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The Development of Water Supply Associations in Finland and Its Significance for Developing Countries

by Tapio S. Katko

A publication of the UNDP-World Bank Water and Sanitation Program

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The cover photo, made in 1920, shows the hand-boring of wooden pipes. Courtesy of the National Board of Antiquities, Finland.

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ABSTRACT

This paper examines the development of rural water supply in Finland to demonstrate certain basic principles that are applicable anywhere in the world. The study is based on the analysis of water supply associations, traditionally the dominant institutions in Finland's rural water supply.

The first-stage associations, dating from the early 1900s to 1950, were informal partnerships or cooperatives that ran gravity systems supplying spring water via wooden pipes. In 1950, the Finnish government began to support the sector financially, giving rise to a second-stage of associations, which include the stock companies typical of rural centers. Third-stage associations, which date from mid-1970 to the present, include increasingly small cooperatives in sparsely populated rural areas as well as bulk-sale companies.

The paper concludes that development of the sector depends on private initiative. Government support has never exceeded 10 percent of total investment: consumer demand has promoted the gradual, dynamic development of water supply in Finland. Consumers have always paid the major portion of capital costs, and in earlier times, contributed much of the labor and materials.

The primary applicable principle is that development of water supply should be based on consumer initiative. Government should concentrate on policy, guidance, and promotion of consumer-managed associations for rural water supply so that consumers can select the service levels they prefer and are willing and able to pay for.

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PREFACE AND ACKNOWLEDGEMENTS

This study was conducted at the Tampere University of Technology (TUT), the Institute of Water and Environmental Engineering (IWEE), from October 1989 to June 1990.

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Tapio Katko
Tampere, November 1991

I. INTRODUCTION

Background

Governments of developing countries, supported by many external agencies, have invested considerable resources in rural water supply. Water projects have been implemented and managed through highly centralized systems with little input from communities and consumers. The systems have experienced serious problems in management and operation and maintenance, and they have also demonstrated poor cost recovery. Community and consumer-managed systems have been suggested to solve these problems.

This study was initiated in early 1980 by several individual experts in Finland and by World Bank staff members. Its purpose is to examine the development of community-managed water supply associations in Finland and seek lessons and replicable components for promoting community management in the developing world. As background for this research, the author prepared a selective review of literature on the development of rural water supply in Finland (Katko 1989).

Meanwhile, in October 1988 the World Bank organized a case study of the development of rural water associations in the United States and its implications for developing countries. Based on these surveys, a more thorough case study of the development of community-managed water supply in Finland was initiated. At the same time, East African water officials and the Finnish International Development Agency (FINNIDA) expressed interest in water associations and community-managed water supply.

Water associations have existed in Finland since the early 1900s, first in rural centers of western Finland. Today they supply water particularly for the sparsely populated rural areas in the eastern and northern parts of the country. The development of water supply associations was most rapid in the 1950s and 1960s, and there are now hundreds of rural water associations in the country. However, the extensive experience gained in the development of these systems has not been well documented.

Objectives

The principal objective of this study is to identify the technical, organizational, economic, and financial characteristics that have contributed to the success of Finland's water supply associations. The study highlights historical development, including recent experiences in rural areas. In addition, the study surveys the relationship of these institutions to municipal waterworks and describes cooperation between different types of water institutions. Finally, the study analyzes possible application of these experiences to developing countries.

The survey seeks to answer these specific questions:

(1) How was the original idea of water associations born, initiated, promoted, and distributed?

(2) What major technical and economic factors affect the development of the associations?

(3) What have been the key factors affecting consumers' contributions and their ability and willingness to pay for water supply? What kinds of tariffs and tariff structures have been used, and how have they evolved?

(4) How have technical alternatives, operation and maintenance, external services, and skills developed in relation to institutional alternatives?

(5) What have been the respective roles of women and men, and how have they changed over time?

(6) What have been the roles of different parties involved in promoting and supporting community-managed water supply?

In addition to identifying the factors that have influenced the success of the water schemes, the report also analyzes key problems and constraints of water associations.

Methods and Structure

Literature available on the topic is limited. In the 1980s, some water associations prepared historical accounts to mark anniversaries. The statistics of the National Board of Waters and Environment on systems serving more than 200 persons were analyzed in 1973, 1978, and 1988. A computerized data base was available for the year 1988. The Water and Environment Districts in eastern and central Finland gathered data for water supply systems serving 10-200 persons. In the western and southern part of the country, data were collected with the help of local health authorities.

As a starting point for the study, a special round-table seminar, "Institutional Alternatives of Water Supply Services," was held at Tampere University of Technology (TUT) in March 1989 (Katko and Morange 1989).

The study was carried out in three stages: preparation, field survey, and analysis. The preparatory phase lasted from January to August 1989, and the field study was carried out from September 1989 to March 1990. The research approach was developed in the preparatory phase. The field-survey phase employed open-ended, semistructured theme interviews of 122 persons who represented 39 water associations in different parts of the country and 11 of the 13 Water and Environment Districts. Other parties involved in the sector were also interviewed.

The analysis focuses on the development process of water associations and also discusses other key issues relating to institutional development, including the relevance of findings for developing countries.

Chapter two briefly describes the historical development of the sector and its relations to general economic and rural development in Finland. Chapter three deals with basic data related to partnerships, water cooperatives, stock companies, and bulk supply companies and their development. Chapter four includes the analysis of the interviews.

Chapter five analyzes the results and implications for developing countries, including applicable principles and potential obstacles. The research approach is evaluated and further studies are suggested. Chapter six includes recommendations for improving water supply in developing countries.

II. HISTORY OF RURAL AND WATER SUPPLY DEVELOPMENT[1]

General Economic and Rural Development

Economic growth in Finland, as in other industrialized countries, came about with the structural change from predominantly primary sector production (agriculture and forestry) to increased production in the secondary (manufacturing and construction) and service sectors. Structural change in Finland came late compared to other industrialized Western countries. In other countries there was typically a transition from the primary to secondary production and then from secondary production to the service sector, but in Finland, the secondary and service sectors have grown together, except for the last 25-30 years when service sector growth has increased faster than secondary production (Hjerppe 1989).

The distribution of employment in Finland has changed dramatically during this century (Figure 2.1). The share of employment in agriculture and forestry was still about

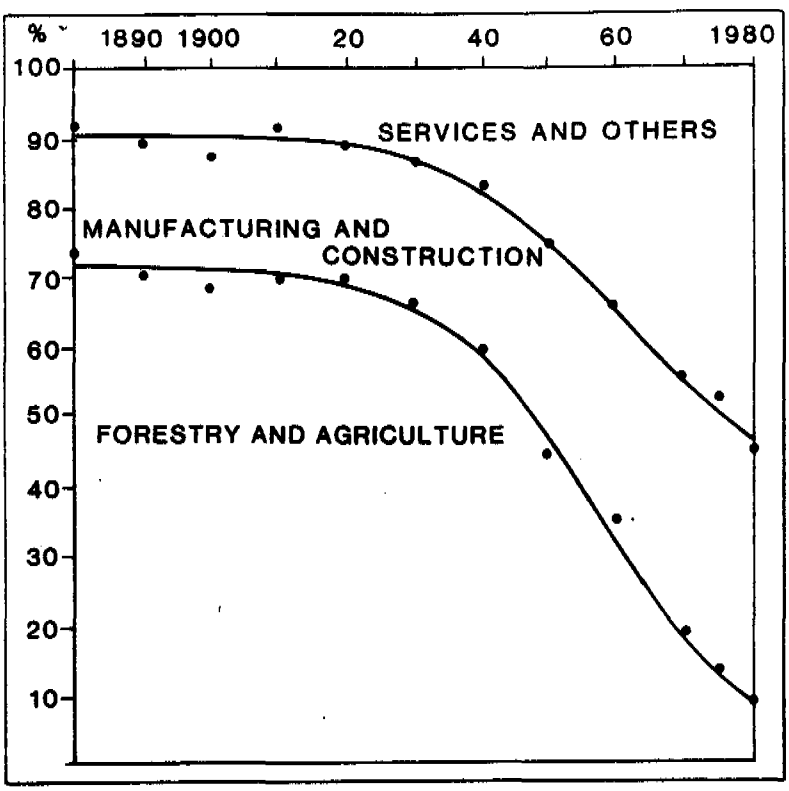

Figure 2.1: Distribution of employment in Finland, 1880-1980 (Heikkerö 1987).

1. Summarized primarily from Katko and Viitasaari (1990) with the permission of *Aqua Fennica*.

70 percent in the 1920s and 1930s (Heikkerö 1987). The corresponding figure for most developing countries today is 70-90 percent. In 1945, about 50 percent of Finns depended on agriculture for their livelihood, but by 1980 that portion had fallen to less than 10 percent (Singleton 1986). The labor force employed in agriculture and forestry in 1975 was only 0.36 million persons, compared with the highest number of 2.02 million in the early 1920s (Honkanen and Tauriainen 1979).

From 1860 to 1985 the growth in per capita gross domestic product (GDP) was faster in Finland than in Sweden, the United Kingdom, or the United States. In 1860 the Finnish figure was half that of Sweden and one third of that of the United States (Hjerppe 1989). In 1988 Finland enjoyed the sixth-highest per capita GDP in the world (The World Bank 1989).

In 1920 the clearing of forests by burning was abandoned, and fertilizers were introduced into agriculture. These changes led to a balance in the production of food in the 1930s. Food shortages occurred during the Second World War, and a balance was again achieved in the 1950s. Surplus production of food was achieved and has been maintained since the 1960s (Heikkerö 1987).

According to Honkanen and Tauriainen (1979), agrarian reforms have been fundamental for farm structure development. Throughout this century, the leading principle of agrarian reforms has been to create a farm system based on private ownership. With a few exceptions, there have been no farms owned by the state, associations, or groups of farmers. The agrarian reforms have been very important in promoting rural development and improving the conditions of the rural population.

In addition to land ownership, other factors promoted rural development. The rural population obtained political rights and women were enfranchised in 1906. The rural population was already completely literate. These factors, among others, contributed to the rapid development of cooperatives. The central organ of cooperatives was established in 1899, and by 1910 there were already 1,700 local cooperative societies. Small cooperative societies were most extensive in the early 1930s (Honkanen and Tauriainen 1979).

Water Resources and Supply Development

Finland has abundant surface water resources: there are 55,000 lakes with a diameter greater than 200 meters. They are usually shallow and located mainly in the central and eastern parts of the country. In the northern and, especially, western parts of the country, rivers dominate. Groundwater resources are concentrated in the glaciofluvial deposits, eskers, and traverse ridges. Excess iron and manganese often lower the quality of groundwater.

In the early 1900s, surface water was used in piped systems. The first rural associations used natural springs and gravity flow. Over the years, surface water became polluted by industries, municipalities, and later also by excess humus from drainage and peat digging in the wetlands. The development of water pumping and transport technology has made it possible to draw and supply water from distant sources. Meanwhile, knowledge of groundwater sources as well as investigation and extraction technology have improved. All these factors have increased the use of groundwater.

Traditional Water Supply

Dug wells have been used in the country for hundreds of years, but documentation is scarce. Usually one well was built per household, although sometimes one well served two or more households. Because of poor water quality, some villages in western Finland had to

use a common well, or in winter the villagers drew water from a hole in the ice kept open by the community. Villages in eastern Finland, however, did not have community wells (Katko 1989).

Rural water supply has relied on groundwater. Four studies conducted in the 1930s and the early 1940s show that 70-80 percent of households drew their domestic water from wells, 10 percent used water from springs, and the remaining 10 percent used surface water (The Committee for Rationalization of Households 1950). In urban areas, rainwater harvesting played an important role before the introduction of public water supply.

Traditional wells were dug manually and equipped with a windlass for lowering and raising the bucket. In 1951 the breakdown of well lining materials was as follows: stone, 30 percent; concrete, 29 percent; logs, 25 percent; boards, 6 percent; earth, 5 percent; and combinations of the above, etc., 5 percent (Wäre 1952). Tube wells were constructed as early as the 1930s.

Most of the water drawn from wells was used for cattle. Therefore, the water source was, if possible, built close to the cattle shelter rather than near the house. In the 1930s, the distance between the well and the shelter on small-scale farms was, on average, 50 meters (The Committee for Rationalization of Households 1950).

Wells have traditionally been sited through dowsing ("witching" using a forked divining rod). Despite studies showing no correlation between water veins found by dowsing and the occurrence of groundwater, belief in water veins and dowsers remains strong among ordinary people. Single wells were usually constructed by the users themselves.

The soil layer covering the bedrock in Finland (and the whole of Scandinavia) is usually thin. On the other hand, bedrock usually contains several fractures. Boreholes refer to wells drilled into hard bedrock. Cable-tool drilling was introduced in the 1950s, and in the 1960s more efficient drilling methods were developed. Boreholes have most often been used by private households or by a small group of users. In the 1950s a large national contractor initiated well drilling but later many small contractors continued the activity. For glacial sand and gravel formations, tube wells have recently been introduced. Since the 1960s seismic sounding by explosives has been used for groundwater inventory. Electrical sounding came later, and seismic hammer sounding for borehole siting was developed during the 1980s.

A variety of methods for hoisting water have been used in different parts of the country. A national well survey in 1950-51 showed that the most common water-lifting devices were bucket with rod, handpump, and windlass. Only about 7 percent of rural households had piped water. Handpumps accounted for about 20 percent of the water-lifting devices (Wäre 1952).

The oldest handpumps were made of wood. They were installed either on the cover of the well or were operated from the cattle shelter. The wooden pumps for single family use are said to have lasted for about 10 years. These pumps were made by special handpump blacksmiths found in most villages. Wooden handpumps were still commonly used in the early 1950s and to some extent as late as the 1960s.

In the 1930s there were three manufacturers of cast-iron handpumps in Finland. The first versions were so-called suction pumps. Domestic manufacture of cast-iron pressure handpumps started in the late 1950s. The demand for handpumps peaked between the early 1960s and the mid-1970s. In the last few years the handpumps have found a new market in recreational second homes.

For decades the single-handpump well has been used by one or only a few families, but seldom by larger communities. This contrasts sharply with developing countries of today, where larger communities can depend on a single point source.

Water was usually carried in one bucket or cowl for distances less than 100 meters. For distances up to 200 meters, water was carried in 2 buckets, sometimes using a shoulder pole. The pole was slipped through the handles of a cowl, and two persons were required to carry it. In winter, a sled was often used for hauling water.

Women and children usually drew and carried water from wells. In areas where wells were seasonal, up until the early 1960s water had to be transported from greater distances by horse, almost solely the task of men. Today, during certain seasons, farmers have to transport water for cattle by tractor.

Water vending has been practiced to some extent in larger centers. Water was transported and sold by vendors from horse-drawn barrels, as in the 1940s in the rural center Kuusamo. Even today, municipal fire brigades and commercial dairies in some rural areas occasionally transport water.

Development of Piped Water Supply

The development of public water supply systems in Finland's urban centers began in the 1870s. Piped water supply in rural areas developed later and more slowly because of the high price and short supply of pipe.

The first rural water supply systems had wooden pipes, usually hollowed pine. The oldest known wooden-pipe network dates from 1872. Wooden pipes were generally used in low-pressure gravity schemes (Peräkylä 1952). Originally, the wooden pipes were hollowed with a hand drill; machine drills were introduced later. Private entrepreneurs manufactured the pipes. Ostrobothnia, for example, had many such entrepreneurs, some of whom sold their services to other regions. In rural areas wooden pipes were used exclusively until the mid-1950s, when plastic pipes were introduced. Plastic pipes have been prevalent since the 1960s (Katko 1989).

In 1948 the government appointed a committee to work out a plan to rationalize households, with particular focus on small-scale farms. This so-called Women's Committee (all nine members were women) completed their report in 1950. Male professionals supported the committee on technical issues. Given the time spent collecting water, and for several other reasons, the committee regarded the development of piped water and sewers as the most important issue in rural household development. Referring to three separate studies conducted on farm women's work hours, the committee cited average daily work for women of 12-16 hours on weekdays and 9-11 hours on Sundays.

According to the committee, the most significant reason for the primitive state of water supply and sewer systems was the low esteem accorded women's work. Moreover, health issues linked to water were not fully understood, water and sewer lines were considered expensive, and technical know-how was inadequate.

Animal husbandry has been central in the development of rural water supply because cowsheds were provided with piped water before dwellings got sewers. Electricity was introduced first into dwellings, followed by sewers and then piped water (Figure 2.2).

With the rapid change in the distribution of employment (Figure 2.1), the total number of farms has decreased. The data on all the dwelling units in Finland reveal that in 1985 most of the country's 2.02 million units had electricity and more than 90 percent had

sewerage, piped water, and a water closet. Most households lacking those services were in very sparsely populated areas. A densely populated area is defined as containing more than 200 persons with the distance between dwellings usually not more than 200 meters; areas containing fewer persons are defined as sparsely populated areas.

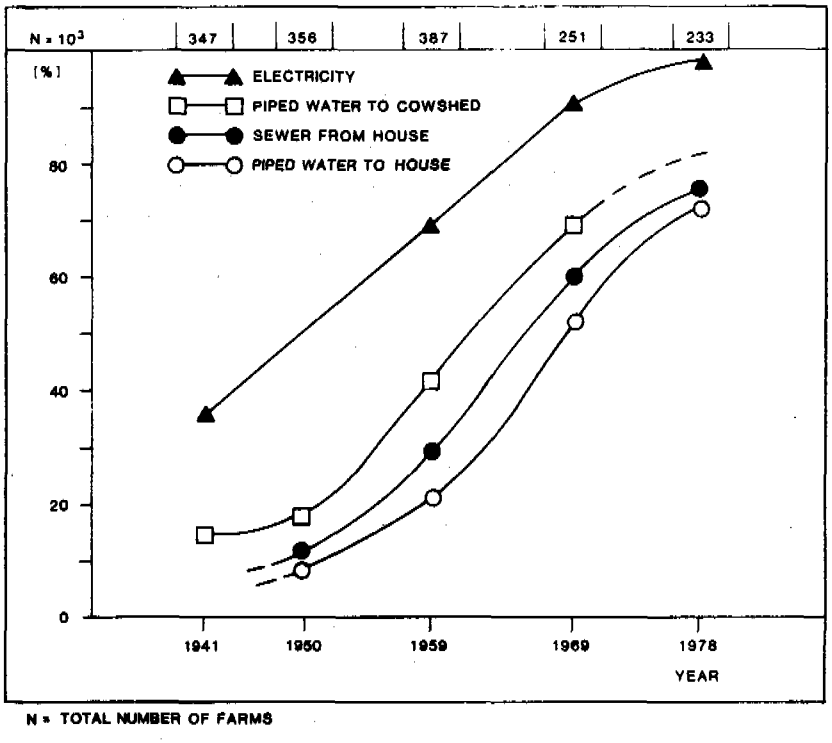

Figure 2.2. The availability of piped water, sewers, and electricity in Finnish farm houses, based on national censuses of agricultural communities in 1941, 1950, 1959, and 1969, and a sample survey in 1978 (Katko 1989).

The Impact of Improved Water Supply and Sanitation

Many myths about water quality and its effects on health have been handed down in folklore. Prior to 1900, it was generally believed that mineral springs had healing powers and that frogs could purify well water. Prior to the late 1800s, the infant mortality rate was over 150 per thousand, a figure typical of today's developing countries. By the end of the century, the rate had decreased because of the promotion of breast feeding in areas where it was not generally practiced (Turpeinen 1979). There is evidence that before the introduction of public water supply in urban areas infant mortality rates were higher than in rural rareas. After water supply and sewerage systems were introduced, the infant mortality rates dropped below rural rates (Pulma and Turpeinen 1987). Before the 1940s, typhoid epidemics occurred in communities along larger rivers and in industrial and residential centers. After the Second World War, the Karelians who resettled in Ostrobothnia often suffered epidemics of typhoid. In the early 1950s, mortality rates in Finland were still higher than elsewhere in Western Europe.

Infant mortality, which is closely correlated sanitation, was about 100 per thousand at the turn of this century. This high figure is comparable to present-day infant mortality

rates in low- and middle-income nations in Africa.[2] Breast feeding came into general practice toward the end of the 19th century and infant mortality decreased most significantly in areas where breast feeding had not been customary.

The infant and child-care system that raised public consciousness of hygiene and sanitation issues evolved in Finland following the Second World War. This program was supported by UNICEF, which today receives a significant part of its funding from Finland. The infant mortality rate in Finland is now six per thousand, among the lowest in the world.

In urban areas, frequent epidemics occurred before the introduction of public water supply and sewer systems. It is not possible to quantify the health impact of improved water supply and sanitation, but these examples show that clear health benefits have been achieved, in part through improved water supply and also through improved hygiene, public education, and nutrition.

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2. In low-income countries, the infant mortality rate varies from 91 to 175 per thousand, and in middle-income countries it ranges from 25 to 127 per thousand (Skyttä 1989).

III. DEVELOPMENT OF WATER SUPPLY INSTITUTIONS

Types of Water Associations

Cooperative enterprise has a long and well-established tradition in rural Finland. The oldest water sector cooperatives were lake drainage associations. They functioned on the mutual trust of the members, who agreed to the drainage projects and paid their costs. These associations were active from the mid-1700s to the 1960s (Anttila 1967). According to Wäre (1989), this tradition set the precedent for water associations to provide rural water supply. The associations were informal at first, and later acquired formal status.

Common water supply in Finland is provided by publicly owned and managed municipal works and privately owned and managed institutions. This study concentrates on privately owned water supply associations: partnerships, cooperatives, stock companies, and bulk supply companies. These associations must, by definition, be nonprofit.

Partnerships. The partnership is the oldest form of association in the country, created in 1734. A revised Partnership Act was passed by Parliament in 1988 (Juhola 1990). A partnership can be established by two members, with an oral or written agreement. Each member is responsible for the debts of the partnership.

Cooperatives. The cooperative movement came to Finland at the end of the 19th century, particularly to the farming societies, and later to other enterprises. The first cooperative act was passed in 1901, revised in 1954, and further modified in the 1980s. In 1990, the laws on cooperatives were amended to broaden financing options and allow creation of stock companies. Water supply cooperatives are structured with a board of administrators elected annually by the association members, each of whom has the right to participate in the annual meeting. The board of administrators sets membership fees, charges, and dues, and is responsible for managing the finances of the cooperative. In smaller organizations, one member of the administrative board serves as part-time system manager.

Stock Companies. The first act on stock companies in the country was adopted in 1864, and the latest revision was passed in 1980. In principle, it made formation of a stock company a more readily available option but limited the rights of shareholders to modify the articles of association. A stock company can be founded by one or more persons. Municipalities usually own at least a portion of the shares of the water company to protect the public interest and influence economic development, land-use planning, and other local concerns.

Bulk Supply Companies. Water supply stock companies are usually responsible for water purchase, treatment if required, and delivery to retail customers. Bulk supply companies sometimes only abstract and treat water, but usually also deliver it to distributors for resale to individual customers. Groups of municipalities or smaller associations may own a bulk supply company (Kotila 1989).

Financing of Water Supply

There are four principal methods for financing the investments of water supply associations: (1) consumer charges, (2) loans from commercial banks, (3) central government support, and (4) municipal support. There have been continuous modifications in financing methods for water supply, and different institutional forms have followed different funding practices.

Central Government Support

Rural water supply and sewerage were first developed by private entities. In 1951, based on the work of the Committee for Rationalizing Households, the Act on Loans and Grants for Water Supply and Sewerage in Rural Municipalities was adopted into law. Only private associations were included in this grant and loan program because rural municipalities believed that the organizing of public water supply or sewerage was not their responsibility. The total volume of these loans and grants remained low until the late 1960s. However, they helped improve the quality of installation and construction since implementation had to be supervised by the water authorities.

In 1963, a law concerning government support to earth and water construction projects was enacted. The maximum total share of grant and loan support was 75 percent of total investment costs for works in sparsely populated rural areas and 60 percent for works in rural population centers. In this way, rural municipalities became support recipients, although the repayment period was 10 years for municipalities and 24 years for private entities. In 1969, under a law dealing with interest subsidies by the Postal Savings Bank, urban municipalities were made eligible to receive funding.

In 1972, the cabinet made a decision on the Government-Supported Water Pollution Control Works. These construction works were partly or totally carried out by the National Board of Waters and its district offices. In 1973, a similar law was made to support water pollution control activities, but both decisions were replaced in the late 1970s by another cabinet decision on Government-Supported Water Supply and Water Pollution Control Construction Works. Under this law, the central government finances transmission mains and trunk sewers and works with the water utilities to tailor agreements on financial arrangements. In the 1980s, this support was expanded to include trunk mains in sparsely populated areas.

The central government has also channeled so-called Employment Promotion Funds into water supply and sewerage since the 1950s. Present government support to water supply is administered through the National Board of Waters and Environment and includes the following forms:

- An interest subsidy scheme for planning, design, and construction of common water supply systems;
- Grants to water supply systems serving more than 10 households. In 1990 the lower limit for the number of households served was removed;
- Government-supported water supply construction works; and
- Employment promotion funds.

The central government's responsibilities for water supply now consist of the following activities:

- Inventory of groundwater resources;
- Approval of plans and designs;
- Construction of regional transmission mains and trunk sewers;
- Advice on the establishment of community-based water associations; and
- Channeling government financial support.

Central government support to the water supply and sewerage sector was directed first to rural centers and later, gradually, to sparsely populated rural areas. Support for regional transmission mains and trunk sewer lines has encouraged the establishment of larger regional systems. In the northern and eastern parts of the country, where economic capacity is smaller and the natural conditions present special difficulties for common water supply, employment promotion funds have promoted water supply and sewerage development. Government support, always less than 10 percent of total investment (Figure 3.1), has been an important incentive for systems that otherwise probably would not have been viable. A parliamentary committee has suggested that by 1995 government support to the sector should be ended (The Ad Hoc Committee for Environmental Economics 1989).

The evolution of central government support to the sector has spawned, to some degree, organizational structures and technical solutions that reflect the political nature of this support. For instance, the construction of regional transmission mains by the water districts was to some extent influenced by the interests of the regional districts. As the volume of conventional river construction activities decreased, district authorities wanted to guarantee their staff employment. At certain times, government support may have promoted particular technical solutions, but today common water supply and point-source improvement receive equal consideration.

Municipal Support

The first urban water supply and sewerage systems were built in the 1890s. By 1920, 15 of the country's more populous urban townships had established public water supply systems, and all but one of these had also built a public sewerage system. The responsible institutions were municipal departments: there were no private urban water or sewerage systems (Kallenautio 1984). The development of urban water supply and sewerage systems was most active from the mid-1950s until the late 1970s. Efficient wastewater treatment plants have been constructed since the mid-1960s.

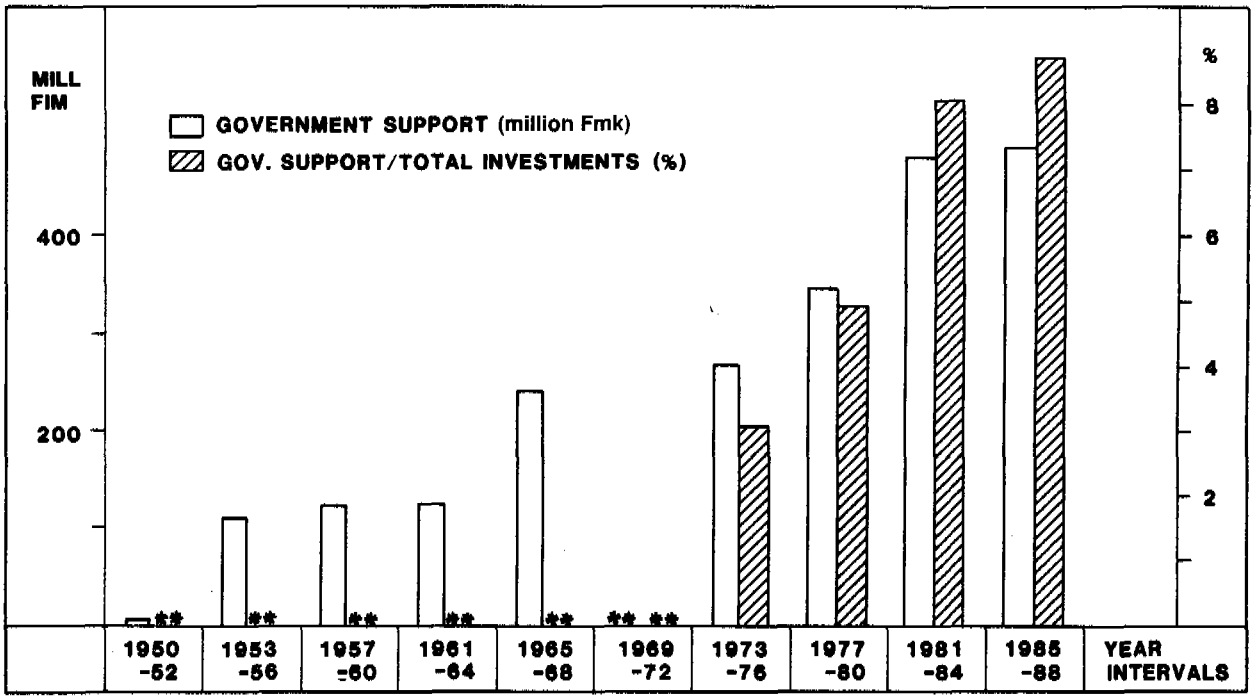
In 1990, there were 460 municipalities in Finland, 94 urban and 366 rural. Municipal governments collect taxes and municipal councils allocate these funds in their annual budgets for water supply and sewerage. Central government support to water and sewerage systems is channeled outside the municipal budgets.

During the 1950s, rural municipalities did not assume responsibility for developing water supply or sewerage, for two major reasons. The first was political: water supply and sewerage systems were needed most in the central village(s) of rural municipalities, but most inhabitants--and therefore most voters--lived outside these central areas. The other reason was legislative: only associations were included in the 1951 Act.

The Construction Act of 1958 mandated municipal provision of sewerage within the planned areas of rural centers, and municipalities either established water and sewerage departments or water (and sewerage) stock companies. Since municipal institutions usually consume large quantities of water, the municipality was often willing and able to purchase most of the shares.

Especially in the 1960s and 1970s, municipalities took over many water and sewerage stock companies. The Association of Finnish Municipalities favored this approach strongly. As late as the early 1980s, it advised municipalities that it is not their responsibility to guarantee the debts of water associations.

In the 1980s, municipalities tried to make their water and sewerage departments more independent, sometimes privatizing them, and many municipalities began to support



* $1 = Fmk 4,3 (1989), BASED ON CONSTRUCTION COST INDEX
** NOT AVAILABLE

Figure 3.1. Government support to water supply and sewerage compared to total sector investments (Pekkanen 1968, National Board of Waters and Environment 1990).

water supply in rural areas. In the past decade, municipal support to water supply has taken the form of grants, loans, payment of interest on loans, or loan guarantees, and has included these other forms:

- Investigation of groundwater resources,
- Preparation of master plans and detail designs,
- Construction (or support for construction) of water supply and sewerage networks,
- Support of on-site supervision,
- Help in bulk purchase of construction materials,
- Support and advice in the establishment of water associations in dispersed rural areas, and
- Assistance with financial accounting.

The amount of municipal grants for common water supply varies considerably in sparsely populated areas. Municipalities may provide different types of financial support, and neighboring municipalities may have widely differing policies. Support has also recently been given to improve point-source water supply in very remote rural areas.

Municipalities have gradually assumed the activities of water districts, which were preceded by the Agricultural Engineering Districts of the 1950s. As piped water and sewerage systems have been implemented in rural centers, the focus has moved to rural areas with dispersed settlement. Municipalities have begun to support water and sewerage systems

covering larger areas. In the future, needs for rehabilitation of water supply and sewerage networks should increase, and this will influence institutional and organizational structures.

Development Stages of Water Associations

Piped rural water supply was first developed in areas where demand was highest and the natural conditions most appropriate. In the Östrobothnia region on the western coast of Finland, the quality of water from traditional wells was low, and homes were traditionally built along river banks. These conditions are technically ideal for piped water supply.

First-Stage Water Associations. This category includes community-managed water supply systems built before 1950, a total of 389 piped water supply systems in rural municipalities. About 60 percent were located in the administrative region of Vaasa, in Ostrobothnia, and most served fewer than 20 households (Wäre 1951). There are no data available on the institutional development of these systems, but most were partnerships based on oral agreements. A number of cooperatives also existed, many of which were not officially registered. Construction was largely based on self-help. Most--nearly 90 percent--used wooden pipes (Wäre 1951) and were built by local, small-scale contractors.

Second-Stage Water Associations. The second-stage associations came during the period from the 1950s to the mid-1970s and are characterized by the following features:

- The beginning of central government support, and later, municipal support for the sector;
- The decrease in construction based on self-help and the introduction of mechanized construction;
- The replacement of wooden pipes by plastic; and
- The growing willingness of rural municipalities to promote development of water supply and sewerage.

By 1960, partnerships were the most prevalent form of institution supplying water to groups of 10-20 households. Cooperatives were the most common institutions serving medium (20-100 households) and large (100 or more households) systems. At this time, all categories of water supply systems increased in number, and the total rose from 360 to 566. Growth was rapid in partnerships and especially municipal waterworks, as municipalities began to consider water supply development their duty in the late 1950s (Peräkylä 1963).

In the 1950s, the Agricultural Engineering District of Oulu was especially active in promoting rural water supply. It organized "water meetings" in rural centers to explain the advantages of common piped water systems, describe the possibilities for financial support, and promote the establishment of water associations.

In the earlier phase, the Agricultural Engineering Districts (predecessors of the Water Districts and later Water and Environment Districts) promoted the establishment of water supply cooperatives. Later, at least in Oulu, the districts preferred stock companies for rural centers.

Engineering consulting companies and contractors were established in the 1950s. Their growth was in part due to rural water supply development. The same decade saw the introduction of the first Finnish-language terms especially for water supply and sewerage.

In the 1950s, the Engineering Department of the Ministry of Agriculture and the Agricultural Engineering Districts introduced a policy that strongly favored the use of groundwater in rural water supply, and district offices began groundwater inventories.

There are no data on the institutional development of small rural water supply systems of the 1960s: the available data cover only systems serving at least 200 persons, approximately equivalent to the category of more than 20 households. Water supply systems serving more than 200 persons numbered about 210 in 1955, about 340 in 1960, and about 390 in 1967 (Peräkylä 1963, Jokela and Murtomäki 1968).

Changes in administrative structures in the 1960s make it impossible to compare institutions. Some rural or semiurban municipalities became urban, but the Engineering Department of the Ministry of Agriculture was responsible only for the development of rural water services.

Third-Stage Water Associations. This category includes water supply associations established from the mid-1970s to the present, most of which are in sparsely populated areas. Municipalities have often supported these associations.

By 1980, about 70 percent of the population in sparsely settled rural areas was connected to common water supply systems. The lowest rates of connection, 60-65 percent, were found in the southern region of Uusimaa and the eastern region of Mikkeli. The highest rate, about 80 percent, was counted in the southwestern district of Åland and the western district of Vaasa (Ministry of Agriculture and Forestry 1983).

In the 1970s, the water districts prepared general plans for water use based on water resource areas. Water supply was one component of these plans. The first master plans for water supply were made for the western part of the country, typically for one river basin or a part of it. In the 1980s, more focused master plans were prepared for one or a few municipalities. Today, regional water master plans can refer to different sizes and types of areas. In the eastern and northern districts, the master plans concentrate on water supply in sparsely populated areas and, typically, cover only one municipality. In the southern and western districts, regional water supply master plans cover large areas.

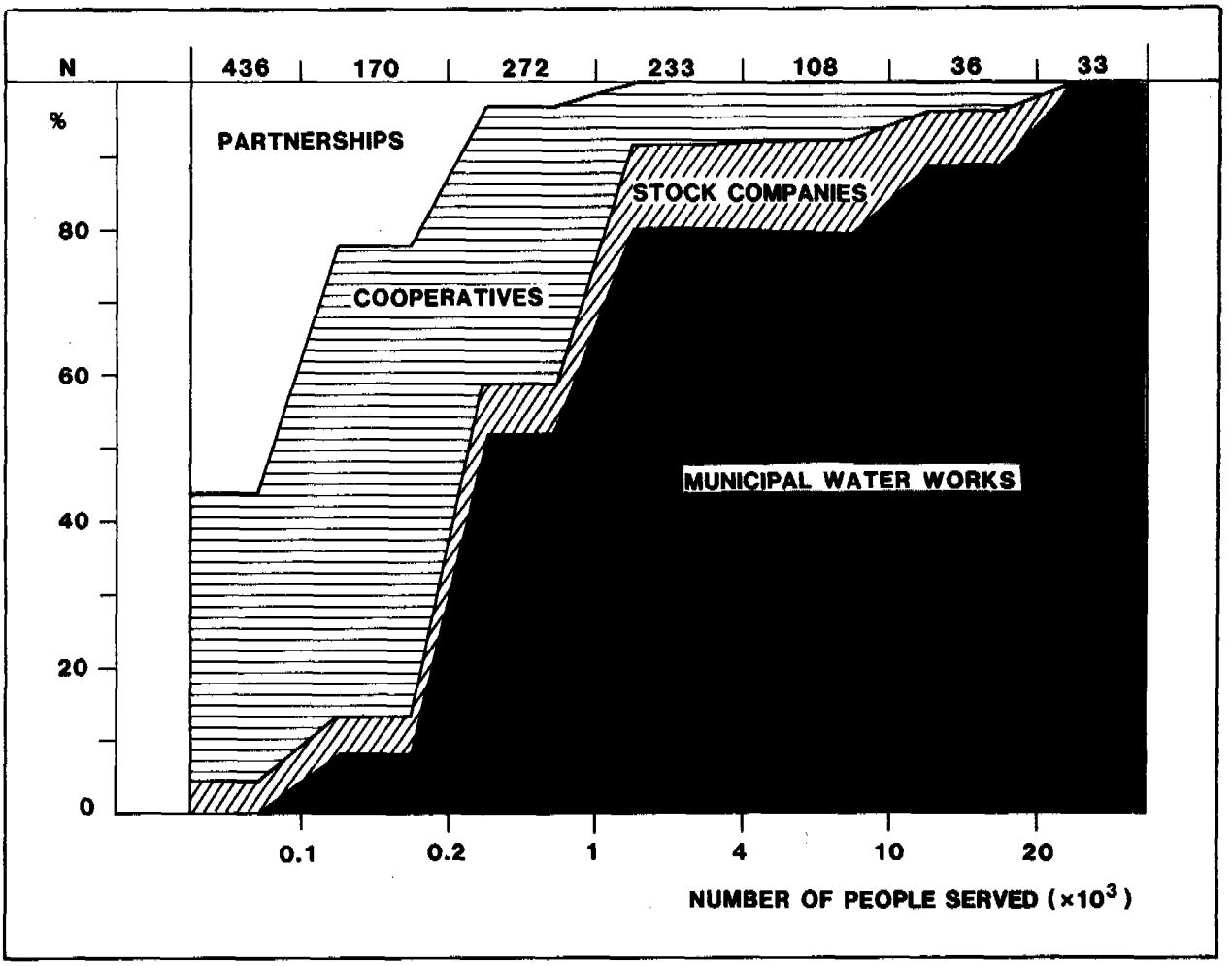
In 1980, the National Action Committee of the International Drinking Water Supply and Sanitation Decade (IDWSSD) in Finland formulated operational goals, one of which was to improve water supply and sanitation in sparsely populated rural areas. During the Decade, a guidebook on water supply in rural areas was prepared as a joint effort by the Association of Finnish Municipalities and the Assocoation of Finnish Water Supply and Sewage Works. In 1987, a cabinet-level policy decision affirmed that the government and municipalities should promote the improvement of conditions in rural areas. Between 1987 and 1990, a special project developed water supply technologies and implementation practices for dispersed rural areas with pilot subprojects in five central and eastern Water and Environment Districts.

Institutional Development in the 1970s and 1980s. The largest investments (in real terms) in water supply and sewerage took place in the 1970s. From 1970 to 1988, the number of persons connected to common water supply systems grew from 2.6 million to 4.1 million, and the number connected to sewer systems increased from 2.4 million to 4.1 million.

Beginning in 1958, rural municipalities became responsible for developing sewerage systems for their centers. In the late 1960s, the rural municipalities started to construct wastewater treatment plants, most of which were completed in the 1970s. In 1974 the Sewage Charges Act became effective. It decreased average per capita consumption even during a period of continuous economic growth.

The statistics of the National Board of Waters and Environment reveal that the share of municipal waterworks has increased, especially in the 1970s. The number of water associations (partnerships, cooperatives, stock companies, and bulk supply companies) has remained almost stable, while the number of industry and institution-owned systems has decreased steadily.

Analysis comparing the institutional changes and size of supply system shows that municipal waterworks serving 1,000-4,000 persons have increased in number, but water associations have decreased. Systems serving 200-1,000 consumers have changed little (Figure 3.2). Most water associations serve fewer than 200 users and so do not appear in the official statistics of the water authorities. The data for this study were gathered from water and environment districts, district health authorities, and by direct contacts. Partnerships are most common among systems serving fewer than 100 persons. Cooperatives are frequently found among systems serving from 200 to 1,000, and stock companies are evenly distributed in each category.



N = TOTAL NUMBER OF SYSTEMS IN EACH SIZE CATEGORY

Figure 3.2. The relative institutional distribution of water supply works in different-sized categories in Finland in 1988. Data on population served could not be identified for 43 water associations (Juhola 1990, modified by the author).

The variety of water supply institutions is reinforced by the fact that in 1988 there were 13 regional, bulk-sale water companies in Finland, and five more were being planned

The variety of water supply institutions is reinforced by the fact that in 1988 there were 13 regional, bulk-sale water companies in Finland, and five more were being planned (Juhola 1990). They are usually owned by municipalities, associations, and other large consumers. Municipalities own and manage the majority of sewerage systems, and their share of ownership has been increasing steadily since the 1960s.

From 1973 to 1987, many water associations merged or dissolved (Figure 3.3). More partnerships were established than were dissolved or merged. The number of cooperatives increased during 1973-78 and remained stable during 1978-87. Cooperatives have been merged with larger systems and new cooperatives were established in sparsely populated areas. About 25 stock companies were dissolved or merged during 1973-87, and about 10 new companies established. This suggests that many of these systems have been merged with or, more probably, made into municipal works.

Many stock companies experienced financial difficulties. Most were located in rural centers and experienced serious strains under the impact of efficiency requirements. The Association of Rural Municipalities promoted municipal takeover of waterworks. Since municipalities usually owned most of the shares, they tended to see such a move as being in their best interest.

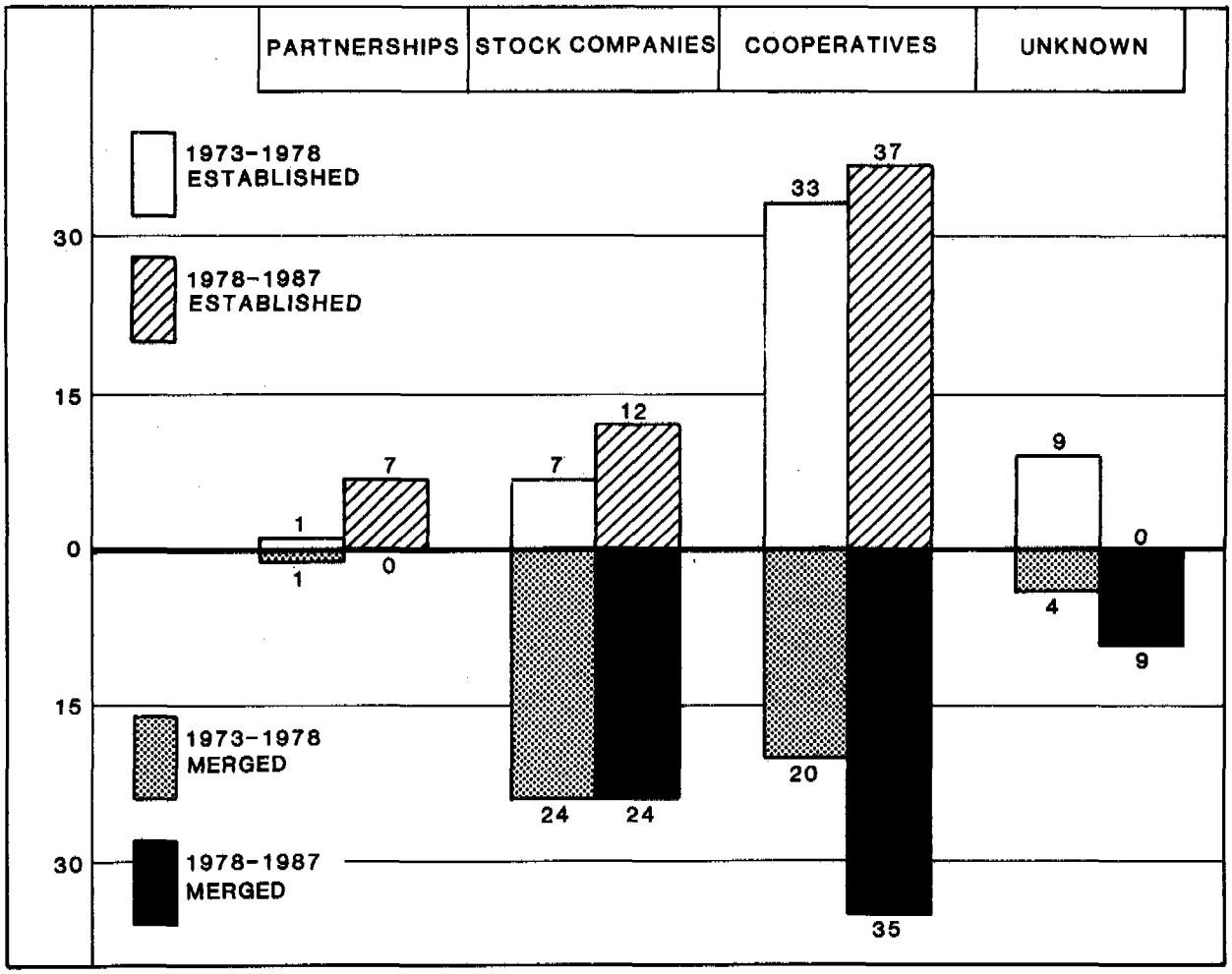


Figure 3.3. Water associations established and merged in Finland, 1973-78 and 1978-87.

IV. CASE STUDIES OF WATER ASSOCIATIONS

Methodology and Approach

During the study, visits were made to a total of 39 water associations and 11 of the 13 Water and Environment District offices. In the preparatory phase, December 1988 to November 1989, key personnel of different water associations were interviewed, as were more than 20 representatives of the National Board of Waters and Environment, water district offices, universities, and professional associations.

Background research provided historical information on the sector. Semistructured interviews developed and tested during the preparatory phase allowed persons interviewed to communicate their views freely.

The list of interview topics (Appendix 1) was not followed sequentially but used as a checklist to cover all the topics. Interviews usually began with traditional water supply issues and covered water supply associations, finance, cost recovery, the roles of different parties, and future prospects. Implications for developing countries were discussed only with persons having specific knowledge of the developing world.

The field survey phase, December 1989 to January 1990, included three one-week missions and several one-day trips. A total of 122 persons were interviewed face-to-face in 63 meetings. Each case-study association was visited at least once, and usually more than one association official participated in the interviews. The author conducted most of the interviews in the preparatory phase. Mr. H. Morange, from TUT, participated in some interviews during the preparatory and field survey phases. Mr. P. Juhola, a M.Sc. candidate from TUT, participated in most of the interviews from October 1989 to January 1990. Most interviews of the case-study associations were conducted by two, or even three, persons. The following analysis follows the sequence of interview topics.

This chapter combines the results of the interviews with the case-study associations (mainly with initiators and managers), those in water and environment districts, and other individual experts and associations.

Selected Case-Study Associations

Altogether, 39 water associations were covered in 34 interviews. Some associations had undergone significant organizational changes over the years. The cases were treated separately when the new organization had either enlarged its supply area or otherwise clearly changed its activities, for example, to sewerage.

The case-study water associations can be distinguished according to the following categories: (1) partnerships, (2) cooperatives, (3) stock companies, (4) bulk supply companies, and (5) point-source improvement in sparsely populated areas.

The case-study associations include 2 partnerships, 25 water cooperatives, 8 water-supply and sewerage stock companies, and 3 bulk water-supply companies. The study includes one case of improving point-source water supply in sparsely settled rural areas (Appendix 2). Three of the 25 cooperatives and 4 of the 8 stock companies also provide sewerage service.

Many case-study associations are located in the western part of Finland, but the cases cover most parts of the country except Lapland and the southwestern district of Åland archipelago (Appendix 3).

The case-study associations were established at various times during the period from the 1940s onward (see Figure 4.1). The stock companies are the largest institutions, and the water cooperatives, which vary in size, serve from 100 to 9,400 persons. The newest water cooperatives operate small systems in sparsely populated rural areas.

Development of Water Associations

The development of water supply associations as described here proceeds gradually from initiation to implementation and operation. The steps point out key decisions that consumers and the association must make during the process:

- Assessment of need for improved water supply
- Establishment of association
- Selection of the type of organization
- Assessment of consumer willingness to join the association
- Planning and implementation
- Operation

Step I: Reasons for Improving Water Supply. In most of the 39 case-study associations, the most significant problem with traditional water supply is excess iron and manganese. Most traditional wells also tend to run dry, particularly at the end of winter (February-April).

Up to the 1960s, milk production was a very important source of income for small farms. Thus the needs of the dairy industry propelled the development of common water supply systems along the western coast. Around 1970, the dairy industry introduced a system of progressively higher prices for better-quality raw milk. Since the hygienic quality of the water affected the quality of milk, this move stimulated the development of common water supply systems.

Finland's movement toward a postindustrial economy during the past two decades (Figure 2.1) has concentrated milk production in the northern and eastern parts of the country and increased the need for better water supply in those regions. In sparsely populated areas that lack common water supply, water is still transported for profit by dairies, municipal fire brigades, and other private businesses and nongovernment organizations (NGOs).

Meat-packers, cheese makers, and potato processors have also been interested in developing rural water supplies. Often municipalities have competed with each other and offered incentives such as high-quality water at a reduced rate to these industries. Rural municipalities have sought to attract industries that receive government support for locating in the so-called "development areas" in northern and eastern Finland.

There are two main alternatives for improving water supply: either common water supply systems or point-source improvement. Usually development efforts and the municipal and governmental support have concentrated on developing common water supply systems. Still, the policies of the Water and Environment Districts vary in different parts of the country.

Step II: Establishment of Associations. In the initiation, promotion, and establishment of water associations, the role of one person, the "driving force" or "champion," is decisive. Usually this person participates actively in other community

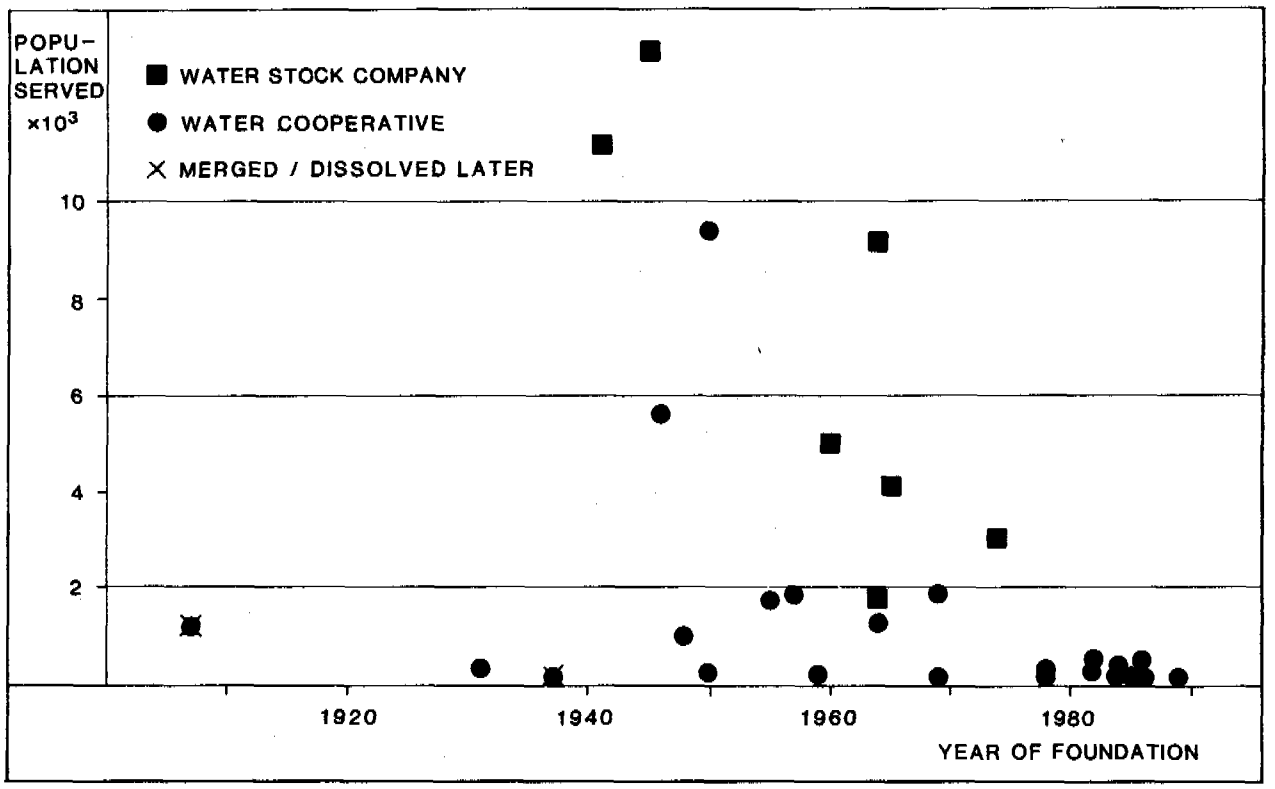


Figure 4.1. Distribution of the case-study cooperatives and stock companies by year of establishment and present or maximum size.

activities. In central rural villages, it may be a police officer, a teacher, or business owner. In more sparsely populated areas, the activist is usually a farmer.

Many water associations have been preceded by informal partnerships based on mutual trust and oral agreements between neighbors. When a larger system has been initiated, the community or a part of it is involved in establishing the association.

The idea for a common water supply can originate with an individual, the water district, or the municipality. The Agricultural Engineering Districts promoted water associations in rural centers during the 1950s and 1960s. In the 1980s, municipalities were important promoters of water supply for surrounding sparsely populated areas.

About 2,000 village development committees have been established since the mid-1970s for smaller villages and sparsely populated areas outside the main villages of rural municipalities (Rimmi 1988). The principal objective of these committees is to safeguard village services so that residents will not move away because basic services and facilities are lacking. The committees make proposals to the rural municipalities on different development needs and the priorities of the community. In about half the case-study associations in sparsely populated areas, the committees have been involved in initiating water supply services. In terms of representation, the village development committees are the largest NGOs in the country today.

Once the idea of common water supply has been introduced, a meeting is called to establish a committee to survey consumer willingness to join a common system and make preliminary plans to organize and finance the system. Representatives of the water district and the municipality may assist the local committee.

After initial preparations, the committee organizing meeting establishes the association. The meeting elects the board of directors and files the registration documents. Registration, a basic requirement for governmental or municipal support, has long been required of water cooperatives and stock companies; however, partnerships have been required to register only since 1984.

Women are often active in demanding improved water supply, especially for households. However, they are seldom elected to the board of directors. It seems that men consider the improvement and management of household water supply to be their duty.

The experiences in nearby villages and municipalities can influence the creation of new water associations. Initiators and newly elected board members often seek contact with other associations to learn from their experiences.

The Pellervo-Seura, the central society of production cooperatives in Finland, developed and distributed the first "model rules" for establishing water associations. These were later modified by the National Board of Agriculture and its Agricultural Engineering Department. Since 1960 the Association of Water and Sewerage Works has provided expertise and guidance in matters related to the organization and operation of water associations.

Step III: Selection of the Type of Organization. *Partnerships* typically serve fewer than 20 households (Figure 3.2). In practice, a partnership requires cooperation and trust. Since any partner cannot leave the partnership without the approval of all the other members, the organization is stable. Currently the Association of Finnish Water Supply and Sewerage Works recommends cooperatives over partnerships (Korhonen 1989), but in the smallest systems partnerships may still be appropriate.

Representatives of water associations were also asked about the advantages and disadvantages of cooperatives and stock companies. Most of the persons interviewed expressed detailed opinions about each organization type.

The principal advantage of water *cooperatives* is the population's long familiarity with the organization type and management structure. Flexibility in decision making and the lack of bureaucracy are important advantages. Several persons interviewed pointed out the equity issue as an important advantage. In practice, cooperatives rely on consumer participation and commitment. They function especially well as small systems serving a few close neighbors (Figure 4.2). However, there are a few large water cooperatives serving about 10,000 people (for example, case no. 10). The service area of a cooperative need not be limited by municipal boundaries.

The biggest problem with cooperatives is potential unwillingness to expand service area. Older, self-financed systems did not receive external support. The connection charge was the same for each member, and the cooperatives would lose money if they added long pipelines for new connections. The government and municipalities now require written agreements on the boundaries of service areas when they provide external support.

Other difficulties beset water cooperatives. Members of older cooperatives may consider their capital outlay a "once-and-for-all-time" investment and can be reluctant to increase it. High-volume users do not necessarily have proportional representation in decision making. Although water cooperatives, as small systems, are usually simpler and less technically demanding than larger systems, their limited expertise can result in problems such as water freezing in pipelines, insufficient maintenance, and service charges that do not recover costs. The organizational fragmentation that results from numerous small water

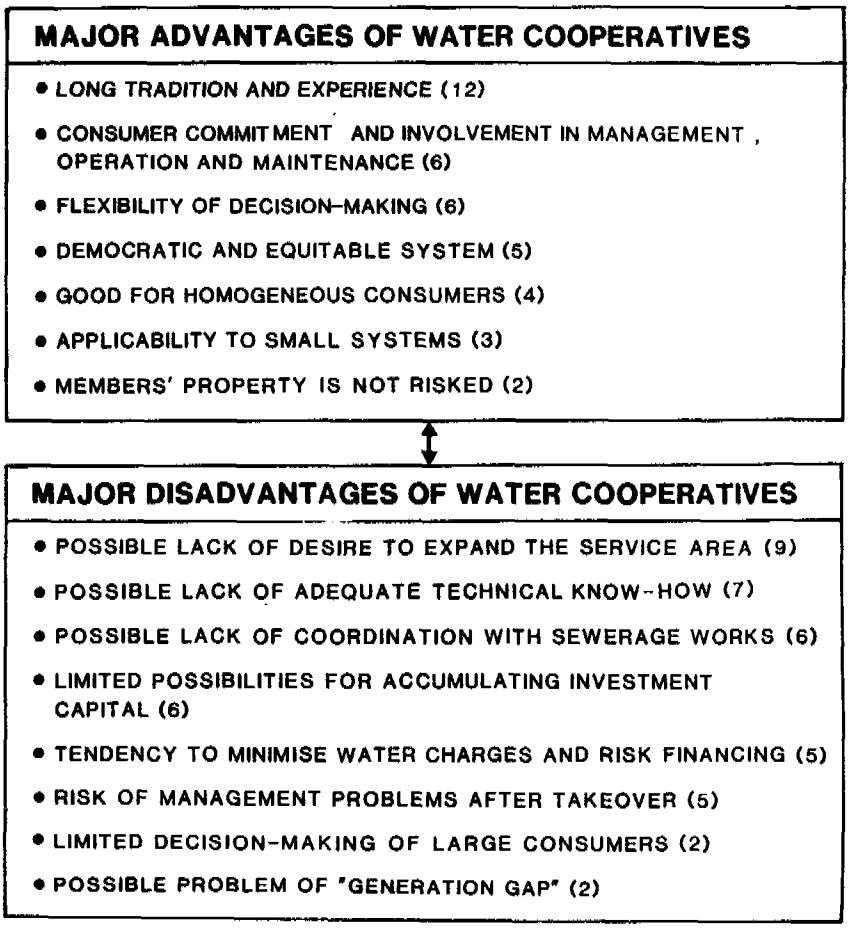


Figure 4.2. Summary of responses to question on advantages and disadvantages of water cooperatives. Frequency of the characteristic is shown in parentheses. There were 50 respondents and 95 individual characteristics.

cooperatives also poses potential conflicts, and a successful cooperative must have a skillful manager to control and expand services.

Compared to municipal water and sewage works, *stock companies* have the advantages of flexible decision making, reduced bureaucracy, and greater cost-effectiveness. The autonomy of stock companies seems especially favorable for tariff setting and cost recovery (Figure 4.3). The principal disadvantage of a stock company is the risk that the larger consumers may dictate their will. Of course, some persons interviewed saw this is an advantage.

In comparing water cooperatives and stock companies, those interviewed mentioned positive and negative characteristics equally. Persons interviewed tended to favor the organization type they represented and to criticize the other. Selection of organization type appears to be influenced by a district's experience with one organization type or another, the experiences of neighboring municipalities, and the preferences of the local water district office. Municipal water works were not strongly represented in the study, and the interview results displayed in Figures 4.2 and 4.3 should be interpreted with this in mind.

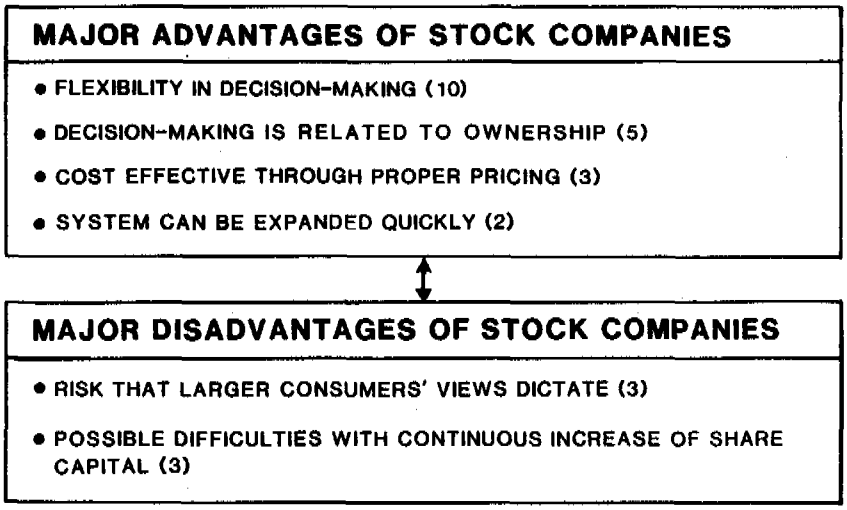


Figure 4.3. Summary of responses to questions on relative merits of water stock companies. Frequency of the characteristic is shown in parentheses. There were 20 respondents and 33 characteristics.

One common disadvantage of water cooperatives and stock companies is their lack of coordination with sewerage works. Chapter 3 discusses legislative and other reasons why municipal departments manage most sewerage works. The few examples of combined water and sewerage cooperatives and stock companies show that these organizations can also manage sewerage works.

Bulk supply companies draw and distribute quality groundwater to shareholders and other distributing works for sale to individual customers. The three bulk supply companies included in the interviews have different ownership structures. In Vihanti (No. 38) the three cooperatives own most of the shares. In Lappavesi Ltd. (No. 37) and Vesikolmio Ltd. (No. 36) several municipalities own the company jointly.

Specific questions about advantages and disadvantages of bulk supply companies were not included in the interviews. Bulk distribution systems have made it possible to distribute groundwater resources over large areas efficiently and cost-effectively. Water district offices have mostly promoted the selection or establishment of these systems through groundwater inventory and technical support. The bulk supply companies often also sell water to small partnerships, cooperatives, or companies. They may also support these associations with technical advice and assist with supervision and maintenance.

Step IV: Assessment of Consumer Willingness to Join the Association. Household willingness to join a common water supply system depends on many factors, including local circumstances, the relative amount of the connection charge, consumer preference and earlier experience, promotional activity, and the quality of system management. In establishing a common water supply system, typically only a few households are initially interested in joining the system. Several meetings and other preparatory work may be needed prior to the establishing meeting, where normally between 10 percent and 50 percent of potential households join the cooperative. Before construction the number usually rises to 30-60 percent (see Figure 4.4).

Willingness to join a common water supply system increases remarkably during construction. Once the "doubters" see that the system will be constructed, many decide to join. Promotion at this stage can be worthwhile, and participation may reach 90 percent. After construction, coverage is usually 90-95 percent, although lower rates may result

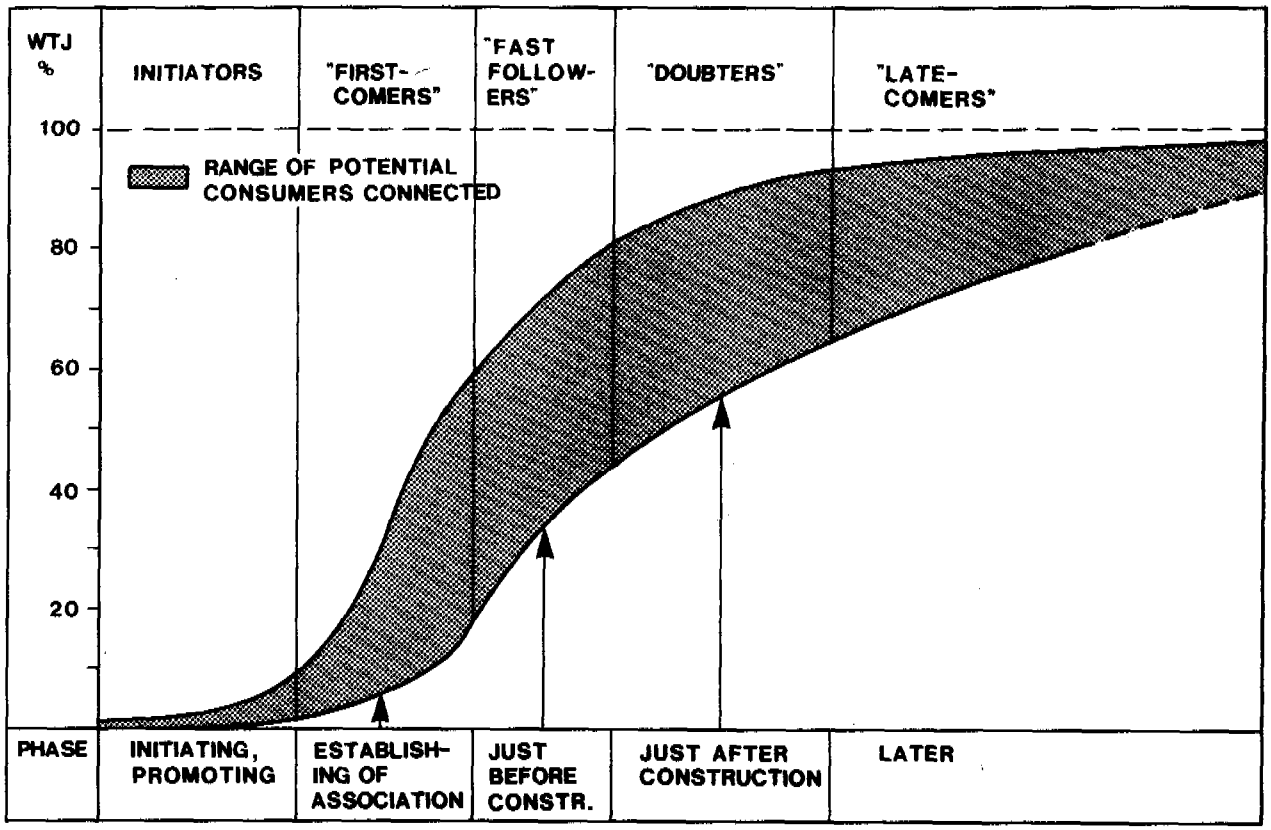


Figure 4.4. Household willingness to join common water supply systems at various stages (4 to 11 cases, compiled by the author).

depending on variables such as location, age, and size of the system. Often, more households join when the system is complete. In a limited service area coverage may reach 100 percent, but systems with an expanding service area may have much lower rates.

Vital to the establishment of a water supply project, the initiator, or "champion," must introduce or sell the idea of common water supply. If there is a tradition of common water supply systems in the area, willingness to join can be expected to be high from the beginning, but sometimes the idea of a common water supply system is introduced by residents who have moved to the area from a community that offered good water services.

The influence of women is decisive when a household decides whether to join a system or not. The interviews revealed clearly that women typically propose joining the system. Even older male respondents often gave answers to this effect. Women participate actively in the initial and establishing meetings. In case No. 16 a local women's rural development organization (an NGO) made the original suggestion of common water supply. As equality has developed in the society, women have been especially active in initiating water supply in sparsely populated rural areas, especially during the 1980s. Women often signed municipal surveys that asked whether the households wanted to improve their water supply (point source or common system).

As a device to generate interest in community water supply, personal visits and discussions by initiating committee members are more effective than questionnaires. Another decisive factor is the cost to the household for connection to the system. Districts and municipalities have differing policies on financial support of the systems. Central government or municipal support can range from zero to 80 percent of the total investment cost. The

average connection charge per household amounts to Fmk 4,000-5,000 ($1,000-1,250 in 1990), but may be much higher in sparsely populated areas. Some districts set the connection fee at a flat rate, while other districts require each household to pay all the costs of connection. The highest acceptable connection charge is about Fmk 10,000 ($2,500 in 1990), though much higher charges can occur. The highest acceptable total cost (connection charge, construction cost of the connection, and material costs) is roughly Fmk 30,000 ($7,500). It is important for consumers to know how much they will have to pay or contribute to the system. In older cooperatives, a significant part of the costs were paid in labor or materials, but this practice is uncommon today.

Occasionally opponents of common water supply organize "antipromotion" campaigns. Even in the late 1980s, several cattle farms in sparsely populated rural areas did not choose to join an existing scheme (for example, No. 23) even though their income is directly dependent on water supply. These households did not value their time and money spent on hauling water. Interpersonal relationships sometimes cause unwillingness to join a system, especially for older systems financed and managed by private households and serving a limited area.

In very sparsely populated areas, point-source improvement remains the most cost-effective option. Households that have recently installed an improved point-source system are often unwilling to join a community system. Since most land is privately owned in Finland, water associations have occasionally been obliged to persuade landowners to allow construction of the pipeline through their property. If a landowner wishes to join the system, he or she must allow pipeline construction without compensation.

Step V: Planning and Implementation. Plans for common water supply systems are often included in area, river-basin, or municipal master plans. In small associations, managers or local experts once made the plans on their own, and up to the 1950s, the representatives of Agricultural Engineering Districts in the western part of the country prepared plans. In the 1950s, several consulting engineering companies were established and became involved in planning and design.

Recently, planning has been carried out by engineering consultants or by staff members of municipal water utilities. Some municipalities have taken over the whole planning process, especially when there are many water associations in the municipality (for example, Nos. 18, 21, and 22). Sometimes the plans prepared by consulting engineers for sparsely populated areas are paid for by the nearest municipality, but in population centers the association pays for the plans on a normal commercial basis. The municipality typically participates in deciding the service area boundaries for an association.

The Water and Environment Districts give technical and policy advice in the planning stage. When they channel governmental support, they require that the system be expandable. If they promote the construction of larger-area systems, they may construct the main pipeline (or sewer), or otherwise share in the costs of the larger-sized pipe. The districts also review and approve technical specifications before they grant government support.

The association participates in planning by determining which households are willing to join the system, by organizing promotion activities, and by arranging financing, including possible external support. Since the consumers in rural areas know the area best, it is advisable to have them involved in the planning stage, if needed. Earlier water associations, especially smaller ones serving limited areas, organized construction on their own. For wooden pipeline construction, a drilling expert and a few assistants from the region were contracted. The consumers helped dig trenches and lay pipe. Since the 1950s, however, contractors have been employed for excavation and installation. In contracts for

sparsely populated areas, the system may be divided into subcontracts to obtain the advantages of small-scale contracting.

In competitive bidding, small systems usually receive about 10 bids. Such rigorous competition keeps costs low: case No. 18 achieved remarkably low unit construction costs by minimizing the risk of contractors and by ensuring fair competition. So-called light technology was used to avoid the need for rock blasting and other costly methods. It seems advisable to involve the municipality in construction, at least in cases where several small water supply systems must be built for different communities or villages.

Often the "champion" or initiator is actively involved and even employed full-time in project construction. Board members, backed up when necessary by municipal and water district representatives, organize project supervision, and in contract-based systems, consumer-board members help secure construction permits and occasionally (for example, case No. 20) contribute labor. Many more men than women participate in implementation and management of water supply systems, although more women are entering the engineering profession.

Step VI: Operation and Maintenance. The associations themselves operate and maintain their water systems, performing the jobs the members themselves are capable of doing and purchasing other services from contractors. When wooden-piped systems were used, association members would locate and repair leaks. A small water cooperative may hire a part-time operator who handles routine operation and maintenance and even meter reading and billing. Larger associations usually have a trained and licensed operator but do not have a large permanent staff. An association of 2,000 or more consumers usually has a full-time manager. In the three cases of bulk supply companies, the number of permanent staff ranges from four to seven. The bulk supply company may have its own operation and maintenance staff, or it may purchase these services from the distributing water works. In Finland, where labor costs are high, a small staff can supply basic services. When additional services are needed, they can be obtained from municipal or private-sector contractors.

By pooling their resources, several small associations within the same municipality or region sometimes share operation and maintenance and even arrange for systematic preventive maintenance and system repair. As technology develops, operation and maintenance needs are likely to decrease but are also likely to require specialized knowledge and skills.

Levels of consumer interest and participation in association affairs vary throughout the life-span of an association. Members are usually actively involved during the initiation and implementation phases, but interest decreases once the system is in place and operating smoothly, and remains low unless a crisis provokes renewed participation.

Financing and Policy

Cooperatives and water associations received no government support before 1951: the systems were fully self-financed. They were often gravity systems with wooden pipes, and consumers made large direct contributions, sometimes for more than half of total costs. Government support increased in real terms in the late 1960s (Chapter 3).

In the early 1960s, municipalities turned their attention to developing water supply and sewerage services in rural population centers. Since the late 1970s, municipalities have increased their support of water supply development in sparsely populated rural areas. In the 1980s, the case-study municipalities typically awarded grants of 10-40 percent of total construction costs (Table 4.1). In one case (No. 22), the municipality made grants of 75 percent, on average, to water cooperatives in sparsely populated areas, but other

municipalities in the same district did not support the systems at all. In most cases, consumers have paid a major part of the costs, either directly or via the water users' association. As more cooperatives have been established and implemented by municipalities in adjoining, sparsely populated areas, the relative share of government support has also increased (Figure 3.1). In case No. 37, the municipality applied a 10-year grace period to loans made to small associations in sparsely populated areas. The municipality has also decided that water charges will be kept the same in all associations it supports.

TABLE 4.1

Financing Sources for Water Supply Cooperatives, 1964-1989
(Year of establishment in parentheses)

Source	*n*	Level of support (%)		Average (%)
Central government	7	0 (1964)	35 (1987)	22
Municipal	14	0 (1964)	75 (1984)	24
Consumers[a]	8	100 (1969)	20 (1984)	54
Connection charge (Fmk)	13	22,000	3,000	7,700
($)		5,500 (1982)	750 (1985)	1,900

a Includes association share.

The maximum feasible cost per household for water supply systems in sparsely populated areas appears to range from Fmk 30,000 to Fmk 40,000 ($7,500-10,000), although higher figures have been reported. In the future more vacation homes are likely to be connected to a common system, or alternatively they will use single point sources. Compared with the costs of a single point source water supply, associations serving 5-10 households are more economical.

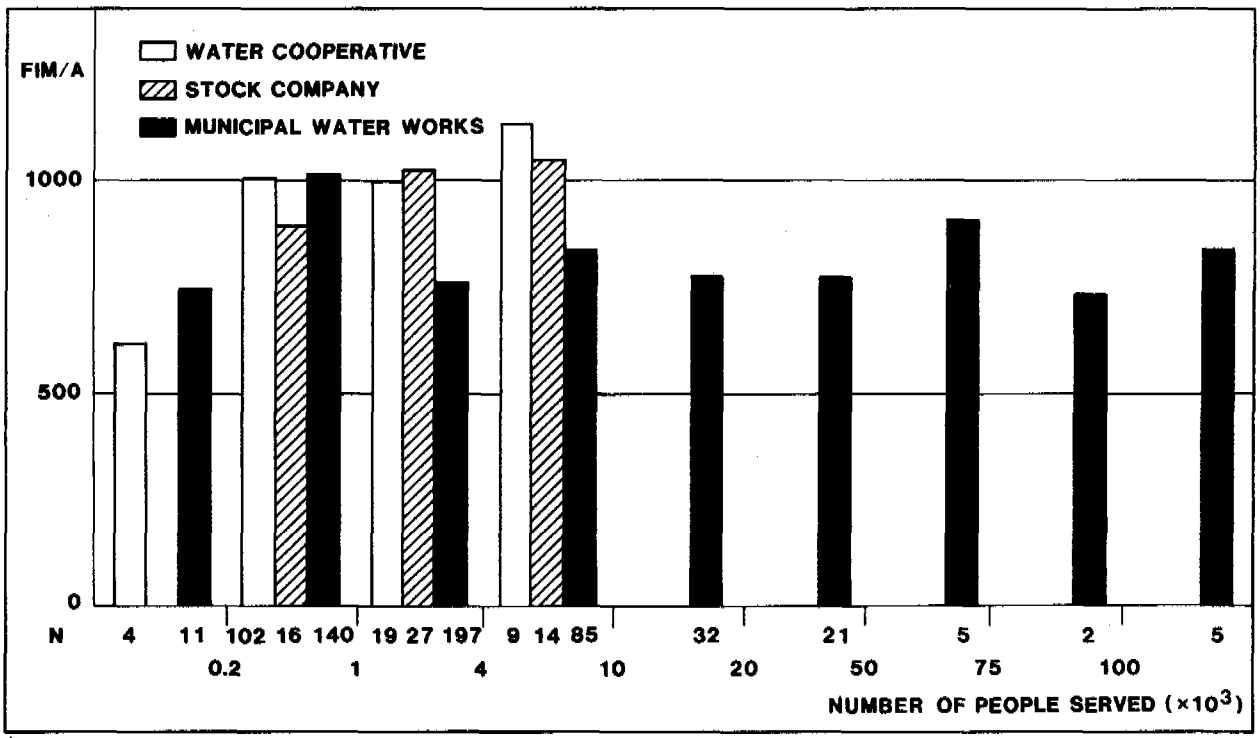
Originally, government financial support for a supply system was paid after implementation. The association had to organize temporary financing, a requirement that dramatizes the commitment and sense of responsibility of the "champions" and the board members. A part of the government financing was composed of loans to be paid back by the associations.

Today as in the past, local banks play the key financial role. In the 1950s and 1960s it was common for the association manager--the "champion"--and often also the association's board members to take short-term, high-interest loans (bills of exchange) at their

own risk. Larger water associations in rural centers sometimes have bank representatives on their boards.

Water associations in Finland collect fees for water consumption, for basic service, and for connection. Some associations levy a separate meter rental fee that is normally included in the basic charge or paid as a lump sum. The associations owning a sewerage system collect a water consumption-based sewage treatment charge and a fee for connection to the sewer.

Water associations can be classified as "old"--meaning they have already repaid their investment costs and need income for operation and maintenance plus possible expansion and rehabilitation--and as "new," which usually refers to associations under 10 years old that must repay investment costs, pay for operation and maintenance, and may also have to provide for expansion and rehabilitation. Water consumption charges, the major income source in eight of the case-study associations, have decreased almost continuously, except for a few years in the late 1970s, possibly because of the energy crisis and the introduction of sewage charges in 1974. The charges have remained constant in real terms during the 1980s (Figure 4.5). Water consumption charges, basic annual charges, and connection charges of the case-study associations were compared with the year of establishment of the system. Consumption charges in 1988 were of the same magnitude, whereas the newest associations in very sparsely populated areas had higher basic and connection charges.

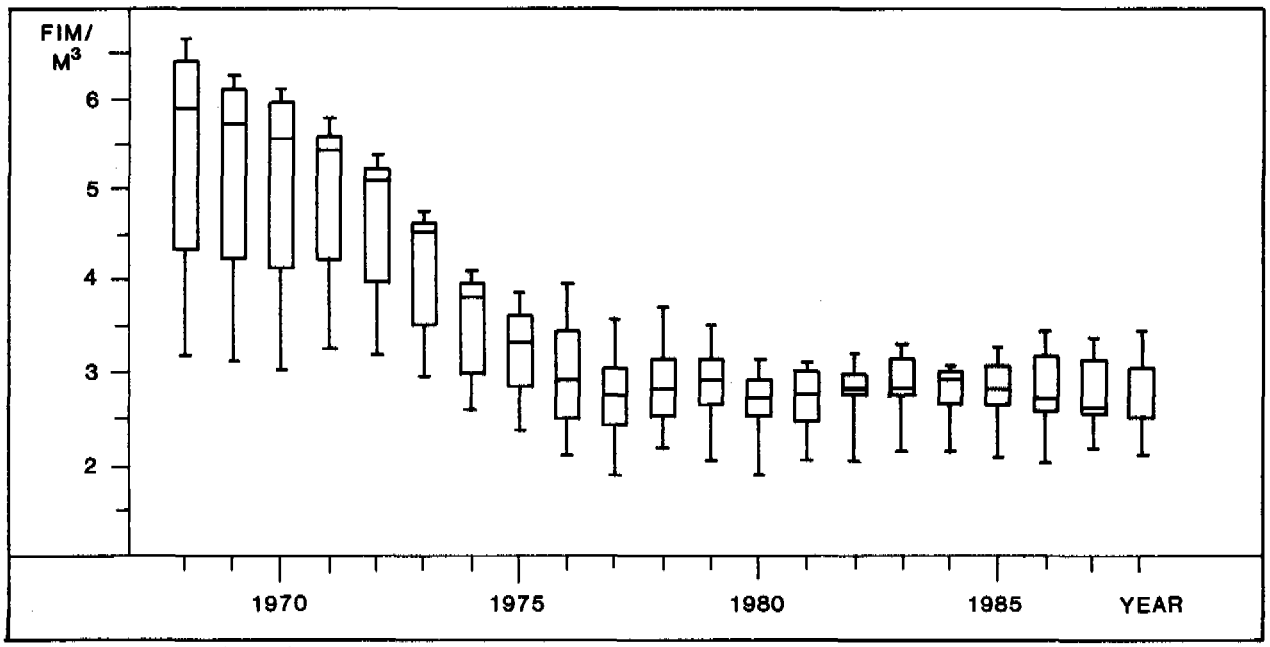


* INCLUDING AVERAGE ANNUAL CONSUMPTION CHARGE, ANNUAL BASIC CHARGE AND AVERAGE CONNECTION CHARGE, ASSUMPTIONS: CONSUMPTION 150 L/C·D; FOR CONNECTION I=5%, N=30 YEARS
1 USD = 4.2 FIM (1988)

Figure 4.5. Annual water bills for a family of four collected by the three major types of organizations in Finland, 1988.

Economies of Scale. In 1987, a study of average charges for water consumption and effluent treatment by waterworks serving more than 200 persons showed that the effluent treatment charges introduced in 1974 were somewhat higher than the water consumption

charges. Economies of scale appeared to function only in schemes serving over 20,000 users (Katko 1988). The study also explored economies of scale by comparing the water charges of cooperatives, stock companies, and municipal waterworks. Annual water bills for a family of four collected by each organization include the average consumption charge, annual basic charge, and connection charge (Figure 4.6). Municipal systems that do not have basic or connection charges are also accounted for.



* 1 USD = 4.2 FIM (1988)

Figure 4.6. Real water consumption charges by eight Finnish water associations, 1988 prices. Maximum, 75th percentile, median, 25th percentile, and minimum values are shown.

Economies of scale seem to function in municipal waterworks serving more than 1,000 persons, while for small municipal systems and most cooperatives and stock companies, the annual bills increase with the number of persons served. Even though large municipal systems do not charge the basic or connection fees, smaller water cooperatives and stock companies seem to be able to supply water at lower prices than the larger schemes. Many factors may cause this. The extent to which smaller systems are subsidized may be very high. Government subsidies to water supply have increased (Figure 3.1), and municipal support increased remarkably in the 1980s. This support is directed especially to systems in very sparsely populated areas. Smaller water supply systems usually do not have to provide water for fire fighting and therefore can use lower-cost, smaller-diameter polyethylene pipe, which also saves on the cost of transporting the pipe. Many smaller systems are also older and are likely to have benefitted from owner-user contributions of labor; a portion of their management, operation, and maintenance may be contributed or only partly compensated. Many smaller associations install their pipe at a depth of 1.2 meters rather than the 2-meter depth required in larger municipal systems: risks of pipe freezing are minimized by using insulation and maintaining correct water flow, and the shallower pipe is more readily accessible for repair. In rural areas, flexible plastic pipes make it possible to avoid some of the expensive blasting through bedrock. Small-scale contractors can construct water supply systems at lower unit costs than larger contractors: Finland's high social security costs and overheads make one-person contracting firms less expensive.

Metering. The first water meters were imported from Europe in the 1920s. Commercial production of water meters in Finland began in the early 1950s (Mäntylä 1990). Water use has been metered in urban areas since the 1920s. A few rural cooperative systems had water meters by the mid-1950s (IWSA 1955). Most systems have used meters since the 1960s. In rural water supply systems, domestic water consumption is almost constant, and meters are commonly read only once every year or two. In some systems consumers read their own meters. In the 1950s, the domestic manufacturer of water meters read and repaired the meters it produced. Larger urban water supply works also perform these services. Once water meters came into wide use, commercial enterprises emerged to provide meter services.

Before the introduction of meters, charges were based on several factors: the number of persons in a household, number of fixtures, estimated water use by household, cattle and irrigation, and the type of connection (in the house, in the yard, or further away). The daily per capita consumption of a yard connection was considered the basic unit. Other consumption was compared to the basic unit to establish the total water rate (IWSA 1955). As late as the 1960s, a few water associations had public standposts equipped with a lock. Keys were sold to standpost users (connection charge) and an annual bill was sent to these households. Thus the system of charges correlated roughly with actual consumption.

Water and Environment Districts. Interviews and discussions with the representatives of 13 district offices (location shown in Appendix 3) revealed different policies concerning the strategies of developing water supply in sparsely populated areas. The researchers visited 11 of these offices, and made contact with the rest by telephone.

The western districts of Vaasa, Kokkola, and Oulu have the longest tradition of water supply development in rural areas. In these areas housing is typically concentrated along the rivers and is not scattered. This housing pattern, together with the low quality of water in traditional wells, favored the development of common water supply systems. The three Water Districts (previously Agricultural Engineering Districts) have been heavily involved in promoting common water supply systems. In the 1950s and 1960s, they directed their support to water supply development in rural centers, and the districts also carried out groundwater inventories. Later the systems expanded to reach less densely populated areas and constructed large mains and connecting sewers. These pipelines, often constructed by the district offices, also made it possible to expand the distributing networks. Some ambitious plans such as that by Arola (1965) involving municipalities south of Oulu have been completed.

In the eastern and northeastern districts, the population is typically scattered and the terrain is often dotted by many lakes. In the northeastern district of Kainuu the water quality of the many natural springs is generally better than in other eastern districts. The western part of the district has flatter terrain, and a few common piped systems have been constructed.

In the district of Kuopio, water supply in sparsely populated areas began to be developed seriously in the late 1970s. During the 1980s, master plans for sparsely populated areas were prepared for most municipalities. Point-source improvement began as a result of a regional development project based in Kuopio and covering the five eastern districts.

For the last few years, the southeastern district of North Karelia has supported common water supply systems. The longest pipelines in sparsely populated areas have been installed there. The district has also promoted point-source improvement of water supply.

The policy of Mikkeli district, different from that of its neighbors, emphasizes point-source improvement of water supply. The terrain in Mikkeli, which is dominated by lakes and a thin layer of soil on top of the bedrock, does not fully explain the policy differences: the policy of Mikkeli district is based on the belief that the people themselves

should be responsible for improvement of their water supply. The district is not actively involved in promotion.

Many of the experts interviewed expressed concern about the slow pace of development produced by a strategy based only on private initiative without public promotion--the "Mikkeli model." On the other hand, the master plans of common water supply systems were criticized for choosing common piped systems without seriously considering alternatives. Furthermore, it became clear during the interviews that some criticisms were based on inaccurate information.

In the southern districts of Kymi and Uusimaa, the sparsely populated rural areas have not received as much attention as the districts discussed above. Government support, in the forms of water supply loans and grants as well as relief work funds, has been directed principally to the eastern and northern districts. The southern district of Uusimaa has the lowest rate of coverage of piped water supply in sparsely populated areas. In the Tampere district, water supply in sparsely populated areas has been actively promoted and developed.

The differences in the policies and strategies applied in various districts are partly explained by differences in environment, population patterns, distribution of employment, and other geographic variations. The variations in policies are also due to the different views of civil servants in charge of the sector in different regions.

Municipalities. Major policy differences exist between municipalities. Some generously support provision of water supply to sparsely populated areas, while neighboring municipalities may provide little or no support. The city of Virrat in Tampere district (case no. 22) provides up to 80 percent of total construction costs, but the nearby municipality of Karvia provided no support for common water supply systems before 1989. Usually the municipalities provide between 10 percent and 30 percent of total construction costs (Table 4.1). In addition, municipalities may provide services such as planning, design, technical supervision, and advice.

Several reasons justify municipal support to water supply in sparsely populated areas. Municipalities serve their own interests by promoting habitation in these areas. For the elderly, who may prefer living in their homes as long as possible, the cost of improved water supply is often less than the cost of supporting an elderly person in a municipal home. Community-managed water supply associations increase the sense of ownership and cooperation among consumers.

In cattle-farming areas, the provision of water is of great importance. Yet several cases show that municipalities can be reluctant to support water supply even when most residents and the decision makers themselves are from the sparsely populated areas.

Major Parties. The major parties involved in rural water supply in Finland are the government, represented by the health and water and environmental authorities as well as municipal authorities; the association, which is composed of three key parties, the champion, the board, and the consumers; and the private sector (Figure 4.7).

Government authorities and municipalities represent the public interest, and the private sector, providing implementation and other services, represents commercial interests. The water association has a dual identity: Initiated through the interest of the champion, the board members, and consumer-owners, the water association also represents the common interests of the community and consumers, who are owners, users, and payers. Thus the association is a private and public body representing both private and common interests.

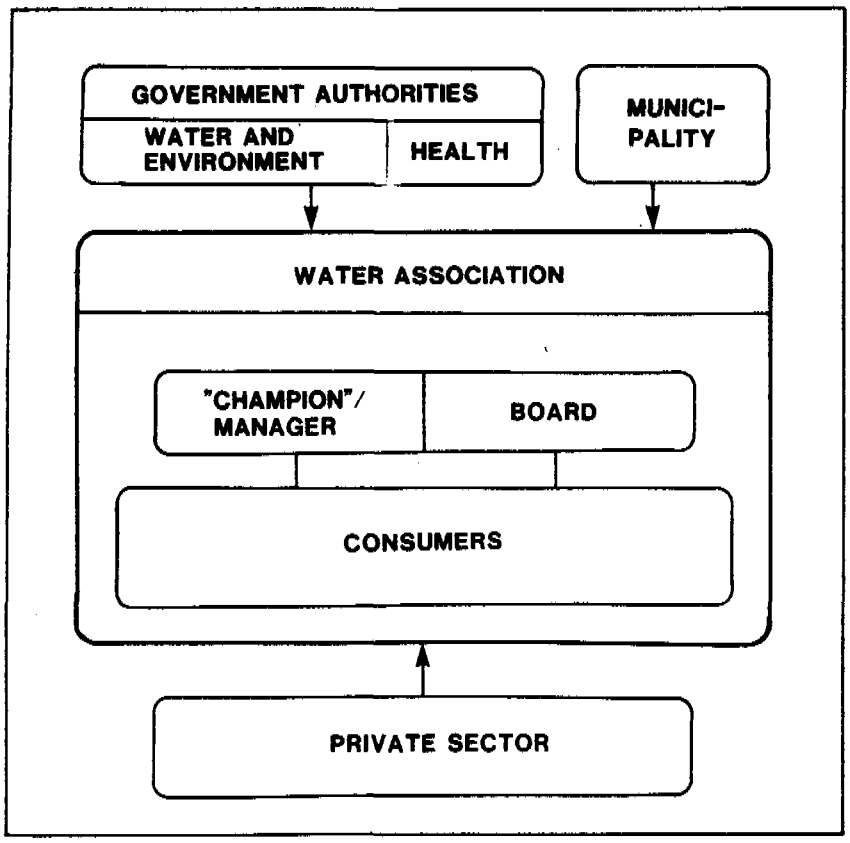


Figure 4.7. Major parties of association-based rural water supply in Finland.

Prospects. At the end of the 1980s, half the population of sparsely settled areas, about 400,000 persons, still had inadequate quality or quantity of water. Point-source improvement is likely to be the best solution in many of these areas (Saviranta and Vikman 1990).

Each municipality must prepare a water master plan for rural areas by 1995, and it is likely that many small water associations will be formed in the 1990s. Many of these systems will eventually be integrated into larger systems, but some may retain their independence as distributing utilities.

Financial and tax pressures will cause municipal waterworks to form more autonomous operations such as municipally owned stock companies. Municipal utilities and user associations will become similar, unsubsidized water supply operations. Government authorities will be required to make certain that environmental quality is preserved and that multinational watercourses are managed fairly. The Ad Hoc Committee on Environmental Economics (1989) suggested that government financial support to the sector be promptly limited and studied. Yet some support will be necessary to encourage the establishment of larger water supply and sewerage systems.

Small systems typically use untreated, good-quality groundwater. In the future the quality may deteriorate and treatment will become necessary. Cooperation between small water associations will be needed to provide for automation and special services. The limited groundwater resources will be used primarily for domestic purposes. Industries and other users will have to rely more on surface water. There is a growing conflict over whether the excavation of gravel for construction should continue or be stopped to preserve groundwater.

Limited groundwater resources and more stringent water quality requirements will require longer water transmission mains, the expansion of bulk supply systems, and the construction of new systems. A similar trend to longer transmission mains can be observed in sewerage and wastewater treatment.

V. DISCUSSION

Consumer initiative has been the foundation of rural water supply development in Finland. Yet the case studies demonstrate clearly that external support and involvement of other parties are also necessary.

Lessons

Economies of Scale and Water Tariffs. As the size of water cooperatives and stock companies increases, the water consumption charges increase. Only for large municipal waterworks do economies of scale apply. The lower rates charged by small systems are the result of savings brought about through use of technically "lighter" design, shallower trenches, and smaller pipe diameters, board members' voluntary contributions, lower implementation costs by using local small-scale contractors, and the shorter distance to water intakes compared to larger systems. The relative share of water used for public purposes is smaller or nonexistent.

Initiation of Improved Water Supply. The development of water supply in rural areas has emerged from the demand for improvement in water quantity and quality. At first this demand was generated by home-based production and cattle farming. Later industries generated demand for improved water supply, as with the dairy industry, which needed large quantities of high-quality water to produce hygienic raw milk. Demand has been highly related to the productive use of water, and poor physical water quality has caused users to press for an improved domestic water supply. Demand for improved water supply seems less driven by needs for improved hygiene in rural areas than in urban centers, where improvement in the common water supply is often promoted as a means of controlling diseases spread by polluted water.

It is clear that women in rural areas have been the source of demand for improved water supply. As homemakers and caretakers of livestock, they have seldom been recognized as primary stakeholders in and promoters of improved common water supply systems. However, the central government recognized the role of women in the late 1940s, when parliament appointed only women to the Committee for Rationalization of Households. The committee's recommendations were the beginning of government support to rural water supply.

Different types of technologies have gradually penetrated the water supply sector. In some cases, old and new technologies are used within the same supply system. Simple lifting devices are still used today, but mostly in vacation homes. The introduction of plastic pipe has helped the development of common water supply systems greatly by making it economically possible to construct long transmission lines.

Rural water supply development started with point-source systems. Except for a few community wells, point sources were used by only one or a few families. Later, piped common water supply systems were introduced, first into larger rural centers by consumer-managed water associations. Municipalities later became interested in developing water supply and sewerage systems for neighboring rural centers. In sparsely populated areas, common systems were introduced by associations, and later municipalities began to support these systems. This gradual development reflects local demand and economic potential, unlike the

approach often taken in many developing countries today and promoted especially by the Nordic bilateral agencies, which emphasizes the objective of full coverage.

Establishment of Associations. In the establishment of an association, an active and visible individual usually plays a key role in the implementation and management of a common water supply system. Every water association needs someone to advocate the idea and push for its implementation. This champion has to be enthusiastic and determined if an association is to be established and its water supply system built and operated. The efforts of Water Districts or municipalities can be decisive in initiating and guiding the establishment of a water association, but that guidance cannot compensate for the lack of a champion. The initiative and determination to establish an improved water supply must come from the village if the system is to be run and managed by the communities. The Finnish experience shows that the service area of a water association does not necessarily have to cover a whole community or group of communities. Neither need the service area be determined by municipal boundaries.

For developing countries, Finland's experiences suggest that projects should not be started before a significant portion of potential consumers are enthusiastic supporters of the proposed system. Promotion is usually necessary, and consumer obligations, especially financial commitments, have to be made clear from the beginning. After the association has been established, it is then possible to start planning and applying for external support, if needed.

Selection of the Type of Organization. There are a variety of institutional alternatives for water supply. The selection of the organization type is often influenced by external parties such as water and environment districts, municipalities, and even politicians. Each association type has advantages and disadvantages, and the best alternatives should be selected case by case.

Partnerships based on oral agreements were once common in small systems but are no longer recommended. Water cooperatives are usually suitable for homogeneous groups of consumers, and stock companies are appropriate for larger systems. Bulk supply companies have been established for regional systems. The three latter types of associations are all flexible in decision making. The so-called model rules have been helpful in establishing associations, and champions and association board members have made field trips to study nearby systems.

Experience shows that smaller water associations often merge with larger ones, dissolve, extend their service area, or find different forms of cooperation with larger water supply systems. Large systems do not necessarily remove the need for small ones, and there is still significant need for cooperatives in sparsely populated areas. Municipalities seem to choose stock companies for water and sewerage services.

Water supply associations are flexible and have adapted well to rural areas. It would have taken much longer to reach the same level of service if more bureaucratic organizations such as municipal water departments had been in charge of managing water supply, especially in sparsely populated areas.

Household Willingness to Join. Willingness to join a common water supply system is usually low in the beginning but increases remarkably during implementation of the system. Initially, the contingent valuation-based measures are used to gauge willingness; however, once the association is established, willingness to join is measured only by actual membership or connection fee payment.

In the initial phase, women play the decisive role in promoting and initiating membership in a common water supply system. Women are therefore the best target group for promotional activities.

The size of the connection charge can limit willingness to join, and for that reason associations in sparsely populated areas often require external (governmental or municipal) support. Since the population density in most developing countries is higher than in Finland, connection charges can be comparatively reduced when local demand is widespread.

Consumers' personal experiences--positive or negative--of water use and supply will influence their willingness to join a common system. Within a target community, good communication can transmit positive experience and reinforce the reasons to join.

Planning and Design. Associations and communities can seldom organize planning on their own, except in very small, limited systems. External services, when required, may be supplied by consulting engineers, municipal experts, or water districts. In population centers the associations usually pay the planning costs, but in sparsely populated areas municipalities may pay part or all of the costs. Consumers and associations have an important role in supplying the local expertise.

Implementation. Self-help construction was once very popular in gravity systems using wooden pipes. The consumer's role has decreased, but even in the 1980s some construction was occasionally provided by self-help.

Today's rural systems are built by small, private contractors with only a few employees. The role of municipalities varies from full construction management to small or negligible technical and financial support. The water district offices take part in technical supervision, but otherwise their role is small except for special construction--long transmission lines, for example.

Association board members obtain construction permits and provide other field management services. The champion (manager) of the association has the overall responsibility for implementation.

Men used to be much more actively involved in implementation than women. Men traditionally took responsibility for improving their family's housing facilities, and women have taken responsibility for operational duties like water hauling.

In older water associations, locally available materials were in common use, but as commercially produced materials conquered the market, the number of consumers and their ability to pay increased.

Operation and Maintenance. Associations themselves are, in principle, responsible for operation and maintenance. In the past, board members and other local people provided these services voluntarily, but today small associations usually employ a half-time manager who becomes a full-time employee as the system grows. If the number of users exceeds 2,000, the manager is usually employed full-time. Special services and repairs are usually purchased from the municipal waterworks or private firms. The number of permanent staff in bulk supply companies is remarkably low.

Many staffing alternatives are available for organizing operation, maintenance, and repair activities. Water works in neighboring municipalities or in the same river basin increasingly cooperate in carrying out operation and maintenance.

Summary of the Development Process. The development process of water associations in Finland consists of seven stages (Table 5.1).

TABLE 5.1

Development of Water Supply Associations

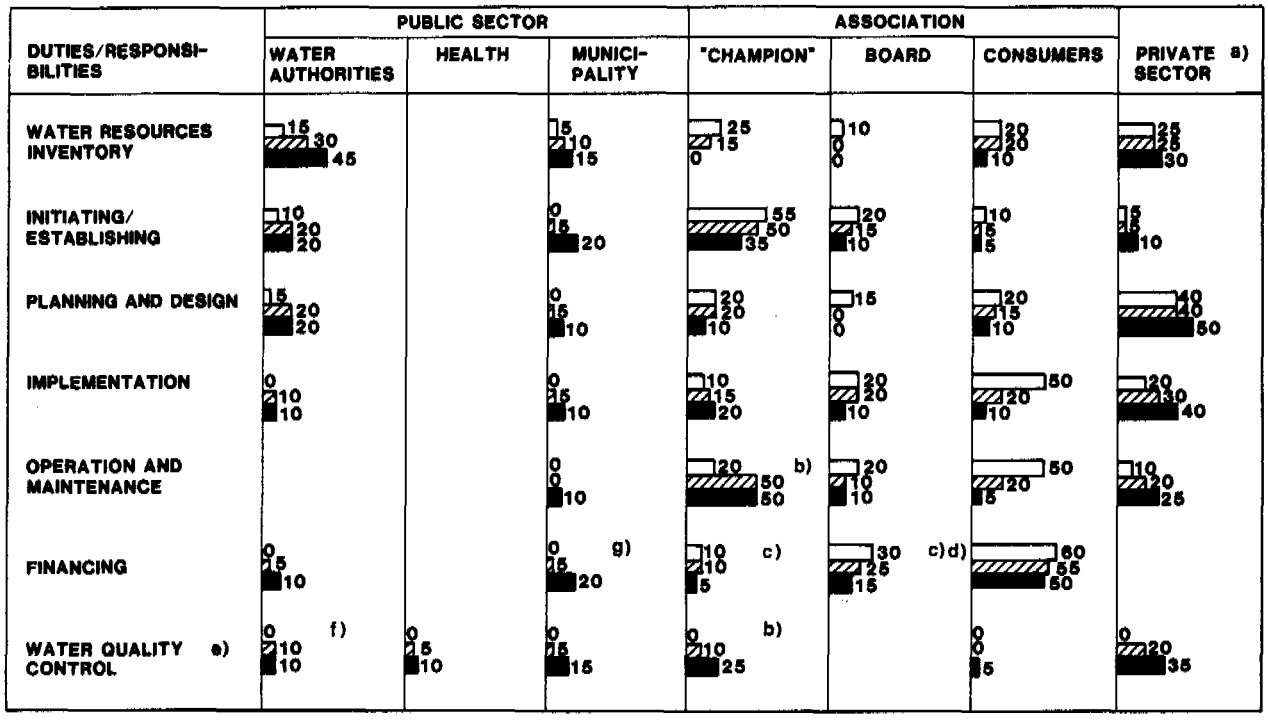
Stage	Key factor	Comment
Initiation	Demand	Based on productive use of water Women initiate at households
Establishing	Champion	The key person is very important
Selecting organization type	Four types	Variety and changes Flexible decision making
Willingness to join	Household	Increases after implementation decision Affected by connection charge and earlier experience
Planning services	External	Water district, municipality, consulting engineers
Implementing	Association mainly in charge	Private contractors Varying external support Male members involved
Operation and maintenance	Association fully in charge	Special services purchased Alternative cooperation forms

Financing. The role of consumers has always been decisive in financing water supply. With few exceptions, they pay more than half of the total cost. Yet government support seems important as an incentive even if it is only a small part of total costs. The government supports groundwater inventories and construction of transmission mains to enlarge regional systems. Municipal support ranges from nothing to 75-80 percent of total construction costs. Such variation in support may even occur between neighboring municipalities. Municipalities are supporting the sector as a cost-effective way to maintain population in sparsely settled areas.

Governmental and municipal support has promoted and guided sector development. It has influenced selection of organization type and level of technology, but it has never played a comprehensive role. Without exception, the case-study cooperatives are responsible for their operation and maintenance. Consumers cover the recurrent costs fully and on average at least half of the investment costs. In the past, consumers covered the investment costs fully, often making labor and other noncash contributions. This is in sharp contrast to externally supported rural water supply projects in developing countries, where the consumers and the recipient governments invest a smaller share.

The water consumption charges of water associations usually decrease in real terms over time. Before meters became available, charges were based on estimated water consumption. Meters have been manufactured domestically since the 1950s and are now used extensively. Regional private enterprises provide meter checking and repair services. Billing is typically based on estimated use, and the meters of most households are read once a year or even less often, inasmuch as consumption seldom changes significantly.

Roles and Responsibilities. Before 1950, the champion, the board, and the consumers were most important in developing water supply. With the technical development of the systems and the general modernization of life, the responsibilities of the board and the consumers have decreased. The role of the champion has remained important, but the champion's duties have changed from part-time initiation and promotion to full-time professional management of the system. Figure 5.1 shows the relative responsibilities of the major parties before 1950, 1950-1970, and 1970 to the present.



a) Mostly on contract basis
b) Including the operator
c) Loans at their own risk
d) Loan arrangements
e) On ad hoc basis till 1967
f) Raw water only
g) Including loan guarantee

FIRST STAGE ASSOCIATIONS BEFORE 1950
SECOND STAGE ASSOCIATIONS FROM 1950 TO MID-1970s
THIRD STAGE ASSOCIATIONS FROM MID-1970s TO THE PRESENT

Figure 5.1. Relative responsibilities of the various parties in the formation and development of water associations.

The private sector has gradually assumed the full responsibility of implementation. Contracts are awarded based on competitive bidding. The private sector has also taken some responsibility for water resources inventory, planning and design, maintenance, accounting, and similar external services.

The overall responsibilities of government authorities are small, but water and environment authorities still play very important roles through groundwater inventory, promotion, technical and financial advice, general policy development, and development of large water supply systems. Although these activities may be small in financial terms, they

are very important for sector development. The Water and Environment Districts are not directly involved in implementation except in special cases of large interconnecting pipelines. Health authorities are concerned only with water quality control.

The Association of Finnish Water Supply and Sewerage Works plays an important part in training and sector policy development. This association is a voluntary organization, and its activities are financed by annual membership fees from water utilities. Most larger associations and a number of municipal water utilities are members of the association.

Although there is an overall governmental policy on the support of rural water supply, each Water and Environment District has the freedom to adapt these principles according to local views and conditions. Government policy and support have been modified according to the needs of the water supply and sewerage sectors. These two are increasingly interconnected. Nowadays the support can be channeled equally to systems of various sizes.

Municipalities have had highly different policies on supporting water supply in sparsely populated areas. Often it is in the interest of the municipality to support rural water supply, but too much financial support may have negative effects by decreasing the responsibilities of the communities and the associations.

There are many parties involved in developing community-based water supply. Each concentrates on what it does best: the associations are responsible for the operation, maintenance, and management of the scheme. External support is typically channeled to the areas where it is most needed, such as initiation, technical advice, groundwater inventory, and planning.

Applicability to Developing Countries

Community participation should be seen as "an active process by which beneficiaries influence the direction and execution of development projects rather than merely receive a share of project benefits" (Paul 1987). The development of water supply associations in Finland has been highly dependant on community participation and management. But entire communities are not often involved in water supply associations, and the decision to participate and contribute is not made at the community level but by individual households and associations. Therefore this study surveys the role of water associations and their key functions, focusing not only on the community but also on consumers, households, and the key individuals. To implement water supply projects in developing countries, real commitment, contribution, and responsibility must be elicited from the community.

The Finnish experiences are not directly applicable to developing countries. While Finland is a relatively homogeneous nation with special social, cultural, political, and environmental conditions and needs, there are often significant differences between various regions of developing countries. This study points out certain key principles and practices that can be applied to developing countries. Demand has been the major factor for initiating common water supply. In areas where consumers have alternative sources, common water supply will be less desirable.

Finland is a sparsely populated country, but population densities in many developing countries can be much higher, and the population growth rates are very high, whereas in rural Finland they are often very small or negative. It is also true that without consumers' own efforts the governments in the developing world cannot improve, or even guarantee, the present level of water supply service.

It is sometimes claimed that cultural and social characteristics have the potential to sidetrack the development process, yet often the real constraints seem political. There are good examples of entrepreneurship in traditional water supply such as the vending and resell-

ing of water. But these practices benefit those who operate the unofficial economy more than the general public.

Replication of the Finnish model depends on strong municipal administration and an ample number of professionals with specific training and experience. Finnish municipalities have usually been promotional and supportive and have raised money for water supply through a solid tax base. In developing countries, the lack of such a tax base, or difficulties related to collection of local taxes suggest that autonomous water associations would be more likely to be successful.

In Finland it is common for one or a small number of highly committed, enthusiastic leaders to promote and manage rural water supply. The study shows that the individuals have acted for the common good and not for personal benefit because, among other reasons, the community maintains appropriate control through the association. It is necessary to evaluate work-related cultural values to determine how and to what extent individuals are willing to assume such responsibility. The rural population in Finland is homogeneous, and managers have little opportunity to promote the interests of a special group, as managers sometimes do in developing nations.

Many developing countries have no private sector to provide services to associations, and land ownership can pose complex problems. Finland's experiences suggest that private ownership of land does not severely hamper the establishment of common water supply. Social pressure in favor of common water supply has usually settled any problems related to land ownership.

Even though the concept of appropriate technology has been accepted in developing countries, impatient leaders still establish overambitious targets for levels and standards of service. Alternative technologies, starting with the simplest solutions, are more likely to succeed in developing countries.

Development of rural water supply cannot be separated from other kinds of development, but the water associations have provided practically no other services than water and sewerage. The management of water supply is not integrated with other sectors. This would suggest that development aid should include sectoral development programs and appropriate cooperation between them. A fully intergrated approach with simultaneous programs under the same management unit seems too complicated and less managable. But the generally weak infrastructure in developing countries means that water supply is not likely to be organized much better than other services.

First Principle. Rural water supply development in Finland has always been based on consumer initiative. When demand exists, people have found ways to improve their water supply. To satisfy this demand, people have established different types of community-managed water associations, and individual households have improved their own point-supply systems. The association has been fully in charge of common water supply. This is not the case in many developing countries where central agencies are responsible for rural water supply. Consumers anywhere in the world should be allowed to decide what kind of water supply service and standard they want and are willing and able to pay for.

Second Principle. The various organizations with roles in the development of water supply must work in complement to each other. Each of these organizations--government water authority and district offices, municipal authorities, health authorities, and the private sector--should concentrate on its areas of expertise and proficiency. Governmental water authorities should concentrate on policy issues, strategic development, promotion, and guidance. Their limited financial support can be an important incentive. Since the precise roles of water supply organizations will vary from one country to another, the roles described here are meant to serve as a general guide for developing countries. The roles of each organization should be thoroughly examined in the context of local conditions.

Third Principle. Compared to the average time required to complete an externally supported water project, the development of rural water supply in Finland has taken considerably longer. This implies that more realistic time frames and objectives should be assumed for water development projects in developing countries.

In the development of rural water supply in Finland, consumers pay a major part of the costs. They pay for all operation and maintenance and usually most of the investment. Only in very sparsely populated areas does external support for investments become significant. This is an extremely important consideration for developing countries, many of which have in the past had the unrealistic and, in practice, unfair policy of providing free water.

Water associations have taken the full legal and practical responsibility of managing water supply systems. The associations provide a model that suggests that public and private interests can be harmonized. As decision makers, consumers represent the public interest, yet as payers they represent private interest. The champion also represents both interests.

Women have initiated improvement in water supply, although their role has been informal and generally unrecognized. Individual households make decisions to join a common water supply, and the role of women seems decisive at this stage. Men are usually in charge of technical implementation and management. Since both men and women are involved in the development of water supply, both should be targets of promotional activities, according to their specific roles.

The survey by Tamm (1989) of water associations and their development in the United States demonstrates remarkable similarities between the experiences of respective institutions in the United States and Finland.

According to Roth (1987), water supply associations (or their equivalent) are common in most developing countries. They are frequently found in Latin America (Argentina, Bolivia, and Chile) and in the Middle East. McCommon et al. (1990) reported examples of community-managed water supply in Guatemala, Kenya, Malawi, the Philippines, Sierra Leone, and Togo. Obeng et al. (1989) surveyed seven externally supported water projects using handpump systems in three Francophone West African countries. This study concludes that system sustainability depends on community members themselves accepting responsiblity for operating and maintaining their handpumps. Kenya also has many independent water supply associations that are managed by special groups or by other NGOs. They do not normally extend their services outside the group; neither did earlier water cooperatives in Finland. These systems use normal commercial principles where users pay the full cost of water. Water charges are determined by extensive metering.

These examples show that there are already several practical experiences of water supply associations in developing countries. They further suggest that associations present practical alternatives to centrally managed water supply systems, and that their benefits should be thoroughly considered.

Evaluation of the Research Method

As developed during the testing period, the approach of this study was to use flexible, semistructured theme interviews. For this type of multidimensional survey the approach is appropriate. It would not have been possible to elicit the detailed opinions of interviewees by more structured, less flexible interviews or questionnaires.

One measure of the study's reliability is whether the selected case-study associations constitute a representative sample. The associations selected represent systems of various sizes, ages, and locations. The case-study associations were chosen based on discussions and findings during the preparatory phase, available background data on the

systems, and the willingness of association managers and board members to participate. In many cases outsiders were asked to give their views on the association.

Alternative approaches were considered during the preparatory phase, and the methodology was selected after consultation with experts familiar with sector development. The author's subjective analysis of the applicability of Finland's experience for developing countries has been reviewed through informal discussions of the first and second drafts of this paper. The real test of these findings will come only when they are applied in projects in the developing world.

Suggestions for Further Studies

Among developed countries, these various experiences of water supply development have not been surveyed much. To use this experience beneficially for developing countries, it is appropriate to conduct such surveys in other developed countries. The experiences of water supply associations in developing countries should also be surveyed, and similar surveys could be conducted in the fields of sanitation, sewerage, and environmental pollution control. Ultimately, the development of water associations in rural areas need not undermine the government's role but rather should encourage broad participation in the development process.

VI. CONCLUSIONS AND RECOMMENDATIONS

Findings on Finnish Water Associations

The development of rural water supply in Finland has primarily been based on consumer initiative. The other major findings are:

(1) Development of water supply started in cities and towns, later spread to rural centers, and appeared last in sparsely populated areas. Initial demand was generated by home-based production and cattle farming, and later by industrial activities.

(2) Consumer-managed water supply associations have played the key role in the development of rural water supply systems. They are heavily dependent on the individual managers who "champion" the associations throughout the project.

(3) The role of consumers was very important in the beginning, and today consumers still pay most investment costs, all the recurrent costs, and contribute in other ways. Long neglected, the importance of the role of women in demanding improved water supply is now recognized, and women are beginning to participate in association management.

(4) The central government and water district offices concentrate on policy, development, promotion, and guidance, but offer only limited financial support. Local municipal authorities support projects in sparsely populated areas. The private sector is responsible for implementation and supporting services.

(5) The champion, consumers, and the private sector have always shared a major part of the responsibilities of rural water supply. With the modernization of life and development of technology, the relative shares of the champion and consumers have decreased, while that of the private sector has increased.

Other, more specific findings on the Finnish water associations are:

(6) Partnerships, often based on oral agreements, have been the organization form of the smallest systems, which in many cases have later become cooperatives. Cooperatives are appropriate for systems with a homogenous body of consumers, whereas stock companies promote more the interests of large consumers.

(7) Individual households make the final decision on joining a common system. Their willingness to join the system increases remarkably during implementation. After completion, consumers and the overall community show interest in water supply only if technical or management problems arise.

(8) Government support has been directed to most needy areas: inventory of groundwater resources, promotion, policy development, and construction of larger pipelines and sewers. In the 1980s, municipalities started to support systems in sparsely populated areas.

(9) Economies of scale do not apply directly to rural water supply. They apply only if the technology, size of system and other conditions are equal. Considerable savings can be attained by constructing "small" systems managed by associations. These systems can supply water at a lower price than larger systems, since they typically assume higher risks in technical design.

(10) Organizations change over time: informal associations tend to become cooperatives or companies as the systems enlarge. There is also a growing trend toward larger integrated systems with bulk sale water companies.

Applicability to Developing Countries

Based on the Finnish experiences, the following basic principles and practices seem especially relevant for developing countries:

- Rural water supply should be based on consumers' own initiatives and priorities.
- The various parties involved in rural water supply each have distinct roles, and they should concentrate on what they are best at.
- Sector development policies should encourage various types of organizations for different conditions. The same principle of diversity should apply to the technologies used.

The findings and principles should lead to the following suggested practices:

- Consumers have to pay a significant part of the capital costs and all the recurrent costs of the system.
- The association should have overall management responsibility. The general meeting decides policy, and the board and the manager take care of practical operation. The "champion" is the key person in all respects.

Recommendations

First, the *roles* of different parties, especially that of the central government, should be reconsidered. The government should concentrate on policy issues, and the associations should take care of practical management.

Second, *consumers* should bear the recurrent costs and most of the capital costs if sustainability is to be achieved. Water tariffs in many developing countries will require drastic renovation: instead of geographically uniform tariffs, individual pricing systems will have to be introduced, and external support will have to be reduced. Alternatives to the bilateral grant are required.

Third, the development *experiences* of water associations and the development of the water supply sector in donor countries should be analyzed and applied. The same applies to water associations already in operation in developing countries.

Fourth, the development of water supply has been gradual even in Finland, which has experienced rapid economic development throughout this century. In developing countries, economic development is likely to be much slower or even negative. Therefore, more *realistic time frames* and objectives must be accepted for water supply projects in developing countries.

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APPENDIX 1
TOPICS FOR SEMISTRUCTURED THEME INTERVIEWS

1. Earliest water supply technology
   - Lifting devices
   - Water transporting

2. Start of water supply development
   - Point source improvement of water supply
   - Reasons for developing common water supply
   - Master planning
   - Initiator, "champion"

3. Selection of association/organization type
   - Type of organization
   - When established?
   - Why this particular type?
   - Views on advantages and disadvantages of the type selected
   - Views on advantages and disadvantages of other types
   - Changes in organization type

4. Willingness to join
   - Initial
   - After construction
   - Later

5. Role of consumers
   - Women's participation
   - Men's participation
   - Self-help
   - Meetings
   - NGOs

6. Roles of different parties involved
   - Government, Water and Environment Districts
   - Local government/municipality
   - Health authorities
   - Private sector

7. Technology selection
   - Pipe materials
   - Operational experiences

8. Implementation and management of a water association
   - Financing
   - Construction
   - Operation, maintenance and repairs
   - Training and public education
   - Latest developments

9. Cost recovery
   - Cost per connection
   - Longest single connection line
   - Tariffs
   - Metering
   - Billing
   - Reluctance towards price increase
   - Evidence on willingness to pay
   - Selling/buying water

10. Sewerage and wastewater treatment
    - Organizational set-up
    - Since when treated efficiently?

11. Future prospects
    - Lessons from other infrastructure services
    - Possible risks
    - Organizational trends
    - Possible integration of systems

12. Implications for developing countries (if subject has appropriate experience)
    - Principles applicable
    - Principles not applicable

APPENDIX 2
THE 39 CASE-STUDY ASSOCIATIONS

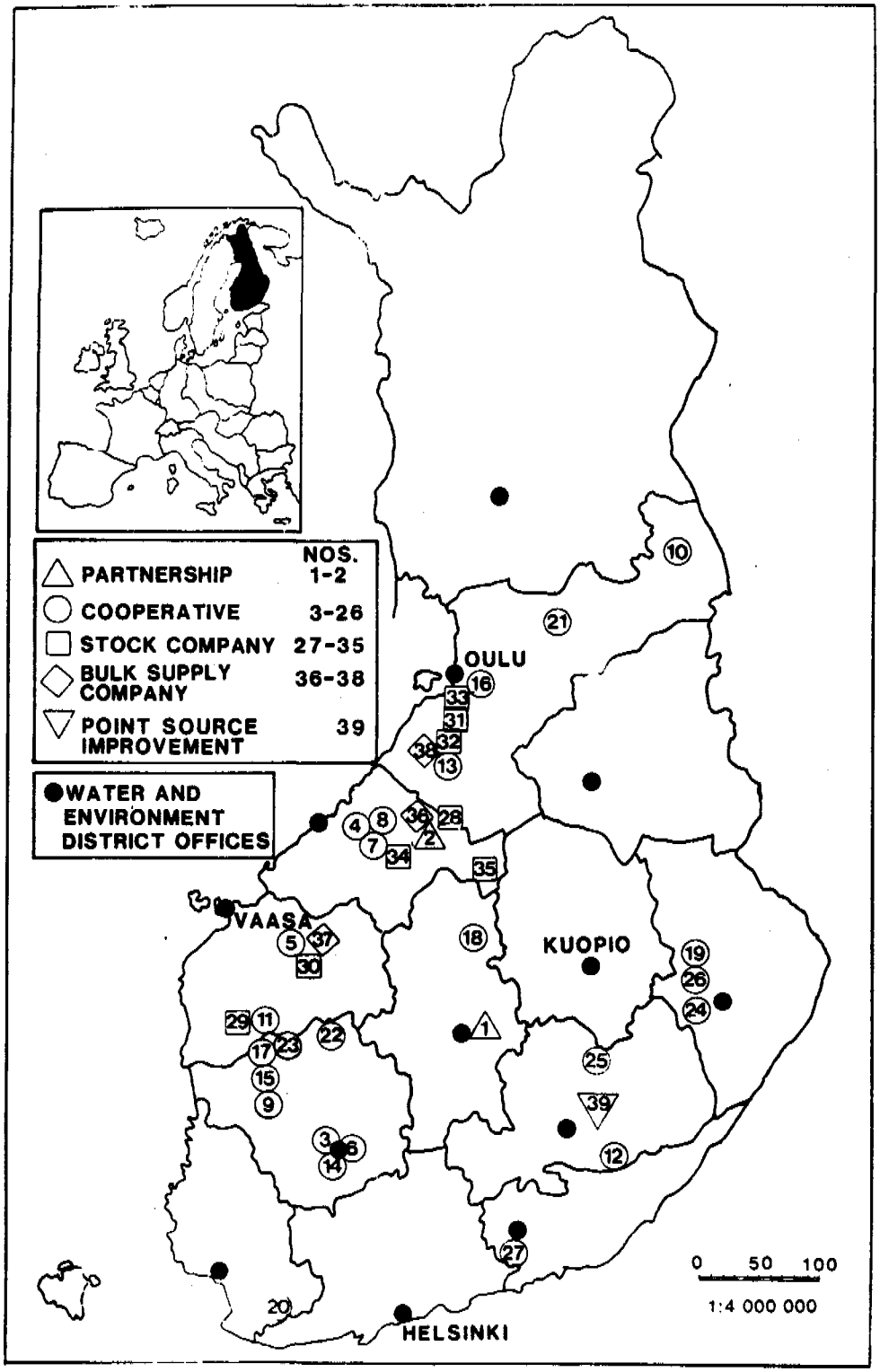
	Name and location	Year established	Number served[a]	Remarks
Partnerships				
1.	Leppävesi Water Ass., Laukaa	1948	80	written agr. 1958
2.	Erkkilä Water Ass., Nivala	1962	23-24	
Water Supply and Sewerage Cooperatives				
3.	Pispala Water Coop., Tampere	1907	400 hh	sold to the city 1962
4.	Lopotti Water Coop., Kannus	1927		continued by no. 8
5.	Simpsiö Water Coop., Lapua	1931	260	exists inside the city area
6.	Messukylä Water Coop., Tre	1938	25 hh	sold to the city 1960
7.	Takkulampi Water Coop., Toholampi	1940		continued by no 34
8.	Kannus Water Coop.	1946	5,700	
9.	Jämijärvi Water Coop.	1948	1,000	
10.	Kuusamo Water, Sewerage and District Heating Coop.	1950	9,400[b] 430 c[c]	"infrastructure"* co.
11.	Sahankylä Water Coop., Kauhajoki	1952	205	wooden pipes till 1988
12.	Puumala Water and Sewerage Coop.	1955	1,750	rural center*
13.	Vihanti Water Coop.	1957	1,900	buys water from no. 38
14.	Lempäälä Water and Sewerage Coop.	1959	62 c	to munic. since 1965*
15.	Palojoki Water Coop., Jämijärvi	1964	1,200	no public support
16.	Pikkarala Water Coop., Oulu	1969	1,910[d]	inside city boundary
17.	Sarvela Water Coop., Karvia	1969	100	no public support
18.	Viitasaari Municipalities and Cooperatives	since 1978	60-240	cooperatives by 1989
19.	Rauanlahti Water Coop., Polvijärvi	1982	300	
20.	Tuohittu Water Coop., Perniö	1982	500	munic. support
21.	Pudasjärvi Municip. and Cooperatives	1980		dispersed rural areas, also partnerships
22.	City of Virrat and Coop.	1984	280	munic. support 80%
23.	Suomijärvi Water Coop, Karvia	1985	280	financial difficulties
24.	Puronmäki-Mattisenlahti Water Coop., Liperi	1986	500	sparsely populated areas
25.	Joroinen Municip. and Cooperatives	1986	10-30 hh	
26.	Southern Polvijärvi Coop.	1987	6	small villages
27.	Takamaa Water Coop., Elimäki	1989	70-80	

	Name and location	Year established	Number served[a]	Remarks
Water Supply and Sewerage Stock Companies				
28.	Nivala Water and Sewerage Ltd	1941	11,200	first on profit basis(*)
29.	Kauhajoki Water Ltd	1945	13,100	
30.	Lapua Water and Sewerage Ltd	1957		since 1972 municipal* works
31.	Liminka Water and Sewerage Ltd	1960	5,000	regional sewers 1986*
32.	Paavola Water and Sewerage Ltd	1964	1,890	two municipalities*
33.	Kempele Water and Sewerage Ltd	1964	9,300	regional sewers 1986*
34.	Toholampi Water Ltd	1965	4,070	no. 7 not able to expand
35.	Pyhäjärvi Water Ltd	1974	3,000	dispersed areas, taken over by municipality in 1989
Bulk Supply Water Companies				
36.	Vesikolmio Ltd, Nivala	1968	($3.1 \times 10^6 m^3/a$)	owned by six municip.
37.	Lappavesi Ltd, Lapua	1972	($2.6 \times 10^6 m^3/a$)	owned by one municip. suplies to munic. and small associations
38.	Vihanti Water Ltd	1978	($3 \times 10^6 m^3/a$)	owned by cooperatives and the municipality
Point Source Water Supply Improvement in Dispersed Areas				
39.	Juva Municipality	since 1985	mostly 1 hh	

hh = households
c = connections
* = also manages sewerage

a latest or maximum number
b water supply
c district heating
d full-time users

APPENDIX 3
FINLAND'S 13 WATER AND ENVIRONMENT DISTRICTS AND THE 39 CASE-STUDY WATER USERS' ASSOCIATIONS



APPENDIX 4

BREAKDOWN OF RESPONSIBILITIES IN ASSOCIATION-BASED RURAL WATER SUPPLY IN FINLAND

Over the years, water associations have relied on individual champions, consumers, and the private sector to assume the major responsibilities for development. In recent years, the involvement of champions and consumers has given way to increasing activity by the private sector. The figure below presents data to substantiate this comparison, based on an analysis of seven activities: water resources inventory, initiation and establishment of associations, planning and design, implementation, operation and maintenance, financing, and water quality control.

Each of these activities was considered independently over the three stages of development in Finland's water associations and the sum total of responsibility was estimated for each actor in the delivery of water supply. Calculations were dervied via an applied version of the Delphic method. The volume of responsibilities was estimated by the author and further evaluated by six experts familiar with sector development. The result is undoubtedly subjective, but it shows the relative importance of various responsibilities. If the comparison were based on monetary, labour or other inputs, the differences between the actors and their responsibilities would be even larger.

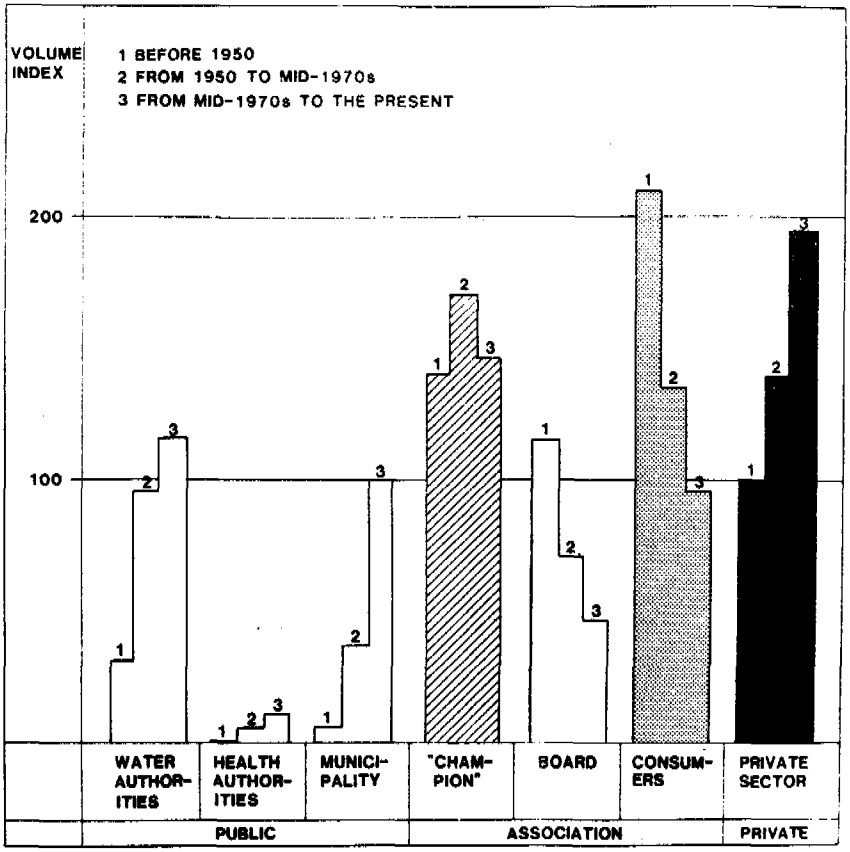


Figure A4.1 Relative responsibilities of the parties involved in rural water supply in Finland

Résumé

La présente étude examine l'évolution du système rural d'alimentation en eau en Finlande afin de mettre en lumière certains principes fondamentaux qui sont applicables partout dans le monde. Elle analyse le système d'associations rurales d'alimentation en eau qui, traditionnellement, dominent le secteur en Finlande.

Dans un premier temps, du début des années 1900 à 1950, les associations en question étaient des regroupements informels ou des coopératives qui assuraient l'alimentation en eau de source par gravité au moyen de canalisations en bois. En 1950, l'Etat finlandais a commencé à aider le secteur financièrement et a de la sorte donné naissance à une deuxième génération d'association comprenant des sociétés par actions caractéristiques des zones rurales. Une troisième génération, qui date du milieu des années 70 à nos jours, comprend de plus en plus de petites coopératives dans des zones à faible densité de population et des sociétés de vente en gros.

L'étude s'achève sur la conclusion que le développement du secteur dépend de l'initiative privée. L'aide publique n'a jamais dépassé 10 % de l'investissement total; la demande du consommateur a favorisé un développement progressif et dynamique du système finlandais d'alimentation en eau. Les consommateurs ont toujours supporté l'essentiel des dépenses d'équipement et, à l'origine, fournissaient une grande partie de la main-d'oeuvre et des matériaux.

L'idée fondamentale est que l'alimentation en eau devrait évoluer à l'initiative du consommateur, l'Etat s'attachant à définir les orientations et à assurer la promotion des associations rurales d'alimentation en eau gérées par les consommateurs de sorte que ceux-ci puissent choisir le niveau de service qu'ils préfèrent, qu'ils acceptent et sont en mesure de payer.

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Extracto

En este documento se examina el mejoramiento del suministro de agua en zonas rurales de Finlandia a fin de demostrar algunos principios básicos que son aplicables en cualquier parte del mundo. El estudio se basa en el análisis de asociaciones de abastecimiento de agua, que tradicionalmente son las instituciones dominantes en el suministro de agua en zonas rurales del país.

Las asociaciones de la primera etapa de desarrollo del abastecimiento de agua, que se remontan a los primeros años del decenio de 1900 hasta 1950, consistían en asociaciones o cooperativas informales administradoras de sistemas por gravedad que proporcionaban agua de manantiales a través de tuberías de madera. En 1950 el Gobierno finlandés comenzó a prestar apoyo financiero al sector, lo que dio lugar a que surgieran asociaciones en la segunda etapa, que incluyen a las sociedades por acciones que son típicas de los centros rurales. Las asociaciones de la tercera etapa de desarrollo, que datan de mediados de 1970 hasta la actualidad, comprenden cooperativas cada vez más pequeñas en zonas rurales escasamente pobladas y también empresas de venta al por mayor.

El documento concluye que el mejoramiento del sector depende de la iniciativa privada. El apoyo oficial nunca ha excedido del 10% de la inversión total: la demanda de los consumidores ha fomentado el progreso gradual y dinámico del abastecimiento de agua en Finlandia. Los consumidores siempre han pagado la porción principal de los costos de capital, y en los primeros tiempos contribuyeron con gran parte de la mano de obra y los materiales.

El principio básico pertinente es que el mejoramiento del suministro de agua debe basarse en la iniciativa de los consumidores y que los gobiernos deben concentrarse en las políticas, la orientación y el fomento de las asociaciones de suministro de agua en zonas rurales dirigidas por los consumidores de manera que ellos puedan elegir los niveles de servicio que prefieran y que estén dispuestos a pagar y puedan hacerlo.

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