian	31.6	18.8
4.	SC/ST	36.8	31.2
5.	Others	5.3	-
	Total	100.0	100.0

Source: Survey Data.

Caste wise rate of illiteracy above 4 years old shows that it is relatively high among SC/ST in both the villages 43% in village 1 and 39% in village 2 as well as among Hindu Nairs in village 2 (Table 3.10-A).

Table - 3.10 A

CASTE WISE INCIDENCE OF ILLITERACY

Sl. No.	Caste	% of illiterates above 4 years	
		Village 1	Village 2
1	Hindu Nairs	7.1	30.8
2	Hindu Ezhava	14.3	15.4
3	Christian	28.6	15.4
4	SC/ST	42.9	38.5
5	Achary	7.1	-
6	Warrier	-	-
7	Others	-	-
	Total	7.5	6.8

Source: Survey Data.

Income wise distribution of illiteracy shows that majority of the illiterates belong to lower income group. In village 1, 53% illiterates belong to annual family income below Rs.1500. In village 2 percentage of illiterates with annual income below Rs. 1500 is 56%. Distribution of illiterates based on family income is given in Table 3.11.

Table - 3.11

INCOME AND ILLITERACY

Income	Village 1 (% of illiterate)	Village 2 (% of illiterate)
Below Rs. 1500	52.6	56.3
Rs. 1501 - 2000	21.1	-
Rs. 2001 - 3000	10.5	6.2
Rs. 3001- 4000	-	6.2
Rs. 4001 - 5000	5.3	31.3
Rs. 5000 above	10.5	-
Total	100.0	100.0

Source: Survey Data.

3.4.6 Male-female Distribution

Average size of the family (numbers) in village 1 is 4.6 and 4.3 in village 2. In both the villages males outnumber females. In village 1, male population is 52% and female population is 48%. In village 2, male population is 55% and female population is 45% (See table 3.12). It is against 48% males and 52% in the panchayat and 49% males and 51% females in the district. The reason for the low percentage of females is migration of females due to marriage.

Table - 3.12

MALE-FEMALE DISTRIBUTION

	Village 1		Village 2	
	Nos.	%	Nos.	%
Male	97	51.6	104	55.0
Female	91	48.4	85	45.0
Total	188	100.0	189	100.0
Average size of the family	4.6	-	4.3	-

Source: Survey Data.

Average number of Children per family in village 1 is 2.5 and in village 2 it is 2.4. Number of Children in families vary from 1 to 9 in village 1 and 1 to 6 in village 2. In village 1 number of familes having one child is 12% and in village 2 their number is 18%. Families having two children is 29% in village 1 and 25% in village 2. In total 58% families in village 1 and 70% families in village 2 are having children three and below. (See table 3.13)

Table - 3.13

FAMILY AND NUMBER OF CHILDREN

Sl. No.	No. of Children	No. of Households Village 1	%	Village 2	%
1	1	5	12.2	8	18.2
2	2	12	29.3	11	25.0
3	3	7	17.0	12	27.3
4	4	9	22.0	6	13.7
5	5	2	4.9	2	4.5
6	6	-	-	1	2.2
7	Above 6	1	12.4	-	-
8	No children	5	12.2	4	9.1
	Total	41	100.0	44	100
Average No. of Children per family		2.5	-	2.4	-

Source: Survey Data.

3.4.7 Housing conditions

Family income largely determines type of the house, size of the house, facilities like electrictiy and sanitation. In village 1, nearly 73% houses are pucca houses, 12% are

Kucha houses and 15% houses are huts. In village 2, only 57% houses are pucca houses, 29% are kucha houses and 14% houses are huts. In both the villages housing conditions of SC/ST familes are very poor. In village 1, out of 6 huts, 3 belong to SC/ST. And in village 2, out of 6 huts, 3 belong to SC/ST. In both the villages, out of the total number of huts, 50% belong to SC/ST. In village 1 while 63% houses are electrified, in village 2, only 25% houses are electrified. Regarding Sanitary facilities village 2 very much lag behind village 1. In village 2 86% houses are without sanitary facilities as against 56% in village 1. Table 3.14 shows the housing conditions and other facilities in the two villages. It shows that in terms of housing and other house-based facilities village 1 is much ahead of village 2. Average annual family income and percapita asset holding being high in village 1, it might have helped families in village 1 to attain a relatively higher standard of living. Electricity and sanitary facilities which make human life more comfortable are available in more families in village 1. Village 2, being situated remotely from main road, has not very much attracted the attention of the local body. Therefore it still remains underdeveloped without minimum infrastructure facilities. For example, the nearest primary health centre is at a distance of about 3 to 4 kms from village. The nearest water source of protected water supply is at supply a distance of about 7kms from village 2. Distribution of water in village 2 will therefore naturally add more cost on erecting pipe line. Major portion of the village 2 is elevated dry land with unsurfaced roads and without electricity. In some elevated areas problem of drinking water is a perennial problem. Wells are very deep and they go dry especially during summer. Malankavu, a harijan colony, situated in an elevated area and very interier to the main road lacks all public utility services and is severely affected by drinking water problem.

Table - 3.14

HOUSING CONDITIONS

Particulars	Village 1 No. of Households	%	Village 2 No. of Households	%
Pucca Houses	30	73.2	25	56.8
Kucha Houses	5	12.2	13	29.5
Huts	6	14.6	6	13.7
Electrified Houses	26	63.4	11	25.0
Houses with Sanitary facilities	18	43.9	6	13.6

Source: Survey Data.

3.5 Socio-Economic status of SC/ST

The economic condition of the SC/ST population in both the villages are below the average level. Wage employment is their major source of income. Land is the only family asset and none of the family possesses livestock asset. Average land held by each SC/ST family is 40 cent in village 1 and 13 cents in village 2 as against an average holding of 91 cents and 71 cents in general respectively. Average size of the SC/ST family is 5.25 in village 1 and 4.75 in village 2. Average number of earning members in SC/ST family is 2.25 in village 1 and 2.75 in village 2. In terms of annual average family income in SC/ST families, village 1 is marginally above the general average family income. The average SC/ST annual family income is Rs.5025 in village 1 but only Rs.2950 in village 2. In village 2 all SC/ST families houses are huts and in village 1, out of 4 SC/ST families houses, 3

are huts. All the SC/ST families houses in village 2 are not electrified and have no sanitary facilities. In village 1, one SC/ST family's house is electrified and only 2 houses have sanitary facilities.

In village 2 all the SC/ST families covered in the survey have own wells. But all of them face water problem and therefore desire pipe water. They have no ability to pay for pipe water. On the other hand in the village 1 out of the four SC/ST families covered in the survey, one family has no well but three families face water problem. No SC/ST family in village 1 gets the benefit of piped water due to non accessibility. No family has the ability to pay for the water. SC/ST people are economically and socially weak in general in both the villages. Therefore they deserve special attention especially in public utility services like pipe water.

3.6 Socio-Economic status and drinking wells

It is generally behind that low income families do not have sufficient income to dog wells. In out sample study in village 2, only 3 families (7%) and in village 1, 5 families (12%) have no wells. In village 1, out of five families having no wells, annual incoem of 4 families is below Rs.1200. In vilalge 2, out of three families having no wells annual income of two families is below Rs. 1200. All families having no wells in village 1 possess land below 30 cents, In village 2 out of three families having no well one has 65 cents and other possesses land below 35 cents. Occupation-wise distribution of families having no wells reveals that in village 1 all are Coolies and in village 2 all are farmers. Again caste-wise distribution shows that in village 2 all the

families having no wells are Christians and in village 1 out of five families having no wells two are Christians two are Hindu Nairs and one is SC. In general, it shows that families having no wells belong to economically weaker section in terms of income and asset.

CHAPTER 4

IMPACT OF KRWS: A COMPARATIVE STUDY OF WITH AND WITHOUT RWS

In this chapter, we shall analyse different aspects of the working of the water supply scheme in terms of the benefits derived by the users as well as the problems faced, in one village served by the scheme. This will be done in relation to the nature of problems regarding protected water supply in the other village not served by the scheme. In the process, we hope to highlight the factors which have a bearing on the effectiveness of operation of the scheme in a micro setting. This, in turn, will have some implication for the formulation of macro policy with respect to rural water supply which will be spelt out in the end.

4.1 Dependence on well water

If the water agency could provide pipe water in every home, the problem of access could be solved. But resource constraints are such that the rural water supply schemes cannot achieve this objective. This is due to the poverty of rural households which is evident from the Socio-economic profile given in the earlier chapter. Distribution of pipe water and people's accessibility therefore assume importance in judging the viability and usefulness of pipewater, which is assumed to provide safe drinking water. The access to water supply may be judged in two ways. Firstly, investigation of the physical distribution of pipe water and pipe points will reveal the degree of accessibility. Secondly, investigation of the distributive benefits which are expected to be derived from the piped water. For instance, suppose one objective was to provide drinking water in water problem areas especially during summer and areas where available water source have defects. The success of this objective would depend upon the percentage of households who get water during summer located within reasonable distance. Of the 41

households surveyed, five households (12%) are without own well, and they collect water from neighbour's well. Ten households (24%) get water round the year from their own wells and therefore don't have water problem. But 26 households (64%), even though they have their own wells, face water problem. The problem is acute during summer. The need for pipe water therefore increases and becomes severe during summer. But even during summer, people hesitate to collect pipe water due to non-accessibility, inadequate and irregular water supply. In other words, it drastically reduces the benefits of pipe water just when people's dependence on it is the most. During summer, wells in dry land area first go dry. People then collect water from neighbours' well situated in wet land or from water ponds which are more accessible than pipe water. Therefore in order to deliver the benefits of pipe water to the deserving water problem families, the public taps must be accessible and the supply must be adequate and regular. Irregular supply has already created dissatisfaction among water users.

In village 2, uncovered by water supply, 93% families have own wells. Only 7% families have no wells. While 36% families and those owning wells have no water problem, 64% of the total households owning wells face water problem during summer. It was revealed in the survey that majority of the people desire pipe water, ie. 77% families expressed their desire to have pipe water. The remaining households do not desire pipe water because they have convenient wells and do not face water problem. Defects of well water are also very rare. 80% families do not have defect in well water. Only 20% families have defects of mud in well water, that too in summer only.

In village 1 which is covered by water supply, 88% families have own wells. Nearly 10% are without wells, while 24% families have no water problem as they get sufficient water from wells but 64% of families face water problem especially during summer. But only 17% families are using pipe water while 83%

are not using. Among those not using pipe water, 20% are not using pipe water because they have their own convenient wells, But 63% are not using pipe water because of non-accessibility. According to people, time spent for collecting water is a problem. Nobody saved time from fetching pipe water. Therefore time saving advantage from pipe water collection is not significant for any family. Supply of water is inadequate and irregular. Despite complaints, people expect advantages like health and accessibility in future when distribution will become adequate and extends to more areas.

4.2 Advantages of pipe water

Potential advantages of pipe water are many. Accessibility, time saving, health and convenience, are the major expected advantages of pipe water. The more the advantages of pipe water to the people the more will be the use of pipe water. Detailed survey before the preparation of the RWS will enable the water agency to estimate the expected advantages, coverage, people response, etc. Expost evaluation study, on the other hand, will only enable the water agency to understand people's reponse, awareness, distributive benefits and realised advantage from water supply. In a village if all families have own wells and have no water problem, the use and the need for pipe water is limited. Under such circumstances scarce capital invested on rural water supply become underutilised while some area is severely affected by water problem.

Inadequacy of such detailed survey has created problems, in the physical distribution of pipe water here. Area facing water problem are not covered by pipe water. Erection of public taps are in areas inaccessible to families facing the problem of drinking water. Water shortage is acute during summer particularly in dry and elevated areas in village 1.

But the tap is on an average 1½ K.M. away from this problem area. Such areas ought to have enjoyed priority and more

coverage. It is interesting to note that it is the wet land and low level area where water is available even during summer that public taps are erected. As a result, people having greater accessibility do not have any urgent need to use pipe water.

The survey reveal that in village 1 covered with water supply, 76% families do not obtain any advantage from pipe water whereas only 24% families, benefit from the pipe water. On the other hand, in village 2, uncovered by pipe water, 36% familes do not expect advantage from pipe water, while 64% families expect advantage. Table 4.1 indicates the households' expected advantages from pipe water according to reasons.

Table 4.1
Advantages from pipe water

Sl. No.	Advantages	Village 1		Village 2	
		No. of House-holds	% of House-holds	No. of House-holds	% of House-holds
1.	Health and Accessibility	4	9.7	-	-
2.	Accessibility and free	2	4.9	-	-
3.	Accessibility and Time saving#	2	4.9	-	-
4.	Relief during Summer	1	2.4	3	6.8
5.	Convenience and Health	1	2.4	17	38.6
6.	Health	—	-	3	6.8
7.	Convenience	-	-	5	11.4
8.	No Advantage	31	75.7	16	36.4
	Total	41	100.0	44	100.0

Source. Survey Data

In village 2, 38% families expect the advantage of convenience and health as against 3% in village 1. For 11% families convenience, for 7% families health and for another 7% families relief during summer are the major expected advantages from pipe water in village 2. In village 1, for 10% families health and accessibility, for 5% accessibility and time saving, and for 2% relief during summer are the single major advantage from pipe water. In village 1 while 76% families do not expect advantages from pipe water, in village 2, uncovered by pipe water, only 36% do not expect advantage from pipe water.

It does not, however, mean that village 2 deserve more attention and priority for pipe water. It only indicates that inorder to establish priority for pipe water between two villages, a detailed survey with the purpose of bringing out the extent and nature of the water problem is useful. Families not having own wells and facing water problem during summer expect more advantage from pipe water. Families having own wells and having no water problem expect no advantage and hence hesitate to use pipe water. It shows that accessibility alone will not always pursuade families to use pipe water. Families having convenient wells do not waste time in drawing water from wells. Therefore it stresses the need for realistic assessment of the convenience of family wells before planning a RWS.

4.3 Socio-Economic Characteristics of water users

Who enjoy the advantage of pipe water is an important element in the assessment of distribution of pipe water. The Socio-economic characteristics of families using pipe water help to understand which group of people benefit from pipe water. Table 4.2 indicates the income wise distribution of seven households using pipe water. All the families using pipe water belong to lower income group. No water using household has annual family income above Rs. 4000. Only one household have livestock, a milk

cow. Three households using pipe water obtain income from agricultural and non-agricultural sources like petty trade and tailoring and four households obtain income from agricultural sources only.

Table 4.2
Distribution of pipe water using Households based on family income

Sl. No.	Annual Family Income (Rs.)	No. of families	% of families
1.	Below Rs.1500	3	42.8
2.	Rs. 1501 - 2000	2	28.6
3.	Rs. 2001 - 3000	-	-
4.	Rs. 3001 - 4000	2	28.6
5.	Above 4001	-	-
	Total	7	100.0

Source. Survey Data

Again occupation wise distribution of households using pipe water shows that 86% are farmers and 14% are Ex-Servicemen. Asset wise distribution of families using pipe water reveals that 43% families hold land 11-50 cents, and 57% families posses land between 51-100 cents and no families possessing land above 101 cents use pipe water (see Table 4.3). It is here useful to note that 32% of people in the village 1, covered with water supply possess land between 11-50 cents and 34% possess land between 51-100 cents and 12% below 10 cents of land. Therefore the survey reveals that majority of the water users belong to 51-100 cents land category or better off than the poor section. In other words low asset class (below 10 cents) and low income class (annual family income below Rs. 1200) do not get the benefit of RWS.

Table 4.3
Asset-wise (Land) distribution of Households using pipe water

Sl. No.	Area of land (cents)	No. of Households	% of Households
1.	Below 10 cents	Nil	-
2.	11 - 50	3	42.9
3.	51 - 100	4	57.1
4.	Above 101	Nil	-
	Total	7	100.0

Source. Survey Data

Again caste wise distribution of water users in village 1 reveals that 100 percent users belong to Christian community. It is against a caste distribution of 73% Christian, 7% Ezhava, 7% Nairs and 10% SC/ST. It shows that no SC/ST family is getting the benefit of pipe water. In general, the survey reveals that low income and SC/ST (weaker sections) households do not derive the benefits of pipe water due to non-accessibility.

4.4 Purpose wise use of pipe water.

The purpose wise use of pipe water reveals many interesting facts. Pipe water supply system intends to provide safe drinking water to people facing water problem. Safe drinking water means pure and clean water in adequate quantity and quality. Once the water agency fails to supply clean water in adequate quantity the objective remains unfulfilled. Survey reveals that only 43% households using pipe water are using water for all domestic purposes, for cooking, drinking and washing.

Another 43% households are using water for bathing and washing purposes and another 14% are using the pipe water for animal bath only.

All the families using pipe water are aware about the advantages of pipe water and their advantages are more or less same. Accessibility and health, according to them, are the major advantages. Nobody saves time by using pipe water as the wells are very convenient. These families daily draw from pipe on an average 1565 litres. On an average each family draws 224 litres of water daily. In other words percapita daily water colection is 43 litres. The quantity of water used varied depending upon the size of the family. The large families fetched more pipe water than small families.

Source-wise use of pipe water shows that people mostly use pipe water for bathing and animal use. Of the total water drawn from pipe 40% is for bathing and 20% for animal use. The share of pipe water used for cooking and drinking are 5% and 4% respectively. Table 4.4 shows the item-wise use of pipe water.

Table 4.4

Purpose wise use of pipe water

Sl. No.	Purpose	Quantity of water used (Litres)	% of water used for each purpose
1.	Bathing	625	39.9
2.	Washing	350	22.4
3.	Cooking	75	4.8
4.	Drinking	65	4.1
5.	Animals	450	28.8
	Total	1565	100.0

Source. Survey Data

Rural water supply policy for the Seventh Plan, at national level, recommends a consumption of 70 litres of water per person per day on the average. In order to supply drinking water at this recommended rate, daily requirements of source yield has to be 16.2 lakh litres for the entire panchayat area and 1.44 lakh litres for village 1. With the present reservoir capacity of 4.44 lakh litres and source yield, it is not possible to achieve this target.

4.5 Accessibility and water use

Equitable distribution of water supply to all people living in the village with priority to problem area was conceived in the project. When water agency formulated the scheme the objective was to deliver water to problem area. But the benefit reached only to limited people in remote and problem area. Water agency has failed to fulfil the objective of providing drinking water within easy walking distance of all households facing water problem. An accurate measure of differences in degree of benefit that households derive from water supply is hard to obtain because of different distances to the water tap. One can say that benefits of water supply are evenly distributed when majority of the households have equal distance or accessibility to the public taps. Table 4.5 presents the average distance of households to the nearest public tap.

Table 4.5
Distribution of Households according to average distance from a public tap

Average Distance	No. of Households	% of Households
1.5 Km.	6	14.6
1.0 Km.	11	26.8
0.75 Km.	8	19.5
0.50 Km.	3	7.3
Below .50 Km.	13	31.8
Total	41	100.0

While 15% families are 1.5 Km. away from the public tap, 27% are one Km. away from the tap. Only for 32% families, water tap is available within half a Km. It shows that for 68% families public taps are more than half a Km. away from the house. If a distance of half Km. can be defined as accessible, then in village 1, 32% households derive the benefits of pipe water due to reasonable accessibility. But since 88% families have own convenient wells at a depth of 20-25 feet, collection of water from a distance of half Km. is very inconvenient. Therefore people hesitate to collect water from water tap except during acute shortage in summer.

All families using pipe water have own wells. Among them 14% of families have no water problem and 86% families face water problem only during summer when their wells go dry. These families use pipe water because of accessibility. Average distance from all the seven house to public tap is less than 49 meters. However it is disquieting to note that one family having public tap 15 meters close to home does not use pipe water. This particular family does not use pipe water due to several factors. (i) Family has own well at 15 feet depth and does not face water problem even during summer. (ii) collection of water from public tap does not save time. Instead, fetching water from public tap takes more time. (iii) Members in the family are conscious regarding the advantages of pipe water viz., health and accessibility. But regarding accessibility, well is more convenient. Regarding health, the head of the family told that they clean the well annually and use boiled water especially for children. No water-affected diseases have occurred in the family. This family is dissatisfied with the pipe water because the water supply is inadequate and irregular.

4.6 Distribution of water taps.

In village 1 there are 9 public taps. But only 5 taps are exclusively within the village. Other four taps are in the

adjacent village. Out of the five taps exclusively within the ward two (40%) are wrong and only three are usable at the time of survey. Water has not flown through the last tap erected within village 1 since its inception in 1983 July. Many people felt that on an average a public tap must be erected for every 15-20 families in order to ensure accessibility. In order to met this demand there must have a minimum of 20-25 public taps. Unless such deliberate policy decisions are implemented it will be impossible to deliver the benefits of water supply to the desired level.

Access to water supply is found to be unequal. People living close to public taps enjoy benefits while people living far away from the tap even though in problem area do not get the benefits. In order to extend water supply to remote and problem areas more investment on distribution is required. Unless the pipe line is extended, the water problem, especially during summer, will remain unresolved. About 25% of the families covered in the survey are living in problem area. Village not having drinking water within a distance of 1.6 Km. was the criteria followed to identify a problem village during the Sixth Plan. This scheme was commissioned during the Sixth Plan. Had this criteria been strictly followed, the problem area in village I ought to have been given priority. In other words, the most deserving area and people do not obtain the benefits of water supply.

Rural water supply policy developed in the Seventh Plan aim to provide drinking water to those villages which do not have an assured source of water supply within a distance of 0.5 Km. If one considers this distance as a norm, nearly 68% families in village 1 is more than 0.5 Km away from the public tap.

On the whole,there is a mismatch between the physical distribution of public taps and the location of households with severe water problems. This has led to two consequences: (i)

the level of utilisation of water supply is below the satisfactory level due to non-accessibility and irregular supply. (ii) water problem area still remains a problem area due to non-accessibility. Therefore physical distribution has to be extended to cover more area.

4.7 Water Distribution problem

Source yield, level of the reservoir, maintenance of the pipeline, pump operation, location of public taps etc. are the factors affecting the distribution system. The study reveals that source yield depletes during summer and water collection is only for 25% of the reservoir capacity. The problem of water scarcity would have been partially solved if a check dam had been built across the canal near the collecting well. Local people stressed the need for constructing a check dam. But it was not envisaged in the original project. Check dam is not constructed despite repeated request of the local body, who meet the entire maintenance expenses. Since the water tank is at ground level, distribution of water in elevated area is interrupted when the water level in the tank decreases. Water flows through all taps only if water is at three-fourth level. But with a one shift pump operator it is practically impossible. Engineering personnel associated with the scheme opine that construction of one more collecting well, and a check dam across the canal and appointment of two shift pump operators will solve the problem of distribution.

4.8 Adequacy and Regularity of Supply

Inadequate and irregular supply are the major complaints. According to the WHO, adequate water supply means providing water in quantities sufficient for drinking and domestic and other household proposes. A sufficient quantity should be made available on a reliable year round basis near to or within household when water is to be used. Irregular supply creates dissatisfaction and users hesitate to wait for pipe water. The need for

pipe water during summer is crucial. Inadequate flow of water from the source during summer season is the main difficulty faced by this scheme. Therefore pipes also go dry during summer and people face water problem. The objective was to provide pipe water to avoid water problem. Water ought to have flown through the pipe throughout the year, during summer and winter. Irregularity and inadequacy of supply of pipe water has deterred even those households having reasonable physical aceess to pipe water from using it.

In fact, inadequate and irregular supply of water are the major complaints reported by the users. In village 1, 98% of the families complained that water supply is inadequate and irregular. Depending upon the source yield, if a proper water supply schedule is prepared and strictly followed, regular supplly can be ensured. Supply schedule has to be strictly followed at least during summer months because during these months there is decline is source yield. A supply schedule, fixed after consulting the local people, will improve the distribution system. But no effort has been made by the Water Agency to fix a supply schedule.

4.9 Quality of Water

The quality, taste and colour of pipe water is an additional factor to be considered in judging the success of a water supply system. Cleanliness of area surrounding the collecting well and water tank, especially when it is at ground level, influences the people's decision to use or not to use pipe water. If the premises are unclean and unhygienic, people will hesitate to use pipe water. The study reveals that miscreants deliberately breach the water canal. Near the collecting well people take bath, wash cloth, wash animals and wet coconut leaves. Area around the collecting well is unfenced. Therefore people use the area for urinal purposes and animal grazing. Measures have

not been taken to fence the area or control the deliberate breach by miscreants. People using pipe water have complaints that water supplied contains mud, which leads to colour differences and taste differences. This problem aggravates especially during summer. Local people have repeatedly requested to improve the quality of water but still no action has so far been taken.

The collecting well has filter facilities. It is said that reservoir tank is cleaned once in every month. Supply line is 2 feet above the floor level of the reservoir tank. Therefore mud oozes down to bottom and when water is pumped into the reservoir it mingles with water creating colour change and taste. As a result when one opens the tap muddy water starts flowing out which is unfit for drinking. However daily cleaning of reservoir tank is not possible. The survey reveals that all the household using pipe water dissatisfied with the taste.

4.10 Nominal and Effective Coverage

If we follow the criteria recommended by Water Agency that 250 persons use one public tap on an average the entire are of the village 1 is covered by water supply. The survey however reveals that only 17% families use the benefits of water supply. Effective coverage of water supply depend mostly upon accessibility, adequate quantity, and regular supply of water. Since 98% of families complaints that water supply is inadequate and irregular, effective coverage of water supply is still at lower level.

Again only 32% of households are situated within a distance of ½Km. from a public tap. Since 88% families have own wells, effective coverage of water supply will go down further unless the number of public taps are increased to reduce the distance from house. Purpose wise use of pipe water also reveals that only 5% families use pipe water for all kinds of domestic purposes. The Survey thus reveals that with respect to accessibility, adequate quantity of water, regularity of supply, quality

of water and propose-wise use of pipe water, effective coverage of water supply is very low. Thus, the village-level survey helps to bring out the significance of the distinction between nominal and effective coverage which we have emphasised throughout.

4.11 Functioning of KRWS

The Kerala Water Authority has a sub-divisional office at Adoor, 8 Kms. away from the collecting well. Head of office is an Assistant Engineer. Besides the Assistant Engineer, there are 3 work Superintendents 3 establishment operators, 2 NMR and one casual labourer. There are six RWS Schemes under this sub-division. Out of these, five RWS Schemes are completed and one is under construction. Kadampanad RWS Scheme with 103 taps is the biggest among them. Other schemes are small with less than 30 taps each. Two schemes are under Special Component Plan for Harijan colonies and its source is open well. Total taps under these five completed RWSS are 180. It shows that Kadampanad RWSS has around 61% of the total number of taps.

Scheme KRWS has only one shift operator from 8.00 A.M. to 5.00 P.M. Therefore after 5.00 P.M. there is no pumping. Minimum two shifts and two operators are needed in order to ensure regular supply. Construction of an overhead tank and a check dam across the canal and appointment of two pump operators for two shifts will help solve the distribution problem partially.

4.12 Mainteance and Expenses

The number of water posts which break down and duration of these breakdowns determines the effective coverage. The number of break downs were very low during the time of the survey. Out of the total 103 water posts in the catchment area only four were permanently unusable. Out of these four water posts one post has been locked due to misuse by local people. The remaining three posts have not been in use as water does not flow through

it. Duration of breakdowns are high when a water post stops working. The local people or the local body will inform the pump operator or the Kerala Water Authority office housed 8 Kms. (average distance) away from the catchment area. There is information gap between the Water Agency office and catchment area. It results in two types of loss.

(i) people cannot collect water, and

(ii) wastage of drinking water.

The extent of loss depends upon the duration of the break downs. Local people reported that there were cases of one to two weeks' duration of break down. Drinking water is lost during these days through the water post. During repair works supply is closed/controlled without prior information. However the survey reveals that the number of break downs and its duration are relatively low in the catchment area.

Since the commissioning of the Scheme in July, 1983, local body has expended Rs,67,344 for maintenance purpose. It shows that on an average local body spent Rs.13,469 yearly towards maintenance expenses. In other words, Local body on an average spent Rs.223 per public tap per month for water supply. The benefits of water supply distributed have to be compared to this cost incurred per tap. The average monthly expenses of this office including salary and other establishment is Rs. 14,957. The electricity bill for water pumping is met by the Kerala Water Authority. The average monthly bill for electricity has been Rs.459 during the last one year. If we divide the total monthly establishment expenses of the Section office between five RWS Schemes based on the number of taps the monthly expenses incurred on Kadampanad RWS Scheme is Rs.9,409. If we add monthly maintenance expenses and electricity chages to this the total monthly expenses incured on Kadampanad RWS Scheme is Rs.10,630. There are no house connections. Therefore no water charge is levied.

In the next chapter, we shall examine the financial implication of this in terms of the magnitude of implicit subsidy involved.

4.13 Local People's Participation

It is possible that local participation of village people in the construction and maintenance of the water supply system might help them realise the value of pipe water. In other words, value given to pipe water by village people influence the chances of success of the rural water supply system. The study reveals that local people are not involved in the construction or maintenance of the water supply system. Lack of co-operation from the local people has become a bottleneck. Formation of a water committee under the auspices of the Panchayat in which local people are represented could contribute to the effective functioning of the water supply system. Because people will feel greater responsibility and give more value to pipe water. This sometimes will ensure better operation and maintenance eventually leading to maximisation of benefits.

4.14 Effect of Water Supply on Health

Improvement of public health is one of the arguments put forward for augmenting water supply facilities. This argument requires an analysis of the health problems caused through unsatisfactory water supply and its impact on health or the health benefits from the existing water supplies. It is therefore necessary to understand which water related diseases are caused and how common they are. There are two possible alternative approaches in health impact study. They are (i) a comparative approach (ii) a follow up approach. The comparative approach take two communities, one with water supply and other without water supply and compare them at a given time. The follow up approach takes a single community and studies it both before and after the installation of improved water supply. In this

study, the comparative approach is followed. But the analysis below suffers from the follwing limitation which should be kept in mind namely, that is based on a small sample and a limited recall period com- pared to what is desirable for a proper morbidity survey; moreover, it is a single time-point survey which is ill-suited for estimating morbidity.

There are many diseases which in the absence of adequate water supplies will cause health problem. Analysis of disease pattern in some rural areas provided with different water supplies will indicate whether health improvement could have been achieved by protected water suppply. Water related disease is in some way associated with impurities in water. It is not feasible to carry out a special investigation of each disease in an area to find out if it is caused through defective water suppply. It is therefore necessary to take a series of disease which are often related to water supplies. There are three main ways in which water supplies can affect disease transmission.

	Transmission mechanism	Preventive strategy
1.	Water-borne	Improved water quality. Prevent use of unimproved sources.
2.	Water-washed	Improve water quality. Improve water accessibility Improve hygiene.
3.	Water related insect vectors	Destroy breeding sites of insects. Improve surface water management.

Water-borne disease is transmitted when the disease causing organism is in water which when drunk may become infected. Water-borne diseases include notably cholera, typhoid, dysentry etc. Water washed disease depend upon the quantity of water used rather than its quality. The relevance of water to diseases is that it is an aid to hygiene and cleanliness and its quality is relatively unimportant. Water washed diseases are such as disarrhoeal disease causing morbidity especially among infants and infections of the body surface of the skin and eyes. These infections are related to poor hygiene and this can be reduced by increasing accessibility and volume of water. Insect vector mechanism for water related diseases are spread by insects which either breed in water; malaria and yellow fever, for example, are transmitted by insects which breed in water.

In the world as a whole diarrhoeal diseases caused through water account for about five million infant deaths annually. In Utter Pradesh cholera rate was reduced by 74%, dysentery death rate by 23% and diarrhoeal death rate by 43% after providing drinking water. It shows that availability of drinking water reduces the incidence of water affected diseases and improve the health status.

The present survey examined the disease that occured in the family within the last one month from the date of survey. Disease is entered as diagnosed by the doctor. The cause of the disease as diagnosed by the doctor was considered. In village 1, 7 families (17%) and in village 2, 3 families (7%) were affected by disease. Out of the 17% of families affected by disease in Village 1, two were cases of fever, 2 were cases of eye diseases and 3 were cases of dysentery. All the families affected by diseases in village 2 were cases of fever. Out of the three, one patient was 47 years old and, others were 15 and 17 years respectively. Among of those affected, 67% visited government hospital and 33% private hospital. Though the doctor

did not mention the cause for the disease, the patients believed that the possibility of water as a cause is impossible as all of them have own wells which are cleaned annually and drink only boiled water. In village 2 uncovered by pipe water, in none of the family covered under the survey, cases of diarrhoea, dysentery, cholera or gastroenteritis are reported.

The families affected by minor diseases are in the low income group, whose annual family income is below Rs.1,500/-. Table 4.6. explains the type of disease that occured within the last one month and the nature of treatment.

Table 4.6

Type of disease

Sl. No.	Disease	Village 1			Village 2		
		No. of families affected	No. of persons	% of total population	No. of families affected	No. of persons	% to total population
1.	Fever	2	2	1.1	3	3	1.6
2.	Eye disease	2	2	1.1	-	-	-
3.	Dysentery	3	3	1.6	-	-	-
	Total	7	7	3.8	3	3	1.6

Source. Survey Data

88% families in village 1 and 93% families in village 2 have own wells. In village 1 only 7% and in village 2 16% of families complained of defects in well water as it contains mud. In village 1, 10% and village 2, 7% of families expect health and accessibility as advantages from pipe water.

4.14.1 Health Awareness and Preventive Measures

On the other hand, people are very much aware of the health advantage of protected water. In village 1, 90% families are thus aware of as against only 70% in village 2. It shows that in village 2 nearly 30% families are unaware of the health benefits of protected water even with higher literacy rate than in village 1. All the families visit hospitals and consult doctor when diseases occur. People have complaints about health visitors. In village 1, 88% families, and in village 2, 84% families complained thathealth visitors rarely visit the house. Health visitors do not visit at all in 9% families in village 2. It shows that the services of health visitors in the form of preventive measures to promote public health are not derived by the people. It is quite interesting to observe the traditional preventive measures that people practice to prevent water-affected diseases and the awareness with regard to the cause of ill-health. Cleaning the well annually and use of boiled water for drinking purpose are the most common preventive measures. In village 1, 42% and in village 2, 11% of families clean the well annually and use boiled water for drinking as a preventive measure, to avoid water affected disease. As a single and major preventive measure, about 37% families in village 1 and 55% in village 2 clean the well annually.

Use of boiled water for drinking purpose is another preventive measure. About 10% families in village 1, and 9% families in village 2 use only boiled water for drinking. In total 88% families in village 1 and 75% families in village 2 practice either of these two preventive measures. Table 4.7 shows the preventive measures that people usually follow for avoiding water-related diseases.

Table 4.7
Preventive Measures

Sl. No.	Preventive Measures	Village 1		Village 2	
		No. of families	% of families	No. of families	% of families
1.	Net water and Cleaning well	17	41.5	5	11.4
2.	Cleaning well	15	36.6	24	54.5
3.	Hot water	4	9.7	4	9.1
4.	No preventive measures	5	12.2	11	25.0
	Total	41	100.0	44	100.0

Source. Survey Data

Health improvements have a variety of indirect economic benefits. Poor health hold down production especially during acute illness, diminish the productivity of chronically infected worker and remove the productive work force those who have to care for the sick.

Poor health caused through water borne disease bring down production and absent from work. If a worker is affected by water caused disease he has to abstain from work. If anybody in the house is infected by unsafe water, worker again has to be absent from work to care for the sick. Such situation affects workers employment as well as wage income. Health authorities and economists have estimated that the cost of sickness and premature death caused through water disease are many times the cost of correcting the water supply[1]. In the survey, instances of water

caused diseases have not affected employment. Although three cases of dysentery are noted in village 1 two are below 2 years old and one is 18 years old. In all these cases employment of the parents are not affected.

4.14.2 Hospital visit and Expenses

Cost of treatment is another aspect. In all the cases expenses on medicine for treatement is negligible as all the patients except one visited government hospitals. Therefore the expense was limited to transport cost only. But one patient suffering from dysentery consulted private hospital and paid Rs.25/-. In village 1 out of three patients in 7 families dysentery case is one, fever case is one and eye disease is one. Those affected by fever are children below 13 years. Out of them only one family is using pipe water. They visited government hospital but did not enquire about the cause of disease. Of these two families, one family has annual family income of Rs.3,000/- and other family's income is Rs.2,000/-. In the case of eye disease they did not visit hospital but used eye drops as suggested by a hospital nurse. The cause is therefore not known. Another person caused by eye disease is 27 years old and visited hospital, but the cause is not mentioned as diagnoised by the doctor. He is also using pipe water.

In three families cases of dysentery are noted. Two patients were children below 2 years, and the third person is 18 years old. Two patients have own wells. None of these families are using pipe water due to nonacessibility. Public tap is one Km. away for two families and 3/4Km. for one family. Out of the three families two families do not preventive measures. They neither use boiled water nor clean the well annually. It shows that those who practice preventive measures are rarely affected by dysentry. Dysentry caused patients visited hospitals but the causes of disease as diagnosed by doctor is not known. Two

patients visited Taluk hospital 8 Kms. away while the third visited a private hospital. Families affected by dysentery do not have latrine facilities. This again affects health. In total, of the seven families affected by diseases only one family has latrine facility.

As noted eariler in village 2 uncovered by water supply, 93% families have own wells and out of them 32% families face water problem during summer. Incidence of water affected diseases have not been observed in village 2 except incidence of fever in three families. Since 70% of the families are aware about better health and they clean the well annually and use boiled water for drinking, these preventive measures have helped to reduce the incidence of diseases caused through water.

Therefore in village 1 with regard to health, water supply may not have much impact. However, the problem of drinking water especially during summer will have to be remedied through appropriate measure in sufficient quantity and regular supply.

In village 1, covered by water supply, only 17% families use the benefits of pipe water, under a situation where 76% families are facing water problem especially during summer. Due to limited coverage of water supply majority of people even though they desire to use pipe water are unable to obtain the benefit because of non-accessibility and irregular supply.

Families practising prevent measures are not affected by diseases. To put it in another way, it is not pipe water alone that can preventive most of the diseases but also the preventive measures. Therefore people will have to be educated regarding the benefits of drinking water preventive measures. This may be more cost effective than opening rural health centres or dispensaries. The services of voluntary organisations, women organisation, school children, balawadies, adult literary centres etc. can be gathered and utilised towards this end.

Reference

1. Sandy Caisncross 1986, Evaluation for village water supply planning, Washington

CHAPTER 5

COST RECOVERY AND FINANCIAL IMPLICATIONS OF K.R.W.S.

This chapter explains the pricing of drinking water in the KRWS based on the survey in order to understand the extent of implicit subsidy incurred and the problems involved in the fixation of water rate. The ability and willingness of households in the catchment area of KRWS to pay water rate, if imposed, is also examined based on the survey data.

The viability of any project depends upon the pricing of its products. In the case of RWS the cost of water or water charge is the basic element on which the entire financial viability of the water supply project is judged. Like the pricing of any product the water rate has to be worked out on the basis of the total capital invested, annual interest on the borrowed capital, recurring annual charges on operation and maintenance, sinking fund for repairs and renewals, overhead costs on management, distribution, billing, collection and allied activities. Allowance has to be made for losses due to evaporation, leakages and waste between the source and the consumer. This type of price computation exhibit a unit rate for water which if realised would make the scheme self-supporting. The cost of the water supply system is realised by service charges based on rational cost and recurring charges in developing countries[1].

However, fixing water rate, as it is a basic utility service is a policy instrument. Economists will argue that consumers should recognise the real resource costs like capital equipments such as pipes and pumps, intangible items such as engineers time and the expenses for collecting water rates. It is because economists always work in terms of real costs and are interested in efficient use of resources. They will even advocate subsidised pricing to encourage fuller use of installed capacity. There are economists who recommended that political decision makers can use water pricing to promote income distribution, economic

stability and development of backward areas[2]. Financial analysts and accountants on the other hand are more concerned to balance the accounts. However, water supply is a public utility service and therefore pricing of water is a policy instrument which should be determined by socio-political criteria in addition to financial and economic ones.

5.1 Types of costs

There are two types of costs involved in the water supply system. They are fixed capital costs and variable/recurring costs Major portion of the fixed costs are met prior to the commissioning of the project. The capital costs for water supply are met by grants from the Government and aid donors and loan from the government, LIC, World Bank and foreign governments. The capital costs such as planning and design are met by the water agency from its budget. Recurrent costs have also an element which is fixed no matter how much water is sold. (eg. loan repayment, operator charges, etc.) and an element which is variable (eg. fuel, electricity, chemicals). If the water rate collected is less than the full cost of providing water, then the customer is subsidised. It is because the benefits of water supply project cannot be captured in terms of money value of returns alone. Hence there is a clear case for state subsidy. This type of argument is further strengthened in view of the low income status of the rural households. Therefore in rural areas the difference between the cost of drinking water supply and water charges really collected can be treated as implicit subsidy element.

5.2 Ability and willingness and water rate

While working out water rate the ability and willingness of consumers to pay is crucial. But such assessment involves detailed and elaborate survey. In rural areas majority of the households are having income below average for a better living. Moreover, their family income will fluctuate over the years due to unpredictable change in agricultural production.

In urban areas, on the other hand a large proportion of the population are employed in non-agricultural sector and earn a regular monthly income. Rural people will therefore sometimes refuse to utilise pipe water if water charge is levied. Therefore higher water rate will sometimes discourage full use of water supply facilities. Under such circumstances, it will result in higher average cost per unit of water. It is therefore worthwhile to assess the rate villagers are willing to pay and able to pay. In communities if people express their ability and willingness to pay for water, it will generate some resources for future development of water supply. The possibility of asking households to pay for the cost of connection over a period of time is one means for extending and accelerating coverage.

But the consumers' ability to pay water rate sufficient for repayment of loan capital will have its own limit. We cannot expect the households using pipe water to pay water rate sufficient to make the scheme self-supporting. However, the burden on the exchequer can be reduced to the extent the beneficiaries pay. The State can therefore explore the possibility of raising funds for future water supply schemes through suitable pricing policy.

Application of the principle of ability and willingness to pay for water supply has to answer some key questions like (i) Should the beneficiaries pay more in order to make the scheme financially viable (ii) should the households pay an individual water tariff (iii) should the villagers be charged for the total consumption when majority of people live in poverty in the catchment area of the rural water supply. But if people's income improves and people are willing to pay water rate, levy of water charge is advisable. Non-affluent communities might not be burdened by a costly scheme of water supply. The survey has revealed that if the system can provide adequate and safe water within accessible distance at a price reasonably low, people will pay water rate, However, the cost of providing safe water to the

poor people through public taps from general revenues of the state/local bodies has almost been an accepted policy of the government.

A significant finding of the survey is that only 20% of the water users have agreed to pay water rate, if imposed. It reveals that 80% people lack ability and willingness to pay water rate. The survey further reveals that only 50% people are prepared to incur the preliminary investment expenses for household water connection. But they have some conditions.

They are:

(i) there must be regular and adequate supply

(ii) quality of pipe water must be good. But the study clearly indicates that with the available source yield and distribution system, it is impossible to supply adequate water regularly especially in elevated area.

5.3 The problems of fixing water rate

There are two alternative approaches to the problem of setting water rates. They are (i) Government can fix the water rate at a level sufficient to cover the cost of the services on a no profit no loss basis principle. (ii) Government can fix a water rate to maximise the net benefits. In other words, to generate a surplus so as to make the project self-supporting and enabling expansion into uncovered areas. If the cost approach alone is followed water pricing can emphasise the financial or the economic aspects of costs. Financial criteria is concerned with meeting all or a portion of the total costs and some notion of average cost can be used to set rates. In the economic approach stressed by the World Bank, the ultimate goal is the effective allocation of resources by providing consumers with the appropriate price signal of the real cost of the supply[3]. Even though water rates are fixed based on financial or economic aspects, a sound water pricing policy should have the following basic objectives:

(i) Induce the socially desired pattern of water use,

(ii) Warn the water agency of when new capacity is warranted and

(iii) contribute to project planning.

5.4 Types of Consumers

The incidence of water rate among consumers are different. Different classes of consumers do not pay water rate in proportion to costs of providing water. If consumers are broken down into different classes based on level of service such as stand pipe, single tap, multiple tap, volume used economic status commercial or industrial use it is possible to levy different water rate.

In Kerala there are only two categories of consumers, domestic consumers and non domestic consumers. For non domestic consumers water rate is double the domestic consumer's rate. Even though water rate has to be determined based on the total cost so as to make the scheme self-supporting, this principle is seldom followed in most cases.

Depending upon the capital costs water rates will vary from project to project. However, in Kerala for urban water supply, while water rate varies project-wise, for rural water supply schemes, water rate is fixed at a uniform rate of 50 paise per 1000 litres. For instance in Trivandrum Corporation area the water rate is 75 paise per 1000 litres (1986-87). In another urban water supply scheme, at Muvattupuzha, water rate is 45 paise per 1000 litres. Water charge is levied for the metered quantity only. There is some anomaly in the levy of water rate. For instance, consumers consuming different quantities are levied at the same rate. This leads to unequal incidence of burden. The water agency ignores the fact that domestic per capita water consumption depend upon (i) type of housing which is related to income levels of the inhabitant, (ii) availability of water,

and (iii) distribution facilities. Rich people with better housing facilities and better standard of living use more water. World Bank study on water supply have suggested a minimum water charge to domestic consumers which would entitle them to a stated quantity of water with a graduated charge being made for additional water consumed[4]. This suggestion look progressive in nature because it charges a higher water rate on rich customers beyond a prescribed minimum level of water consumed.

The water pricing as suggested above has two merits. First, it would rather equalise the incidence of burden. Second, wastage or misuse of water can be reduced.

In some cases water rate are varied with property valuations in residents of the high valued houses being charged more than those in low valued houses. But in Kerala no such differentiation or classification is followed while fixing water rate. In Gujarat the Water Agency is entitled to recover Rs.5 per capita per year from beneficiary even though the per capital cost of maintenance[5] is calculated at Rs.20 per year.

5.5 Water Rate

Water rate fixed in Kerala is not adjusted for increasing operation and maintenance costs and to make funds for future investment. Government always hesitate to increase water rate fixed several years back for reasons like public criticism, loss of popularity of elected representatives and other political considerations[6]. Continuation of supply of protected water at very nominal rates and, in certain cases, even free of charge can no longer be considered a sound practice. A High Level Committee on Social Infrastructure and Service set up by the Government of Kerala (1983), observed that 'where a household at present pay about Rs.100 per month for the electric power consumed there is no reason why they should grudge paying Rs.50 per month

for the water consumed. The committee added that the practice of free allowance, supply of water free to so called Charitable institutions, etc. will have to be summarily stopped'. If only these measures are boldly introduced and enforced by the Government these types of public utility services can be made to work efficiently and on a self-finalising basis in the long run. But the Committee's observation that there is no reason why customers should grudge paying Rs.50/- per month for water consumed does not consider the ability and willingness of the customers. As already mentioned water users belong to different income groups and charging a uniform rate per 1000 litres of water from every user irrespective of their income level, impose heavier incidence of burden on low income group. Therefore the possibility of imposing different water rates for different income level customers or providing some subsidy to the low income group customers can be explored.

Distribution of drinking water in rural area is largely through public taps·6nly in limited RWS schemes house connections are allowed. Even in urban areas only 28% of the water supply are through house connections and 72% are through public tap points. In certain towns, only a portion of the total house service connection is under metered charges while the rest is either levied on flat rate or merged in the property tax. But the supply of water through metered connection at a rate based on a recovery of the total capital cost and recurring cost has to gain momentum. Metering of water is not only highly desirable as a means of controlling consumption but also provide an equitable base for tariff charge and minimise waste and uneconomic use of water. Control of water leakage, metering with possibility of reducing unaccountable losses, introduction of differential tariff, flow limiting and the use of dual water system are some important factors to be considered for better distribution of drinking water and fixing the water rate.

Comprehensive water supply schemes undertaken for implementation in Kerala under bilateral assistance with the Netherlands had worked out the water rate based on operation and maintenance costs and recovery of capital costs[7]. The worked out water rates are different for each comprehensive scheme and the rate has been derived based on the present value of all costs and the expected returns from water charge at 85% water metering. Based on this criteria water rate worked out for comprehensive water supply scheme varies from Rs.1.76 per 1000 litres to Rs.320.

5.6 The problem of subsidy

Even though the Kerala Government levies water rate, it is grossly inadequate to meet the recurring costs. Therefore Government has to 'bridge the gap' through implicit subsidy. This is true more in the case of RWS where house connections are rare and water is priced at a flat rate of 50 paise per 1000 litres irrespective of the capital costs. As a result water rate worked out will vary scheme-wise depending upon the type of technology used. The maintenance costs are met by the local bodies. In other words local bodies are also incurring some implicit subsidy for the supply of drinking water in rural area.

5.7 Calculation of water rate for KRWS

The calculation of water rate based on the capital and variable costs, capacity utilisation and water waste will help to understand the extent of implicit subsidy incurred by the state and the panchayat for providing drinking water.

The total fixed cost of KRWS is Rs.5.33 lakhs and the reservoir capacity is Rs.4.40 lakh litres. The design period is 30 years. The fixed investment cost and operation and maintenance costs are converted into annuities using the interest rate as charged by LIC at 10% for RWS. These costs are converted into present value by the interest rate at 10% as discount factor.

The present value thus calculated is used for working out the water rate for 1000 litres. The capacity utilisation is assumed at 70% based on the average calculation of the pump operator for one year. Also 20% wastage of water due to leakage, break downs, evaporation, cleaning etc. are assumed. The following procedure shows the calculation of water rate.

1.	Annual fixed cost	Rs. 9167
2.	Annual Maintenance cost met by panchayat	Rs.13469
3.	Annual electricity charge	Rs. 5505
4.	Annual expenses on salary and wages (calculated based on the number of public taps under KRWS)	Rs.108891
5.	Total variable costs	Rs.127565
6.	Planning (Design) period	30 years
7.	Present value of fixed cost at 10% discount factor	Rs.86413
8.	Present value of variable costs at 10% discount factor	Rs.1202549
9.	Present value of all costs at 10% discount	Rs.1288962
10.	Water rate for 1000 litres to cover all costs (30 years)	Rs.1288962
		Rs.12.89 lakhs x 1000 litres
		26980 lakh liters

= 48 paise per 1000 litres

11.	Annual value of maintenance cost incurred by panchayat	Rs. 13469
12.	Present value of cost incurred by panchayat at 10% discount factor	Rs. 1.28 lakhs
13.	The present value of cost incurred by panchayat for 1000 litres of water	5 paise

Above analysis shows that in order to function the scheme on a no-profit no-loss basis, the water rate has to be at 48 paise per 1000 litres, without allowing any provision for increase in operation and maintenance expenses. In other words in order to provide drinking water to people in Kadampanad panchayat, Government and the panchayat together spent 48 paise per 1000 litres. Out of it cost incurred by panchayat for 1000 litres of water is 5 paise. As long as water agency does not levey water rate from users it has to be treated as implicit subsidy. The total implicit subsidy for KRWS at present value thus works out at Rs.12.89 lakhs out of which panchayat's share is Rs.1.28 lakhs.

In order to work out the price of 1000 l;itres of pipe water as calculated above, so as to understand the impact of implicit subsidy at state level, we must have state's total investment on RWS and the total reservoir capacity. Since such data are not available such a calculation is not made here in order to assess the extent of implicit subsidy. However, the extent of implicit subsidy is analysed with respect to revenue and expenditure.

The revenue and expenditure of the Kerala Water Authority shows that the amount of money spent on water supply, especially RWS, do not in any way commensurate with the revenue collected by way of water rate. The difference between the revenue and expenditure has, therefore to be called as implicit subsidy which is met from the state budget. Table 5.1 shows the expenditure and revenue of the Water Authority for two years.

TABLE 5.1

Expenditure and Revenue of the Kerala Water Authority on RWS

(Rs. lakhs)

Sl. No.	Year	Expenditure *			Revenue
		Capital	Maintenance and operation	Total	
1.	1985-86	2528.3	246.1	2774.4	13.3
2.	1986-87	2156.8	354.9	2511.7	24.5

* It does not include the cost incurred by the local bodies.
Source : Kerala Water Authority.

It indicates that only 1.9% of total expenditure on Rural Water Supply Schemes in Kerala is realised through water rate in 1985-86 as against only 1% in 1986-87. It again shows that water rate collected is only 5.4% of operation and maintenance costs in 1985-86 as against 6.9% in 1986-87.

In aggregate terms the extent of implicit subsidy incurred on RWS in Kerala was Rs.2761 lakhs in 1985-86 as against Rs.2487 lakhs in 1986-87. If we exclude the capital expenditure and take into account only operation and maintenance expenses, the extent of implicit subsidy is Rs.233 lakhs in 1985-86 as against Rs.330 lakhs in 1986-87.

This shows the magnitude of the implicit subsidy which Government incur annually for RWS. The basic question here is, whether the Government is capable to spend such huge amount on subsidy for providing drinking water to rural people ? Further, when Government spend such a huge amount annually for drinking water one has to judge whether the deserving area and people get the benefits of water supply.

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CHAPTER 6

CONCLUSION AND POLICY IMPLICATIONS

The importance of RWS, macro and micro aspects, growth of RWS under successive five year plans, and problems of RWS, were discussed in the first two chapters. The next three chapters analysed the socio-economic characteristics of two villages, benefits and problems of water supply distribution in one village and financial implication of the KRWS through the case study. Now, in this concluding chapter, we shall spell out the policy implication of our case study.

Drinking water is a basic utility service without which life is impossible. Therefore the importance of RWS cannot be overemphasised. Both at national and state level, since fifth five year plan, greater stress has been laid on drinking water supply especially in rural areas. As a result more area and people have been covered by RWS. But still RWS schemes are beset with several problems. Unless these problems are tackled, it will be impossible to distribute the benefits of RWS to the people as envisaged in our five year plans. Therefore some policy implications which will be relevant for future RWS Planning is discussed below.

The success of rural water supply system largely depends upon the technology used for tapping the water source, its operation and maintenance, accessibility of public taps, quality and adequate supply of water and response and participation of the local people.

1.1 Designing Technology

The design criteria cannot be standardised or applied indiscriminately in all areas. Therefore, while establishing appropriate criteria for design, account should be taken of the national coverage situation as well as technological, financial and institutional constraints. This type of approach will improve water supply coverage as well as magnitude of investment. In Kerala no evaluation study has been taken up to review the water supply problems including technological considerations and to asses the derived benefits of the water supply system. In order to ensure better use of low cost technology the Water Agency should review the existing water supply system through wide spread evaluation. However, the type of technology selected minimising the cost on rural water supply must not jeopardise the effectiveness of improvement and at the same time it must be responsive to the local needs. The selected technology will have to be such as to control water loss.

Resource scarcity is the crucial problem now facing the water supply system in Kerala. Therefore the need to assess the alternative construction techniques and materials for storage reservoir and elevated tank are more important. Information on low cost container would be of value. Along with it project report has to be finalised on the basis of cost-benefit analysis of alternative sources. Pumping facilities, treatment work facilities and distribution facilities need scientific appraisal before a project is finalised. Preliminary evaluation studies regarding the source yield is also very essential. A study of the geological condition of the proposed catchment area would

help to ensure source yield and water defects. The fluoride content in ground water must also be studied before finalising the project. In case the source yield depletes especially during summer, alternative source will have to be identified and located in advance. The project components have to be designed to utilise the available water to maximum advantage by avoiding wastage of water.

1.2 Reservoir facilities

Water storage reservoir sufficient for about one day's supply has to be provided. It is to discourage intermittent water supply on health ground. Contamination of water pipe is a problem particularly with intermittent supply. The case study reveals that water supply is irregular and intermittent. The reservoir tank in the case study is at ground level. Water distribution in the elevated area is therefore affected when water level goes below three-fourth of the reservoir capacity. Therefore, measures will have to be implemented to maintain the water level in the reservoir always above 3/4 capacity. But it is proved impossible as the case study brings out. The reservoir tank is 1.3/4 Kms. away from the infiltrating-cum-collecting well. Therefore the pump operator cannot always read the water level in the reservoir. In order to avoid such technical problems the distance of transmission reservoir from the treatment reservoir has to be reduced to the minimum. Moreover, reading of the water level in the reservoir tank will give a clear picture of the reservoir variation and the quantity of water distributed. Water reading is more useful where water meters are not installed for measuring water supplied.

1.3 Realistic cost Estimate and Timely Completion

Realistic cost estimate and completion of the project in scheduled time are essential to save scarce money from inflation-caused cost escalation. Normally two to three years are needed to complete a rural water supply scheme. However, there are instances where schemes have not been completed even after four to five years. For instance 21 RWS Schemes started; one in 1980-81, 2 in 1981-82, 4 in 1982-83, 10 in 1983-84 and 4 in 1984-85, at an originately estimated cost of Rs.1134.5 lakhs have been under different stages of completion, during 1987-88. In 1987-88 its estimated cost has been revised to Rs.1260.75 lakhs. In other words, additional cost to be incurred due to non-completion of schemes within the scheduled time is Rs.125 lakhs. It shows that there is need for some rethinking on keeping the time schedule in completing the RWS especially when we face resource problem. However, the case study reveals that works of this water supply scheme started in 1981 was completed in 1983. The works were completed within the scheduled time. Therfore the expenditure did not exceed the estimated cost.

1.4 Selection of RWS based on Resource Availability

Wishful thinking Syndrome is the most common defect in water supply policy formulation. It comes from a political popular slogan 'pipe water in every village'. But such goals are unrealistic when viewed against resource availability. We struggle hard with inadequate resources to realise unrealistic goals. This problem is probably increased by the over ambitious goals of the U.N. Drinking Water Decade 1981 - 1991'. Therefore determination of the proper proportion of

investible funds within a state to be devoted to community water supplies is one which faces the planning body. More rural water supply schemes are taken up for execution without realistic assessment of resource availability. It leads to scattering of limited resource in more schemes which are always grossly inadequate to complete the scheme within the scheduled time. Therefore in future identification and final selection of RWS Scheme must be strictly based on resource availability.

Population of Kerala according to 1981 census was 255 lakhs. Out of it, rural population was 207 lakhs (81.25%). The projected rural population of Kerala in 1991 is 246 lakhs. Rural population covered with water supply was only 41 lakhs in 1981. Based on the per capita cost of rural water supply scheme in Kerala at Rs.150-Rs.220, the total investment required for providing pipe water to all the rural population by 1991 according to 'International Drinking Water Supply and Sanitation Decade' is estimated at Rs.546 crores. Accordingly investment required for rural water supply during seventh plan 1985-90, and first year of the eighth plan was estimated at Rs.465 crores. As against this estimate, the plan outlay earmarked for rural water supply in the State sector in the seventh plan is only Rs.95.30 crores. In other words, outlay earmarked is only 20.5% of the requirement. Another Rs.150 crores is earmarked under Accelerated Rural Water Supply Scheme by the Central Government. Thus the total outlay earmarked is Rs.245 crores. This accounts 53% of the required capital. It shows that physical targets are in no way linked to financial availability. In many cases villages are identified for rural water supply schemes based on social and political considerations. Resources are therefore thinly distributed over a large number of water supply schemes which are grossly insufficient. Completion of RWS Schemes therefore prolong beyond the estimated time.

Transfer of officers from one project to another during the course of the work of the project also lead to untimely completion. It has to be a policy decision of the government. However proper care has to be given to allow to continue the Engineer in charge of the project until the completion of the project.

1.5 Socio Economic Survey

Pre-investment Socio-economic survey of the village before finalising a rural water supply system will prove more useful. Such surveys will expose several factors like problem area, local people's response to water supply, alternative sources of water supply, erection of public taps, ability of people to take house connections, backwardness of the area, socio-economic conditions of the people in the project area etc. which are necessary for the successful functioning of the project. In other words, some sort of awareness among the local people can be developed through the survey. The case study reveals that this rural water supply system had no such survey. Therefore the real problem area could not be identified and located. Of course the survey is an expensive and time consuming exercise. WHO assist its member countries in the preinvestment phase of water supply regarding technical, managerial and financial aspects of water supply. Kerala Water Authority can take necessary arrangements to obtain services rendered by the WHO.

1.6 Accessibility, Coverage and Water Supply Schedule

Accessibility determine the chances of success of the Water supply system. The survey reveals that above 90% of the people of the project area have conventional type family

wells at 10-25 feet depth within the house premise. Therefore pipe water will have to be provided within reasonable distance after closely assessing the convenience of well water and its accessibility. In other words, more stand pipes will have to erected within reasonable distance and distance between stand pipes must be based on some standard norms acceptable to local people. The accepted policy of the government that no person shall walk more than 150 meters for drinking water need a reasonable rethinking based on the reality that in most of the families in midland area well water is available within the house premise. Therefore in order to utilise the pipe water the taps must be made more accessible. Regular and adequate supply is another success criterion of a rural water supply system. In the case study 97% people opined that water supply is irregular and inadequate. In order to ensure certainty water must be available in pipe for 24 hours daily. It is impossible with the present source yield. Therefore a fixed water supply schedule must be observed after consultation with the local people. Duration of the supply line may be fixed keeping in view the population of the village so that target of water supply per head is fulfilled. It is understood from the survey that irregular and interupted supply have invoked people's dissatisfaction and lost confidence of reliability and it persuades people to use alternative sources of water.

1.7 Pricing of Rural Water Supply

In Kerala RWS is priced at 50 paise per litre irrespective of the capital costs. Water rate is levied from consumers having house connections. But number of house connections under RWS are very limited. It shows that

drinking water in rural area is provided almost free. This results in huge committed expenditure by the Kerala Government. The water rate calculated in the case study for RWS shows that average cost incurred for every 1000 litres of drinking water supplied is 48 paise. As there is no house connection under this RWS, no water rate is collected. The entire costs are therefore subsidised by the State Government and local body. This being the situation, the magnitude of implicit subsidy that the Government incur annually in order to supply drinking water in rural areas will be alarmingly high.

The survey reveals that nearly 20% families are willing to pay water rate. Therefore, the Government should reexamine the water pricing policy and granting of house connections under RWS. Depending upon the source yield, Government can therefore, examine the possibility of granting connections to houses and hotels/tea shops in rural areas in order to recoup some revenue through water charges. Such a policy will help the State Government reduce its burden of implicit subsidy incurred on RWS. Government can also examine the possibility of imposing a per capita water charge per year from public tap users as is being done by the Government of Gujarat.

1.8 Maintenance of RWS

The operation and maintenance of RWS Schemes are understood to be poor as is revealed by the case study. While planning RWS, matters relating to maintenance should also be taken into consideration. It should include the procedures established for preventive and corrective maintenance, the availability of operators and quality of

their training. The infrastructure required for satisfactory operation and maintenance is not often given sufficient attention. In the case study it is found that due to lack of raw materials maintenance works have prolonged for months. Therefore, in order to make the RWS Schemes more effective the physical work and the maintenance must be kept in perfect order. The presence of a line helper for each RWS with sufficient know how, training awareness and tools is necessary in order to correct the repair of the main line or taps as soon as it goes wrong. It is essential to make the system more efficient and to avoid the wastage of valuable drinking water. A three tier maintenance set up with a care taker at village level, a machine at block level and a mobile repair team at the district level has been successfully tried in Tamil Nadu. The advantages of such maintenance set up have to be studied to see whether it could be introduced in Kerala also.

1.9 Quality of Water

The quality, taste and colour of pipe water will also determine the chances of success of the water supply system. Cleanliness of area surounding the collecting well and water tank, especially when it is at ground level, influences the people's preference for pipe water. If the premises are unclear and unhygienic, people will hesitate to use pipe water. The case study reveals that miscreants deliberately breach the water canal. Near the collecting well, people take bath, wash cloth, wash animals and wet coconut leaves. Area around the collecting well and reservoir tanks is unfenced. People use the premise for urinal purpose and animal grazing. Measures have not been taken to fence the area or control the deliberate breach by miscreants. People using pipe water have complaints that water supplied contains

mud, colour difference and taste difference. This problem aggravates especially during summer. Therefore in future when planning for RWS, measures will have to be taken to fence the area around the infiltration well and the reservoir tanks.

1.10 Selection of problem villages

In Kerala 95% villages are identified as problem villages with regard to drinking water. The Kerala Water Authority has to fix priority list of villages for providing drinking water to the problem villages. But it is understood that no such priority list is fixed by the Authority in the matter of giving water supply to the problem villages of same category. As a result non-problem villages are provided with pipe water when problem villages remain without pipe water. Selection of scheme for inclusion in the work programme are done at random based on political pressures.

The chances of success of the rural water supply improve when more people and more area use the benefit of pipe water. In other words, success depends upon the effective coverage of the system. It has been the policy that problem area must get first priority in the distribution of pipe water. Social and political considerations shall not in any way influence the location of public taps. In case a problem area does not get the benefits of pipe water, measures will have to be implemented to expand the pipe line to such area. Unfortunately, the case study suggests that the problem area badly in need of water has been neglected while non-problem area has been provided with pipe water.

1.11 Local People's participation

Local people's participation in the rural water supply system will make the system more successful. The case study shows that even though the Panchayat meets the entire expenses on maintenance works it has no voice/control in the management or execution of the project. Formation of a water committee to look into the problems of the water supply system will possibly improve its functioning. This is because people under such situation will feel the responsibility, need and benefits of the water suply system. This system can be tested in one project. If it proves successful such committees can be constituted in each project area with the co-operation of the local body.

1.12 Decentralisation of Powers

The water Agency is not decentralised enough to be able to serve in rural area. There is little devolution of authority from top to down. The Kerala Water Authority, formerly the Public Health Engineering Department, is the Apex Body which implements the water suply schemes with its lower level offices. The Authority is divided into two zones. South Zone and North Zone and one chief Engineer is in charge of one zone. Below the chief Engineer there are Superintending Engineers and under them there are Divisional Offices. An Executive Engineer is in charge of Divisional Office. Below the Divisional Offices are the Sub Division offices. Assistant Engineer/Assistant Executive Engineer is in charge of the sub division office and they are the lower level executive officers. These officers often hesitate to serve in rural areas because of the lack of better living

conditions. Therefore the office management becomes less efficient. The needed data/information are not collected and made available. This is sometimes one of the major drawback of non-decentralisation of powers. If the local body is also associated with the formulation and implementation of the RWS this sort of inefficiency can be minimised.

A top down decision in RWS is not a realistic aproach. In other words water supply agency is not decentralised. The initiative for pipe water has to come from the local level itself. In fact, if possible a harmonisation between a top-down and bottom-up approach is necessary. Since drinking water is a basic need, the crucial issues in RWS such as cost recovery, house connections, maintenance and installation of public taps have to be decided realistically after convincing the local people to accept changes in attitudes and practices through community participation. The constitution of a local level water committee to decide on matters such as water distribution, time schedule, flow restriction and maintenance of the project will help the RWS Schemes to deliver the maximum benefits. WHO have recognised the need for community participation in all stages of project implementation in order to contain the shortcomings of RWS Schemes. But it is yet to be tested in Kerala.

1.13 Public Health Education on Water Supply

Public education on the importance of water supply to health and on the proper use of facilities is not being given in Kerala. Successful results will bring about fruitful changes of public attitude that will help to increase the willingness of communities to participate in water supply

schemes. School children are an important target group for such information or their exposure to health education will assist in evolving a process of attitudinal changes. In the case study it is found that drinking water is not extended to the lower primary school. The distance to the water tap from the school is more than one kilometer. In future while executing RWS priority must be given to schools also.

1.14 Data base and information

There are serious deficiencies in information transfer mechanism related to water supply. The study reveals that even sufficient basic data regarding nominal and effective coverage of water supply is lacking. It is necessary to collect and update data regarding source-wise technology used, cost difference among used technologies, availability of source yield, details regarding maintenance and operation, area coverage, etc. The mechanism for information likely to be useful are dissemination of information from project evaluation and demonstration, publication of the results of research and development projects and dissemination of publication to specific target groups. Concerted efforts are needed to build up sensible and effective information transfer mechanism. State level initiative is an important ingredient here. The statistical base for planning of water supply is so weak as to be virtually non-existent. Statistics of water delivered/supplied are not compiled separately. Information on reservoir levels and capacity is not available. Therefore there is considerable uncertainty in regard to the assesement of actual benefits that have accrued from the project. The State level statistical unit now attached to the water agency will have to concentrate on these aspects and need to be strongthened in order to collect, keep and update the basic statistics covering all aspects of water supply system.

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PERFORMA FOR THE SOCIO ECONOMIC BACKGROUND SURVEY AND USE OF PIPED WATER SUPPLY

I. Identification

Village: Name of Head of the Household:

House No: Caste: Religion:

II. Particulars of Household

Sl. No.	Name	Relation with Head of the Family	Age	Sex	Education	*Occupation	Annual/ Monthly income (Rs.)
1.							
2.							
3.							
4.							
5.							
6.							
7.							

III. Family Asset and Annual Income

A. Land	Area (Cents)
1. Owned	
2. Operated	
3. Garden	
4. Irrigated	
5. Unirrigated	
Source of Irrigation	
(i) Domestic Use	
(ii) Irrigation	
6. Other assets (Specify)	

*Self employed in trade, cultivation, household industry, wage labour in agriculture, industry, construction, service, salaried employment. Housewife, unable to work due to old age, infant, student, others.

B. House

Kucha	Yes/No
Pucca	Yes/No
Huts	
Electrified	
Not-electrified	
Sanitary Instalation	Existant
	Not existant

C. Annual Family Income (Rs.)

Agricul. Income

Non-Agril. Income

Other Income (Specify)

Total Income :

Schedule - 2 : Distribution Benefits:

1. Source of water before piped water supply
2. Type of water supply serving you.

(a) Private tap (Househole connection)

(i) No. of taps:

(b) Public tap

(1) Estimated number of users of a single public tap.

3. Why do you prefer piped water?
(Health/accessibility/timeserving/less costly/others)

4. Quantity of water used daily (Ltrs. per day)

Uses	Qty.	Source	Distance
1. Drinking			
2. Washing			
3. Cooking			
4. Bathing			
5. Gardening			
6. Animals			
7. Others			

5. If household connection, is it metered or not: Yes/No

6. If not metered Why: (Reasons):

7. Are you prepared to meet the preliminary private cost for househole water connection: Yes/No

PROFORMA FOR SOCIO ECONOMIC SURVEY AND USE OF PIPED WATER SUPPLY (VILLAGE NOT COVERED BY WATER SUPPLY)

Source of Water and Uses

	Sources		Distance	Convenience	Time spent for fetching water
	Own	Others			
1. Drinking					
2. Washing					
3. Cooking					
4. Bathing					
5. Gardening					
6. Animals					
7. Others					

2. Do you experience drinking water problem — Yes/No

3. If yes, specify problems

4. Do you desire piped water? — Yes/No

5. Are you aware of advantages of pipe water?

6. If yes what are the specific advantages?

7. In your opinion why your village is not covered by water supply

8. Were you affected by any water caused disease like dysentry, diarrhoea?

9. Are you able to pay the water charge?

10. Are you prepared to meet the preliminary expenses on household water connection?

11. Do you think much time is wasted in collecting water?

12. Is there any defect in the water now using? — Muddy/foulsmell/ Salinity/others

13. In your opinion what are the advantages of piper water?

PROFORMA FOR THE SOCIO ECONOMIC SURVEY OF THE USE OF PIPED WATER

1) Health Survey particulars

1.*Disease caused in the family within past one month

Sl. No.	Name of the Disease	Age of the patient	Cause of the disease as diagonised by the physician	Nature of Treatment	Agency Treated	Medical Expens		
						Medicine	Fees	Other
1	2	3	4	5	6	7	8	9

1. i) Diarrhoea
   ii) Dysentry
   iii) Cholera
   iv) Gastroenterities.

2. Did any member in your family suffer from diseases caused through water before and after water suply.

3. If yes name of disease

4. Do you visit hospital for treatment?

5. If no, why?

6. Nearest primary Health Centre/Hospital and distance

7. Do health visitors, visit your house regularly? If yes, nature of his advice.

8. Are you aware of the health hazards caused through polluted water?

9. What preventive measures do you practice

10. In your opinion what are the causes for disease

Polluted water/Unclean food/inadequate food/ hard works.

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