

Community Water Supply in Switzerland

- what can we learn from a century of successful operation?

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In the last decade there has been a marked shift towards decentralisation in many developing countries as responsibilities are passed from national administrations to local authorities. In many places this shift to a local approach has left the communities isolated and struggling. Many infrastructure projects are in difficulties because of the lack of organisational support and know-how. In Switzerland, rural communities have developed and managed their own water supply networks for a long time – in some cases over 100 years. There may be lessons that have been learned in Switzerland over this period that could be helpful - if properly adapted - to communities in developing countries as they take responsibility for their own systems.

The management of water supply schemes in Switzerland is very much the responsibility of the individual communities. In many villages these systems were initiated before the end of the nineteenth century and have proved to be appropriate and sustainable over a long period of time. This publication is not an attempt to promote the 'Swiss system' as a model for developing countries, but rather seeks to recount some experiences that may be helpful or relevant. Even if the Swiss approach cannot be exported as it is, there still may be some lessons to be learned from more than a century of experience. These shall be pointed out and illustrated in this publication.

The study on hand focuses on villages - settlements of up to 10,000 inhabitants. The history of village water supply systems is quite different from the experiences of the cities, which are beyond the scope of this study. The goal of this publication is to pass on important Swiss experiences to policy- and decision-makers and practitioners in other countries, especially in the South. For this purpose, a set of case studies was selected to represent a wide range of different organisational arrangements.

There are two important concepts underlying this study: the 'household-centred approach' (HCA) and 'balanced development'. (These are described briefly below.) The 'household-centred approach' is a concept that puts the household in the centre of infrastructure projects such as water supply networks or sewers. The idea beneath this concept is that any decision about water supply or sanitation should attempt to solve the problems as close to the household level as possible. Only if a problem cannot be tackled on one level should a solution at the next level up be considered. In this way more decentralised, bottom-up solutions can be provided, in the hope that they will be more sustainable than the existing ones.

'Balanced development' is a strategy that takes into account the many different aspects of development projects. The various fields of focus are: social, institutional, economic, and technological aspects, and rules and regulations, knowledge and skills. Any project should be assessed by its implications in all these fields. Additionally, there are environmental issues, which typically are addressed throughout all fields of focus. The present report is structured along the thematic fields of the balanced development strategy.

Switzerland is located in the centre of western Europe. Most of the country lies in the mountainous region known as the Alps. Two thirds of the population live in small urban centres; this distribution is reflected in the large number of small water supply networks.

Rainfall occurs all year round. The annual average is about 1500 mm, one third of which evaporates. The remaining 1000 mm is theoretically available for different water uses, but only 70 mm is needed to satisfy human demand. These numbers illustrate that water is an abundant resource in the country and that all human activities together make use of only a small part of the available water. However, some water shortages may occur locally during dry periods, because the need for artificial storage is generally fairly low.

The main sources of piped water are springs, groundwater, and lakes (See Figure 1). Of all the water distributed, 71% needs no treatment at all - or only preventative chlorination - to meet the quality standards. The rest, mostly lake water, is treated in large treatment plants and supplied to urban and peri-urban areas. Only during the last 40 years have concerns over the chemical quality of the water

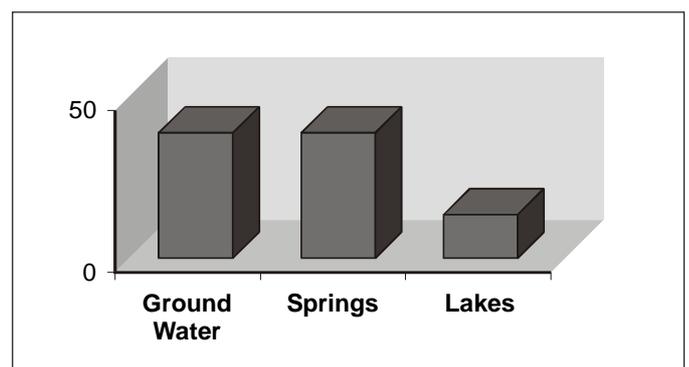


Fig. 1: Use of different types of water sources (% of total piped water)

been raised, the main causes being elevated levels of nutrients (mainly nitrogen and phosphorus) and agricultural chemicals. These issues are now being addressed with a set of source protection regulations.

OVERALL DATA FOR SWITZERLAND

Coverage	Access to public water supply:	98% of population
	Access to improved sanitation:	94% of population
Uses of piped water	Households and small businesses:	60%
	Industry:	20%
	Public institutions:	7%
	Losses:	13%
Sources of piped water	Ground water:	42%
	Springs:	42%
	Lakes:	16%
Water consumption	500 l/person.day in 1980	(highest value for any year)
	400 l/person.day in 2000	(decrease mainly due to conservation measures in industry)
Usage at household level	Cooking and drinking:	3%
	Toilet flushing:	30%
	Bath/shower:	20%
	Other purposes:	47%

INSTITUTIONAL ASPECTS

The political system of Switzerland is characterised by its federal structure. This means that a large degree of autonomy and responsibility is given to the lower units of administration, such as the cantons (equivalent to states) and the municipalities. This leads to large differences within the country in respect to social settings, and also in economic variables such as levels of taxation.

In the water supply sector, the different tasks are divided between the three administrative levels: the municipalities, the cantons, and the central (federal) government. Responsibilities in respect to water supply are:

- The municipalities (these include villages as well as towns) are responsible for water pumping and distribution. By law they are required to deliver 'safe water in sufficient quantity' to all the households connected.
- The cantons have to make sure that the water delivered to households is of sufficient quality. They also enforce the respecting of protected zones (where use around collection points is restricted). In general, cantons play an important role in setting standards and providing support to the communities.
- The federal Government establishes the legal framework for the protection and conservation of water resources as well as quality standards for drinking water.

An important concept within the administrative organisation of Switzerland is the autonomy of the municipalities (towns and villages). This implies that every municipality has its own budget and can decide on the level of municipal taxation. This mechanism enables municipalities to take many budgetary decisions but also raises competition with surrounding municipalities for tax payers (since people may decide where to live according to the levels of taxation).

This concept also has implications for the management of water supply networks. Municipalities are required to deliver safe water at a reasonable cost and in sufficient quantities to all connected households. Experience has shown that this can be achieved by using high-quality products, good craftsmanship and continuous maintenance. The involvement of local people in the management of their water supplies has also proved to be cost-effective.

Communities are often also responsible for schools, streets, wastewater and drainage, and gas and electricity distribution networks. For each of these issues, the municipality can join forces with neighbouring communities to use resources more efficiently. In the water supply sector, this happened to a large extent in the 1950s and 1960s. Today, most of the villages are integrated into regional networks to increase the security of supply during dry periods.

There are three different models of organisational set-up used in the country today. Generally the management of water supply networks is within the responsibility of the municipalities. In many villages and cities, a section of the administration takes care of managing the system. However, a municipality may also choose to hand this task over to either a community based organisation (often co-operatives) or a private company. Of these three models of organisa-

tional set-up (municipal administration, community based organisation, or private company as management unit), management by the municipality is the most common in Switzerland. This publication presents a set of case studies to reflect all three types of management arrangement.

ECONOMIC ASPECTS

Today, the average price for a cubic metre of water is SFr 1.50¹ - roughly the same as the price of a litre of milk. Over the last 100 years, the (nominal) price of water has gone up by a factor of 6. Considering that the price of other goods has increased 10 to 20-fold, and wages even more, it is clear that water has become relatively cheap over the last century. However, the initial investments to set up supply networks were substantial and in the early years the expenses for water made up a significant part of the household budget.

Over the last 150 years, the water supply sector has developed into a major industry. Today, municipalities are investing some SFr 600 million every year in water infrastructure and twice that amount for operation and maintenance. Per person, a total of SFr 250 is spent for water supply every year (and SFr 700 for drainage and sanitation). Most of these expenses are covered by the municipalities. On a per capita basis, the expenses for water supply account for less than 0.6% of the annual GNP (which is around SFr 45,000 per capita).

Tariffs vary considerably between different villages and towns. For example, the volumetric charges may vary from SFr 0.90 up to SFr 2.50 per cubic metre. On top of that, there are usually annual charges, and there is a one-time fee to be paid for the installation of the house connection. This can be several times the amount of the yearly charges, usually being a percentage of the house value.

By law, the charges for water should cover all the expenses for water supply. Tariffs are often set by the municipality but they must be approved by an institution of the canton. They can be adjusted periodically to balance deficits or surpluses. As many communities will have to renew large parts of their networks during the next few years, it is likely that tariffs will increase generally. It is expected that small communities especially will struggle to allocate enough financial resources to this important task.

SOCIAL ASPECTS

Technological systems such as a water supply networks have to be considered in the social context in which they are embedded. Special attention should be paid to traditional rules, rights and values. In the case of village water supplies, the important values and rules originated in an environment dominated by farmers. Traditionally, farmers tried to store surplus food in order to prevent starvation during periods of hardship (winter, unfavourable weather, etc.). This same principle of keeping a reserve for emergencies proved to be of value when applied to financial resources for communal water supply networks. As farmers often took on the management positions of village water supplies, the transfer of such principles came naturally, and so generous reserves of financial assets can be found in many places.

Another social aspect is the long democratic tradition that always required people to participate in decision making processes and take on responsibilities. Even though the right to vote was restricted to adult men until relatively recently, the tradition of taking joint decisions has existed for centuries.

There is a long history of providing unpaid labour for communal undertakings. Today, this is still a significant factor for many communal and political institutions, and also for sports clubs. People dealing with the first water supply networks had to build up know-how and skills in their spare time and on a voluntary basis. This effort may be partly explained by the high social status connected to this kind of job, as well as by the long tradition of voluntary work.

The importance of social processes is clearly demonstrated by the fast spread of water supply networks at the end of the 19th century. Starting in around 1850, the bigger cities invested in communal water supplies. The advantages and luxury of having tap water inside the house was a strong motivation for the smaller cities and villages to set up their own networks, and so a large number of water supply networks were started. During that period, the linkages of water supply and health were only starting to be recognised. Health benefits were considered a positive side-effect, but the main motivation for interior house connections was the daily convenience and luxury.

¹ SFr 1 = US\$ 0.6 (This is the value used throughout the document.)

Men and women related - and still relate - to water supplies in different ways. Most caretakers, service suppliers, and managers were men. For many centuries most of the political decisions were taken only by men, whereas women were responsible for many household tasks such as fetching water. The experience over the last two centuries in Switzerland has showed that it is not only women who benefit from household water supply connections, but society as a whole. At the end of the 19th century factories spread all over the country, many of them employing women. This meant that the time no longer used for fetching water could now be 'sold' to factory owners, providing another strong incentive for setting up a water supply network.

In many villages, the water supply network started as a fairly exclusive project of the wealthier people. However, within a few years, their initial investment had been taken over by a more public approach. Nevertheless, piped water remained an expensive asset, and for many years not every house in a village was necessarily connected to the network. Often, the connection charges were (and still are) based on the value of the house or on the size of the plot. This is a simple and effective means of social differentiation so that everyone contributes to the common network according to his/her financial means.

TECHNOLOGICAL ASPECTS

There have been vast improvements in terms of technology over the last century. Water supply networks have developed from local, gravity-fed supplies made of wooden pipes to regional networks of reservoirs, pumps, treatment facilities and pipes made of cast iron, steel, PVC, or polyethylene. While a description of all these developments is far beyond the scope of this study, it is worth mentioning that constant technological upgrading has been taking place.

For example, before the advent of pumps only springs in elevated locations could be developed as sources of water for the networks. These higher springs were usually also the first ones to drop their yield in dry periods, a problem restricting numbers of cattle (and thus income) in some regions for decades. The process of industrialisation was a strong driving factor for the development of new technologies. It also made materials such as iron and steel as well as energy (hydro-power and coal) more available and affordable.

This sustained development of technology had a strong effect on the nature of the day-to-day business of water supply networks, and required all the people and institutions involved to keep up with the pace of developments. A good example of this development can be shown in the village of Wittenbach, where the same company that manufactured cast iron pipes in the 1900s today offers a full-range of services and modern products for water and gas networks.

RULES AND REGULATIONS

Today, the issues connected to water supply are governed by an extensive and complex set of regulations, most of which did not exist during the early phases of public water supply projects. However, the actions of buying, selling and owning were clearly defined and it is assumed that the increasing enforcement of these laws was an important factor not only for trade in general but also for the spread of water supply networks. Only where the right to own (i.e. sell/buy) is guaranteed, are people willing to invest time and money for the improvement of a common water supply. Thus, the consistent and stable property laws provided a solid framework, not so much for private profit but for common enterprises such as water supply networks.

For many centuries, spring water was a private rather than a public good. The (private) ownership of land was connected to the ownership of all springs on this land and the water originating from these springs. Only with growing availability did water become considered as more of a public good, and this was reflected in the requirement for institutions dealing with water supplies bodies - corporations, co-operatives, or the municipal administrations - to be or become public.

For the initiation of water supply projects, the water quantity and accessibility regulations formed a solid framework much needed for stable development. During the 20th century, legal requirements for water quality became increasingly stringent and were a driving force for the construction of many water (and wastewater) treatment plants. In a similar way, the regulations for source protection have evolved and are now slowly starting to have an impact on the management of water supply networks.

One set of legal requirements has had a special influence on the development of water supply projects in Switzerland - they are the fire protection laws. Since many buildings are made of wood, concern for fire fighting has been a strong driving force in the setting up and developing of water supply networks. As a consequence, networks often were designed to meet the dual purposes of providing water for household use as well as for fire fighting. This required the pipes and the reservoirs to be larger than would be needed solely for a drinking water supply network. To address these issues, state-owned independent bodies were set up at the canton level to provide fire protection insurance. They quickly evolved into main actors in the field of water supply, a role they still play today. Every house owner must pay fees to the respective insurance provider, and that money is then in turn used to support water supply projects.

Another set of laws regulates the quality standards for water. These laws require water suppliers to set up a sampling schedule and to act on results from the chemical and microbiological analysis of these samples. The actual analysis is done by a regional laboratory, and the standards are set by a national committee.

In a typical setting with the municipal administration being responsible for water supply, accountability is addressed on several levels. There is often a technical director as the administrative head of the network and he is directly accountable to one member of the communal council (the political executive of the village). All members of the communal council are elected by the community and thus are accountable to the voters. Direct interaction with the consumers results in a much more direct influence on the caretaker if there is a problem in the network. Because many villages are small, people know each other well. This is a very direct way of social control of the caretaker, and it functions also as a motivation to do a good job.

SKILLS AND KNOWLEDGE

In the early days of water supply networks, the skills and knowledge connected to these systems were not restricted to engineers. In many places it was the skilled craftsmen (especially blacksmiths) who took the lead in practical issues while the engineers were responsible for the planning of networks. The spread of supply networks generated a demand for people being able to take care of them. This position was often handed over to local people - the title 'Brunnenmeister' (literally 'master of the wells') shows the high level of reputation connected to the position. Know-how and skills are often passed on without formal training but rather within families - from father to son, as this was (and is) a profession dominated by men.

More recently, professional associations have started their own training programmes. The most important ones in the field of water supply are the Association of Caretakers ('Brunnenmeisterverband') and the Swiss Association for Gas and Water (SVGW). They are increasingly taking on an active role in developing standards and training technical as well as administrative specialists.

A wide range of technological skills must be mastered for effective construction and maintenance of a water supply network, the most obvious ones being connected to the use of pipe materials, pumps, and electrical equipment in general. For water supply networks in the 19th century, the ability to manufacture iron pipes was crucial. This skill was strongly supported by the emerging manufacturing industry. Since then other skills, such as welding polyethylene, have become more important.

Another important skill connected to the setting up of networks is the ability to draw maps. The art and science of representing physical objects in a clearly defined manner on a sheet of paper made the planning of water supply networks possible. The sciences of geography, topography and cartography evolved in the 19th century and quickly spread within Switzerland, the country being one of the world leaders in that realm. The existence of accurate maps enabled planners and engineers to make well-informed decisions, a crucial process for the design of water supply networks.

At that time the skills and knowledge connected to the management of infrastructure networks were not being taught at schools or universities. Members of the management units of water supply networks had to acquire them on the job, a process that took many years. In order to safeguard a sustained level of service, these people made themselves available to the management units for many years, sometimes for a lifetime.

ABOUT THIS PUBLICATION

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Düdingen where a company manages the water supply network

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INTRODUCTION

Düdingen is a village of some 6,700 inhabitants, 10 km to the north-east of the city of Freiburg/Fribourg in western Switzerland. Its French name is Guin, and it is situated right at the border between the French-speaking and the German-speaking parts of the country. The village is mentioned in documents as early as 1182. The village consisted mostly of farms until the middle of the 19th century, when industrial development began. The arrival of a major railway line in 1862 initiated a faster phase of industrial development. The construction of a major road was another boost for this sector, and the village population increased rapidly. During the 20th century, there has been a country-wide shift away from agriculture and industry towards services. This trend is also reflected in the village's current employment pattern: out of the 2,900 jobs, 8% are in the primary sector (agriculture), 34% in the secondary (industry), and 58% in the tertiary sector (services).

Thanks to its fortunate location on one of the major railway lines (between Bern and Lausanne), the village has experienced a steady



Construction of the two main reservoirs in 1913 - a labour-intensive process involving many of the village men.

FACT BOX DÜDINGEN

Population today (2002):	6,700
Population in 1913:	1,000
Length of water supply network:	60 km
Water consumption today:	270 litres per person per day (including industry)
Owner of the water supply network:	The Company - Düdingen Water Supply AG - owns the mains, and each house owner owns the connection from the street main).
Operation and maintenance:	Düdingen Water Supply AG
Management unit:	Executive Board of Düdingen Water Supply AG
Annual turnover:	SFr 750,000 (SFr = Swiss Franc, SFr 1 = US\$ 0.6)
Connection fee:	SFr 20 per m ² of building area
Water charges:	SFr 0.90 per m ³ water used

KEY EVENTS

1871:	Construction of first factory (dairy industry) creates 82 jobs in the village.
1898:	Dry year - a 'Water Committee' is appointed by the Communal Council.
1906:	Communal Assembly approves budget allocation for the Municipality to buy two springs.
1908:	Acquisition of two springs by the Municipality.
1912:	Communal Assembly approves expenditure of SFr 80,000 by the Municipality to set up a water supply company. The springs and land for a reservoir are handed over to the Company. Enterprises, the church, and private persons invest a further SFr 200,000 in the Company.
1913:	Formal establishment of the Company. Construction of the basic water supply network begins (48 house connections, 18 km of pipes)
1914:	March: inauguration of the network, December: formal approval by a regional court
1919:	Share capital is increased to SFr 300,000.
1921:	First extension project (5 km of pipes added).
1933:	Share capital is increased to SFr 315,000 (today's value) in order to pay for network extensions.



growth of population, industry, and its economy in general. However, it still retains some of its agricultural characteristics. Regarding the water supply, the villagers have established a management framework which is unique among the villages in Switzerland: since 1913, a company¹ - under the supervision of the Municipality - has been responsible for water supply. This case study describes this system, its main stakeholders and their relationships, in more detail. The Company is called Dürdingen Water Supply AG.

THE BEGINNINGS OF THE WATER SUPPLY SYSTEM

For many centuries, the region where Dürdingen lies today was a swamp. Only after this wetland had been drained by networks of trenches, did the land become arable, allowing the village to spread. For many centuries, it consisted only of farms, a church, and a mill powered by the nearby stream. Farmhouses were located close to springs, so that each house had its own source of water. Additionally, water from the stream was used for irrigation. Each farmer had the right to irrigate his field for a certain amount of time so that all of them could make use of the resource.

After the arrival of a major railway line in 1862, some factories were set up in the village. In 1872, a milk pasteurising plant arrived; followed by a brickyard, a cheese factory, and a hotel. Some of these factories had their own water sources. Nevertheless, the increasing population was putting more pressure on the local water supplies, and water scarcity was becoming a growing problem, restricting growth. In 1898, the Communal Council appointed a 'Water Committee'. It consisted of three people from the village. Their duty was to check the availability of water resources in the region and to compare different alternatives for supplying water to the village.

SETTING UP A NETWORK

There followed many years of struggle with surrounding villages to buy water sources. In 1908, the Municipality of Dürdingen bought land that included two springs and sufficient area for a first reservoir. An engineer from the nearby city of Freiburg had estimated the costs of the first project to be around SFr 200,000 (equivalent to the combined average annual wages of 130 industrial workers). The plan was to set up a company with sufficient capital to meet this target. During a communal assembly in 1912, the proposal to inject SFr 80,000 from the communal reserves was approved by a majority of votes. It was decided that the Municipality would own 40% of the shares of the company to be set up. The local church and some of the larger enterprises injected another SFr 80,000, and private persons contributed SFr 40,000. With all the finances in place, the Company was ready to start work. The Executive Board was elected, and the bylaws were approved in 1913. They were the legal foundation of a public water supply network.

All the work for constructing the first water supply project was put out to tender. Local entrepreneurs competed for the jobs. Work progressed quickly, and more sources were bought during the following years. The initial project consisted of 17 kilometres of pipes, 45 hydrants for fire fighting, and 48 house connections. In December 1914, the network was inaugurated with a party. In the following decades, this network was quickly extended, reaching also to the surrounding clusters of houses.

HISTORICAL DEVELOPMENT

During the first years of the water supply network, only a small proportion of the available water could be sold to the customers. The reason for this was the fact that only a few households had been connected to the network, and the factories needed water only periodically - but when it was needed it was generally consumed in large quantities. During the two world wars no new connections were made because the general situation was very unstable. Between the wars and after 1945, more households and small enterprises

¹ This type of company, known as an 'Aktiengesellschaft' (AG) in German, is allowed under private law in Switzerland to issue shares which can be traded without restriction. It is possible for all the shares of a company to be held by government, but in this case only a proportion are held by a public body.

were connected to the network, and demand increased dramatically. More pipes were constructed, so that the network doubled in length between 1915 and 1960 - and again between 1960 and 1990. The number of hydrants increased from 45 in 1915 to the current 240.

During most of its history, the special set-up of the management system was often the subject of discussions in the local political arena. Several times the appropriateness of private sector management of public water supplies was questioned. However, the Municipality had a major influence on the commercial decisions - it owned 40 % of the shares and it was represented by three of the seven members of the Executive Board. (This influence continues to this day.) Furthermore, there were a number of bylaws that regulated the activities of the Company, ensuring that the interests of the public were being met. The advantages of this special set-up were finally acknowledged, and it has remained largely the same ever since.

There have been huge advances in technology during the last century. While the first project relied on water only from springs, it soon became obvious that these sources were not reliable enough during dry seasons. This weakness was overcome by the construction of a large groundwater pumping station in 1963. This plant enabled the Company to satisfy all the different local demands, and it prevented them from constructing connections to neighbouring villages.

Since the first project, the Company has always been the owner of the network - including the sources. No special permit was needed for this because land (and the sources on that land) were subject to private property regulations for a long time. In 1979, a state law was enacted, which clearly stated that the issue of water supply was a duty of the municipalities (cities as well as villages). This law required the Municipality of Dürdingen to adjust the arrangements for the management of the water supply. The Municipality was given the responsibility of supplying water to the public, but the ownership and the management of the network were given to the Company, based on a concession agreement. The new bylaws were approved by the executive of the canton and by the municipal assembly in 1984. This arrangement still holds.

THE ACTORS

In Dürdingen, a complex network of stakeholders has evolved over the past century. In the following sections, these stakeholders and their interactions will be described. A simplified version of this network is also depicted in the following figure:

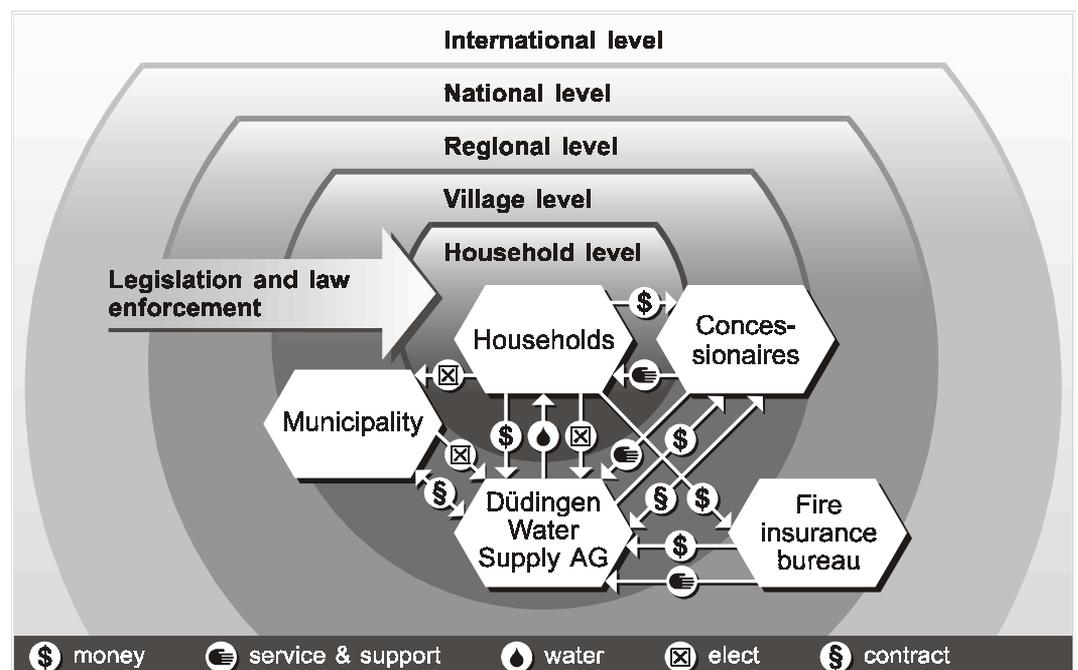


Fig. 1: The main stakeholders in Dürdingen and their interactions

DÜDINGEN WATER SUPPLY AG

Düdingen Water Supply AG is a company. Its scope of business is defined as 'the extension, upgrading, operation and maintenance of the water supply system including the hydrants for fire fighting purposes'. The Company only has three (part-time) employees: a caretaker ('Brunnemeister'), a secretary for all the billing, accounting and communication, and a person who reads the water meters. Düdingen Water Supply AG consists of three steering units: the Executive Board, the Finance Committee, and the Technical Committee. The Executive Board is responsible for strategic decisions, the Finance Committee supervises the secretary in financial aspects, and the Technical Committee supports the caretaker in practical day-to-day issues.

The Executive Board is elected every three years by the Shareholder Assembly. The shareholders have voting rights according to the value of the shares that they hold, but no party can hold more than 20% of the voting rights. (This regulation was introduced to prevent any party from having too much influence on elections and decisions) The Municipality owns 40% of the shares, and is the biggest shareholder of the Company.

The members of the Executive Board work almost on a voluntary basis - the annual salary of SFr 3,000 is a small fee for the considerable effort needed for this job. Usually, there is not much competition in the elections for the Executive Board. Current members of the Board have to find suitable candidates, who then are proposed for election. Once elected, members may stay for up to 15 years on the Executive Board, but their positions still need to be confirmed every three years.

The actual construction and repair work is done by three concessionaires. Düdingen Water Supply AG defines their regular duties in contracts. The Company itself operates on the basis of a 25-year-concession from the Municipality of Düdingen.

THE MUNICIPAL ADMINISTRATION

The Municipality is legally responsible for the supply of water to the households. Even though it has handed over the actual business to the Düdingen Water Supply AG, it still is closely involved. Not only does it hold 40% of the shares, it also provides three of the seven members of the Executive Board, and one of them is also the head of the Technical Committee. Thus, the Municipality has an executive as well as a supervisory role.

The reason why the water supply network in Düdingen was set up as a company was that the Municipality did not have enough financial resources to construct a network. Only with the help of other stakeholders - such as the church and some entrepreneurs - was it able to raise sufficient funds. During the 20th century, the Municipality has become financially more powerful, and there was an attempt to buy all the shares. However, it became clear that the existing set-up of the water supply was an optimal solution for the local circumstances, and the attempt was abandoned.

The Municipality is responsible for fire fighting. It owns the hydrants, which are maintained by Düdingen Water Supply AG. The fire brigade consists mostly of local men doing the job on a voluntary basis. The head of the fire brigade is automatically a member of the Technical Committee so that he can make sure the design of the water supply network also serves the purpose of fire fighting.

HOUSEHOLDS

Today, every house in Düdingen is connected to the public water network. Private households and small businesses use 70% of the water delivered (whereas industry uses only 12%). The proportion used for domestic purposes increased during the 20th century, the water usage in the beginning of that century being dominated by some large industrial users.

PRIVATE SERVICE SUPPLIERS (CONCESSIONAIRES)

Düdingen Water Supply AG itself does not do any construction or repair work. This work is contracted out to three local entrepreneurs running small businesses. Long-term contracts between Düdingen Water Supply AG and these local entrepreneurs define the duties and rights of both parties. These long-term contracts are called concessions, and the local entrepreneurs are therefore called concessionaires.

One part of the contract states that the concessionaires should be prepared to respond to a pipe burst emergency 24 hours a day. Therefore, at least one of them should be on call

at any time of the day, and they cannot all go for vacation at the same time.

Düdingen Water Supply AG periodically checks the whole network for leaks. If a leak is detected in a house connection, the Company may require the house owner to have it fixed by a given deadline, at his or her own expense. The house owner is required to select one of the three concessionaires to do the repair work.

The concessionaires are all local people who have been running small businesses over a long period of time - for example, one person who was a concessionaire for 35 years was also the caretaker for 18 years of this period.

CANTON (STATE)

During the 20th century, the Canton (state) played an important part on several occasions to support the legal status of the water supply in Düdingen. For instance, the approval of the executive of the canton was needed for the first water network project (1913). As new laws at the national and regional levels evolved, the institutional set-up of the water supply system had to be re-adjusted. This was the case in 1981, when it was agreed that the appropriate form of relationship between the Municipality and Düdingen Water Supply AG would be a concession.

Furthermore, the Canton is also responsible for water quality testing. This duty is taken care of by a specialised laboratory. In collaboration with the local caretaker, staff of the laboratory take samples and test the water for chemical, physical and biological parameters. In the event that some parameters are close to or above the legal standards, the canton experts advise the caretaker. The canton has the right to enforce certain technical standards.

FIRE INSURANCE BUREAU

The fire insurance bureau (whose name translates literally as 'building assurance of the canton') is an independent, public organisation. It was founded in 1812 with the double purpose of insuring all the buildings of the canton and supporting capacity for fire fighting. These goals have remained very much the same since.

For all house owners it is mandatory to have fire protection insurance, and the fire insurance bureau has a regional monopoly. The rates are based only on the current value of a house. The income of the insurance bureau may be used to support any aspect of fire fighting and prevention, including increasing the size of reservoirs and distribution pipes, but also supporting the fire brigade.

Because the fire insurance bureau is a not-for-profit organisation, it only redistributes money. Tariffs are set so that rich people (with more expensive houses) cross-subsidise poor people (with cheaper houses), and everyone gets a good level of service. In addition, the tariffs for centrally located property cross-subsidise properties in marginal areas of the village. This principle is embedded in the bylaws of the bureau, along with guidelines for managing the funds and fixing prices.

Today, the bureau insures around 100,000 houses in the canton of Freiburg/Fribourg, in total worth some SFr 50 billion. Thanks to a clever investment policy (along with the steady growth of the regional economy), it has been possible to lower the rates by 40% over the last 15 years.

ISSUES OF INTEREST

■ **Tariffs** - The volumetric charge in Düdingen is low (SFr 0.90/m³) compared to the national average of SFr 1.50 per cubic metre. This is in the interest of the shareholders, as most of them are also customers of the Company. Tariffs are proposed for renewal once every two to six years by the Executive Board. They then have to be approved by the Shareholder Assembly as well as by the Village Council.

There are two opposing interests that govern the income and expenses of the Company: on one hand, the Company is required by law to have financial reserves - a given percentage of the annual turnover. On the other hand, there is an incentive to invest as much as possible in maintenance and repair of the network to minimise water losses. So far, the Company has managed to keep those opposing principles in balance.

Many of the customers are also shareholders of the Company and so they have a direct influence on the setting of the tariffs. During the first decades of operation, the large industrial companies persuaded the Düdingen Water Supply AG to set tariffs which offered lower rates to large consumers. However, as time went by, the number of small customers (households) increased, and the original tariffs were replaced by a uniform volumetric tariff for both large and small consumers.

- **Shares** - Düdingen Water Supply AG is a company. Anyone can buy and sell its shares, but they are not available on any stock market, and the value of the shares is not indexed. In practice, the rate of transfer of shares has always remained at a very low level. A few institutions own a majority of the shares, while many people own only one share. The bylaws of the Company determine that no single party may enjoy voting rights at the Shareholder Assembly greater than the level equivalent to ownership of 20% of the shares, even though some parties (e.g., the Municipality) own more than 20% of the shares. This rule is to prevent one party from dominating the decision-making processes and elections, even if it owns more than 50% of the shares.
- **Shareholder value** - The dividends of the shares are strictly regulated according to the bylaws of the Company. It is stated that they must not be higher than the current government loan interest rate plus 1%. Consequently there have been many years when the dividends of the shares were below 5%, and during the first five years of business operation, no dividend at all was paid. This fact indicates that the majority of the shareholders are less concerned about maximising the dividend than in investing in a financially solid company and in obtaining a good service. The main reason why many individuals own shares (many owning only one share) is that this enables them to participate in the election of the Executive Board and to take part in the annual Shareholder Assembly - an important event in the life of the community.
- **Water charges** - As in most of the water supply schemes in Switzerland, there are two kinds of fees payable to the water supply institution: a one-time connection fee, which is usually based on the value or size of the house, and a yearly fee based on the amount of water used. In Düdingen, each household is also obliged to rent a water meter from the Company. Furthermore, house owners are required to pay for the construction of the connection to the street main. These connections remain their property, and so the house owners are also responsible for maintaining them. The Company can ask house owners to fix leaking connection pipes at their own expense.
- **Ensuring payment** - Customers who do not pay their fees in time, initially receive a warning. If a bill remains unpaid ten days after the warning, a fine is added to the fees. Then the defaulting customer is liable to prosecution. Theoretically, the supplier could also disconnect a customer if prosecution does not ensure full payment. However, the bylaws state that the 'essential supplies of water may not be denied', which, in practice, means that no household can be disconnected from the network.

However, there are many means of increasing social pressure on people who do not pay. Often, it is enough that the secretary of the Company sends a reminding letter or pays a visit to the defaulter's house. So far, there has been no case of a customer being prosecuted. This experience illustrates that, in small social settings such as a village, the variety of possibilities for applying social pressure makes it unnecessary to carry out the threat of disconnection.

- **Water meters** - If a water consumer has doubts about the accuracy of a water meter, he or she may ask to have it checked at a certified calibration institution. If the error lies within a tolerance of $\pm 5\%$, the water meter is considered to be working correctly and the user pays the cost of the test. On the other hand, if the accuracy is outside this range, the water company pays for the test and refunds the amount estimated to have been overcharged during the previous three years.
- **The role of the local elite** - It was the local elite who initiated the process of constructing a public water supply network. This is illustrated by the fact that the first president of the Executive Board was also the president of the Communal Council.

The number of people involved in the issue of water supply has always been fairly limited. The villagers who have worked in this sector for many years usually discuss technical as well as management issues among themselves. Nevertheless, there has always been a strong sense of ownership in the village because anyone could buy shares and so benefit from the economic success of the Company.

- **Lean organisational structure** - The Company hires its employees on a part-time basis: the secretary is employed for 40% of the time, and the caretaker for 80%. Additionally, one person is hired for a few days each year to read all the water meters. The staff are managed by the Executive Board and the Technical Committee, who do most of their work on a voluntary basis. This efficient and lean organisational structure enables the Company to keep administration costs at a very low level. This fact is clearly reflected in the low water charges - a benefit appreciated by all customers.
- **Social acceptance** - Before the network was built, there were many years of struggle over the issue of water supply. Many people who were satisfied with their own private source were reluctant to spend the community's money for water supply. Therefore, it was important to increase the social acceptance of the communal project. This was helped by the formation of the Water Committee (consisting of three well-reputed local people) to check on all the sources available. After this task was accomplished, a larger committee was set up, involving important people including, amongst others, a doctor, a hotel owner, and the local priest. The involvement of the church also supported the case, and the blessing of the priest was the core of the inauguration ceremony in 1914. The high prestige of the communal project is clearly demonstrated in the following picture.



The inauguration ceremony of the first reservoir in Dürdingen - an important social event. The reservoir not only served a technical function but was also an object of pride in the village. The church was an important stakeholder in the village, and also a shareholder of the Company. Therefore, the priest (the second person to the right of the door) was one of the main participants in the ceremony.

- **Legal set-up** - Initially, it was the Water Committee which took on the responsibility for the water supply. Even after the establishment of the Company was formally approved by a regional court, the question of whether a company should be responsible for a public service was often disputed. In 1971, a national law was passed (followed by a canton law in 1979), clearly allocating the responsibility for water supply to the municipalities. However, this law also offered scope for the municipalities to hand over this duty to other bodies, as long as the municipality stayed in control. An analysis of the organisational set-up showed that this could easily be achieved by issuing a concession to the Company. An amendment to the bylaws of the Company clearly stipulated the roles of the Municipality and the Company. This reform was accepted by the shareholders in 1984, and the situation has been widely accepted ever since.

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FURTHER INFORMATION

This document forms part of a series of case studies introducing community management of small water supplies in Switzerland. The series highlights a striking diversity of institutional frameworks that have all contributed towards more than a century of successful investment, operation and maintenance, rehabilitation and renewal of water utility infrastructure. For more information on this publication or to access other documents in the same series, please contact Skat Foundation at the address below.



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Rehetobel a village administration in charge of the water supply network

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INTRODUCTION

Rehetobel is a small village in the Canton (state) of Appenzell in the north-eastern part of Switzerland. It lies 15 km to the east of the city of St. Gallen. First settlements in the village's current location date back as far as the 12th century. With its nice view and good climate it has been a health resort for more than a century. Since its early days, the village has been dominated by small farms, some of which still exist. Today 9% of the villagers still work in the agricultural sector, compared to a national average of 4%.

However, industrialisation has had a strong influence on the village. For many decades the textile sector dominated the economy of the village and the region. A large home industry evolved during the second half of the 19th century. Embroidery enterprises, weaving mills and other small factories flourished and their numbers grew quickly. This trend persisted during the first decade of the 20th century, and the population reached its peak level (2,400 people)



FACT BOX REHETOBEL

Population today (2002):	1,700
Population in 1900:	2,000
Length of water distribution network:	20 km
Daily water consumption:	240 litres per person (including 60 litres per person for industry)
Owner of water supply network:	communal administration (mains), households (house connections)
Operation of network:	caretaker (employee of the municipal administration)
Management unit:	section of the municipal administration
Annual turnover of the management unit:	SFr 400,000 (SFr: Swiss Franc, SFr 1 = US\$ 0.6)
Connection fee:	SFr 5,000 per connection (irrespective of property value), or SFr 2,500 per flat for buildings with several flats
Water charges:	SFr 2 per m ³

KEY EVENTS

1496:	First recorded mention of Rehetobel
1796:	A large part of the village burns down
1850-1870:	Many municipal road construction projects
1890:	Part of the village centre burns down, including the church
1890s:	Purchase of many springs in the region by the Municipality
1900:	Communal assembly orders the construction of the first water supply network, with emphasis on the 41 hydrants
1904:	First construction phase is finished: 158 households are connected to the network, 14 km of pipes
1910:	Village population at its peak: 2,400 inhabitants
1914-1918:	World War I: economic crisis, many people leave the village
1922:	First extension of the network is finished
1947:	Drought, water had to be fetched from neighbouring village
1949:	Connection to the water supply network of a neighbouring village with more groundwater resources
1950s:	Start of a phase of sustained growth of economy and population
1968:	Connection to a regional water supply network (lake water)
1994:	Additional connection to the regional water supply network
1997:	Water supply becomes a financially independent section of the municipal administration.



in 1910. When the textile sector was struggling during years of crisis (World Wars I and II), the village of Rehetobel was strongly effected. However, the second half of the 20th century saw a phase of steady growth and increasing stability. More people moved to the village for its high living standards. Whilst some small textile factories have survived until today, they are now complemented by other small- and medium-sized businesses and services.

THE ORIGINS OF THE WATER SUPPLY SYSTEM

For many centuries, people relied on local springs and some dug wells for their water supply. Most of the dug wells in the village were private property, but some were owned and maintained by Corporations. In addition, there were several ponds in the village for fire fighting. However, in the event of a fire these ponds were emptied quickly, even with the simple types of mobile manually operated fire-fighting pump available at that time. Because most of the buildings were made of wood, fires posed a serious threat to the village over many centuries, and fire fighting was considered a task of paramount importance.

The first water supply network was planned after a fire devastated parts of the village in 1890. Consequently, the emphasis of the water supply network was on the fire protection side, house connections having a lower priority. Immediately after the fire, the Communal Assembly ordered the administration to start purchasing local water sources to supply the planned network.

In 1900, the Assembly approved the plans for the basic communal network, including 41 hydrants for fire-fighting. In 1904, the construction of this network was completed. 158 households were connected, supplying more than 1,000 people with tap water. The construction of the network was an expensive task, even though the fire insurance bureau covered 45% of the construction costs. A bank loan covered the rest (it took the Municipality until 1940 to fully pay it back).

DEVELOPMENT AND GROWTH

The early 20th century was a time of fast population growth in the village. Many houses were built and connected to the network, so demand was rising quickly. Water was also increasingly used by some factories for industrial production (cooling, cleaning, etc.). When the demand could no longer be met by local sources, a connection to a neighbouring village with more resources had to be built. However, demand kept increasing dramatically, particularly because of the increasing numbers of flushing toilets in private households. In 1910 the average daily consumption was 40 litres per person. By 1980, this value had increased to about 180 litres per person, not including commercial and industrial water uses.

As other villages in the region were facing similar problems, a concerted action was started in the 1960s. Initiated by the fire insurance bureau, the villages set up a regional water supply network connected to water intake on the lake. However, water shortages were still occurring in Rehetobel in dry summers because the transmission main was too small. Therefore, another connection to the regional water supply was built between 1994 and 1996. With this extension, the current demand can be met even in dry years.

Fire fighting was the main purpose of the basic network built in 1904. This was also reflected in the fact that the committee deciding on the technical issues of the network was called the 'Fire Police Commission', and it was headed by the chief of the local fire brigade. During the 20th century the purpose of household use became increasingly important (compared to fire fighting). In order to adjust the bylaws of the water supply network to the new circumstances, a new committee (the 'Water Supply Committee') was formed in 1980. Its goal of developing new bylaws was achieved in 1994 when the municipal assembly approved them. Today, the Water Supply Committee functions as a technical support to the municipal councillor responsible for water supply.

In order to comply with new legislation, the water supply section had to become a financially independent body of the village administration in 1997. This new set-up implied that all the expenses for management, maintenance and operation as well as for renewal of the network had to be met by the annual charges and the connection fees. It was an attempt by the Municipality to achieve more budgetary transparency. Under the new arrangement, it is impossible for the administration to cross-subsidise activities in the water supply sector

using general tax money or other funds. On the other hand, any surplus of the water supply section has to be set aside as a reserve and cannot be used by the general administration of the village.

Over the last century, the issue of water quality has seen a radical change. In the early days of the water supply network, the only quality parameters assessed were smell, taste, and colour. During the second half of the 20th century, the regulations for water quality (raw and treated water) became increasingly stringent, and many parameters were added. Combined with the effects of increasingly intensive agricultural practices, this meant that many local sources no longer complied with the regulations. The sources had to be disconnected from the network, but were still being maintained in case of an emergency. Today, there is an attempt to improve the raw water quality of these sources and make their yield available again to the village. However, this is a lengthy process that involves convincing farmers to use less fertiliser and cattle waste slurry in the vicinity of the sources. The years to come will show if this challenge can be met by the village administration or if the back-up of other institutions is needed.

THE ACTORS

Over many decades a complex network of stakeholders and institutions has evolved in the region of Rehetobel. The main stakeholders in this network are the water users, the municipal administration, the Regional Water Supply, the local service providers (private companies), and the fire insurance bureau (see Fig. 1). These actors and their relationships will be briefly described in the following sections.

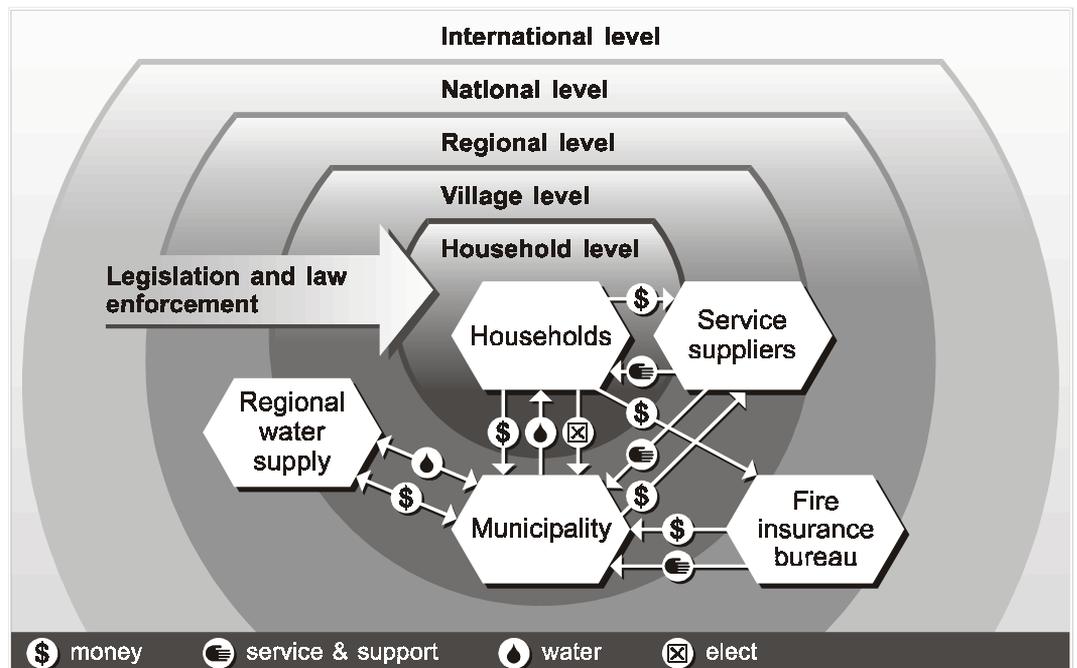


Fig. 1: The main stakeholders in Rehetobel and their interactions

HOUSEHOLDS

Households account for most of the water use in Rehetobel. As the house owners also own the house connections, they are responsible for their maintenance and renewal. If householders neglect their duties, they can be forced by the Municipality to renew their house connections at their own expense. The households can contract a plumber from a list of certified service suppliers. In practice, there are two small businesses in the village which do most of this work.

All the adult inhabitants of the village have the right to elect the members of the municipal council. They also have the right to vote on budgetary decisions of large projects - such as the construction of a transmission main.

PRIVATE SECTOR

There are several small companies doing maintenance and repair work in the region. If work needs to be done on a house connection, the municipal administration may order the house owner to commission the work and pay for it. Only accredited companies can be commissioned. Any house connection construction or renewal has to be approved by the Municipality.

The planning of extensions is done by a small engineering company working in the region. As they have been working in the village for more than 20 years they know the network very well. The municipal administration has been very satisfied with the quality of work delivered and thus never had reason to call in another engineering company. However, any major work on the network - extension or renewal - nowadays has to be put out to competitive tender. The job description and the criteria for decision making have to be published in the communal publication, a monthly brochure. So far, the advantages of knowing the network and the local circumstances have always enabled the same engineering company to win the work.

For small works and in the case of a pipe leakage, the caretaker himself can commission a local company. Often specialised equipment is needed, and the company with the appropriate equipment is given the job.

MUNICIPALITY

The Municipality consists of two separate bodies: the Communal Council (village executive), and the Administration. The nine members of the Communal Council are elected by the Communal Assembly, which includes all the adults of the village. The job of a municipal councillor is done part-time on a voluntary basis. One term lasts four years, re-election is possible and common. One member of the Communal Council is appointed as the head of the water supply section. This person takes the strategic decisions in the field of water supply. As (s)he is usually a lay person, (s)he is supported by a technical committee, the 'Water Supply Committee'. This technical committee consists of the head of the local fire brigade, the vice president of the Communal Council and some inhabitants of the village who have experience in issues of water supply.

The operation of the network is performed by a network operator (caretaker). He is employed by the Municipality to devote one third of his time to the business of water supply. For the other two thirds, he is employed as operator of the regional wastewater treatment plant, and for both systems he is on call 24 hours a day. In the case of an emergency, he may order a private company to support him or to do the urgent work. Furthermore, he is responsible for reading and checking the water meters. The billing is then carried out by the municipal registry.

The Communal Council as a whole decides on the water tariffs. Tariffs have to be set so that all the expenses of water supply can be met by the yearly water charges and the house connection fees. Surpluses may be accumulated for a few years to cover a potential loss in any year.

REGIONAL WATER SUPPLY NETWORK

During the first half of the 20th century, many villages in the region had set up their own water supply networks. Even though some of them were inter-linked, they all faced the same problem of low reliability of supply in drought years. In the 1960s, an initiative in several villages resulted in the construction of a pipeline to a planned lake water treatment plant. In order to deal with this task a new committee was set up. Each village sent one representative to the board of representatives. This committee then appointed one member as the president.

According to the needs of each village, the total demand was determined. This enabled the committee to commission an engineering company for the design of the pipelines and pumps. The costs for all common infrastructure was split up according to the demand of the different municipalities, and the fire insurance bureau also covered 25% of the costs. The caretaker of one of the villages was employed part-time for the purposes of the Regional Water Supply Network. The responsibility for paying his wage was shared between the six villages.

The Regional Water Supply Network is a very purpose-oriented association with a lean structure. The board of representatives takes all the strategic decisions, and the president handles the day-to-day business with the support of the caretaker. They also send yearly bills to the individual villages, according to their respective purchases of water.

FIRE INSURANCE BUREAU

Prior to the 19th century, there was no fire insurance. After an accident, appeals were sent out for regional, national, and even international support, mostly relying on contributions from individuals. This system was slowly replaced by the regional fire insurance bureaus. Initially set up by the cantons, these institutions invested money on a regular basis, and they were the driving force behind many hydrant networks. These networks were also then used by the towns and villages as bases of water supply networks.

Today, the fire insurance bureau (literally 'Building Assurance') is a public, independent institution. It covers roughly 24,000 houses in the region. It is mandatory for all house owners to be covered by this insurance, thus there is a regional monopoly. However, the administration of the canton supervises the bureau, and their duties and rights are clearly defined in laws and regulations. The insurance bureau does not obtain money from the government - all its expenses must be covered either by fees from the house owners or by reserves from previous years. Therefore it is a non-profit organisation. Most of the expenditures go towards refunds for losses due to fires and proactive investments in fire-fighting infrastructure.

The bureau covers 15-30% of the investment costs of new water supply infrastructure projects, depending on their importance for fire-fighting. On average these funds are equivalent to the costs of the additional infrastructure needed for fire fighting - reservoirs, hydrants, larger pipes. Thus, the insurance bureau does not actually subsidise water supply projects but covers the additional expenses for fire-fighting. Nevertheless, it plays an important role as a support to the municipalities in technical, organisational and juridical questions.

CANTON (STATE)

The Canton runs a water analysis laboratory. For reasons of efficiency, the laboratory is shared with two other cantons in the region. The staff of this laboratory takes water samples from all the networks of the region twice a year. If contamination is detected, sources must be disconnected from the network or additional treatment equipment added. The villages are also required to set up a sampling scheme for internal quality control. The staff of the laboratory advises and supports the villages in this task.

The Canton is also responsible for enforcing the environmental laws. These have a special significance in the area of groundwater protection. The management units of the village water supplies have to delineate protection zones around water sources. In these protection zones, certain activities such as the spreading of fertiliser and slurry are restricted or prohibited. Experience has shown that especially small villages struggle with this unpopular task as the different stakeholders know each other personally. Thus, it is important that the Canton can provide a stable and consistent law enforcement policy to support the villages in enforcing such restrictions.

FACTORS LEADING TO SUCCESS

- **Support at the intermediate level** - It has been crucial for the village of Rehetobel to have some support in technical and financial issues for their water supply network. As the necessary knowledge and skills were not available at the village level at the time of the first water supply network, they had to be provided at the regional level. It was partly the fire insurance bureau - but also the private sector - which was able to provide this knowledge. On the other hand, the fire insurance bureau was interested in supporting the villages in their attempts to provide better measures for fire-fighting as this considerably lowered the number and extent of cases of fire damage. Thus, the construction of a network for fire-fighting and drinking water created a win-win situation for the villagers and the fire insurance bureau.

- **Professional planning** - For many decades, planning of new connections was done on an ad-hoc basis, often without involving an engineer. Houses were connected to existing house connections instead of to the distribution network. This led to low pressure and delivery rates in some houses. It took the responsible communal councillor many years of work to convince the rest of the Council that the investment for professional planning pays off over the long run. This planning is now implemented and involves an inventory of all the communal water infrastructure as well as a prioritised action plan for the next 20 to 30 years. This plan was commissioned by the Communal Council, and provided by professional engineers from a private company. They also advise the Council on other strategic decisions.
- **Dual purposes of the water network** - In many villages in Switzerland, fire protection was an important driving factor in the setting up of water supply schemes. This fact is well illustrated in the village of Rehetobel, where fire fighting was more important than supplying drinking water during the first decades of the village network. Therefore, the design of the basic network focussed on hydrants, reservoirs, and their connections. The network not only saved the lives of many people and animals, but its function could easily be extended to the supply of water for household use. As the same network serves hydrants and households, all the water must be of drinking quality. The use of drinking water for fire fighting purposes may be considered a waste of resources. However, the example of Rehetobel shows how the purposes of fire fighting and water supply can be efficiently combined.
- **Industrialisation** - Switzerland was one of the first countries in Europe to start a process referred to as the 'industrial revolution'. This move towards industrial production was especially strong in the region of Appenzell - amongst others. It affected many different levels and aspects of society. An important aspect was the advent of novel energy sources and technology such as hydropower. Industrialisation also had a strong effect as a social process - some people were accumulating wealth while others were driven into harsh working environments and relative poverty. From today's point of view, the supply of drinking water to many private households can be seen as one of the major achievements (or side-effects, depending on the point of view of the assessor) of industrialisation. It had a positive effect not only on people's health but also on the well-being of society as a whole.
- **Long-term involvement** - All of the people and institutions dealing with water supply issues in Rehetobel have been involved for many years or even decades. For example, the engineering company responsible for planning new developments has been contracted for different projects over a period of 20 years. The long-term involvement enabled the company to acquire a wealth of tacit and explicit knowledge. This in-depth knowledge is put to effective use in the planning of renewals and extensions to the network. The current set-up not only ensures that knowledge is kept close to the village but also that it is available over a long period of time.

CHALLENGES

- **Stable level of investment** - For a village the size of Rehetobel, investments in infrastructure projects can easily breach the limits of the municipal budget. Experience has shown that, especially in years of economic instability, these investments had to be cut considerably. During the many years when the village saw no building activity (and therefore received no water connection charges), the investment levels were too low. Even though these years of under-investment may have occurred as much as 60 years ago, some of the effects are only being felt now. Thus, it is a remaining challenge for the Municipality to make up for this neglect. At the same time it also has to make sure that the current level of investment is stable and at a sufficient level to ensure that the system is continually being renewed. At the time of this publication (2002) it was not clear if the water supply section was going to be able to provide sufficient funding for its activities or if an increase in charges would soon be needed.

- **Connection charges** - Until 1997, the connection fees were a fixed percentage of the building value. Today, the fee is a fixed sum based on the number of house units (flats) per connection. Under both arrangements, the connection fees make up an important source of income to the water supply section. Thus, the financial health of the system is partly dependent on growth. This puts a considerable pressure on the budget of the section in years when there are no new connections. Future price arrangements will have to depend more on the annual charges - by increasing either the annual standing charges or the volumetric charge.
- **Size** - Rehetobel is a small village - today it has a population of around 1,700. Due to its size and the high level of automation, there is not enough work to keep one network operator busy. However, most of his workload is in response to unforeseen events and so cannot be planned. Therefore, it is important to supplement this responsibility with a flexible and complementary activity. In Rehetobel, this was achieved by employing the caretaker for both the water supply network and the regional wastewater treatment plant. As these two sectors are closely interrelated, his know-how is used efficiently. In other small villages, the caretaker is also employed for the regional water supply network or other complementary tasks.
- **Loss rate** - There is an estimated loss rate of 20% of the water delivered. Compared to the national average of 13% this appears to be a high value. However, it includes the water used by a public swimming pool, which is not metered. All the water used for fire fighting - practising and real emergencies - is also included in this 20%. Another factor is the large variation in altitude in the network - one reservoir lies at 1090 metres above sea level, and some houses are just above 900 metres. Thus, in some areas of the network the pressure is high. All these factors - combined with the age of the network - explain why the leakage rate is at a relatively high level.
- **Gender issues** - The water supply (and sanitation) sector of Switzerland is dominated by men. In Rehetobel, it was only recently that a woman was appointed for the first time as the head of the water supply section. As all the other Communal Councillors, she is a lay person dealing only part time with the sections appointed to her. Thus, it is important to have ways of support in technical questions. This support can be delivered by the Water Supply Committee, but also by councillors of neighbouring villages or people who previously were involved in the business of water supply. Thus, the fact of her being a woman has posed no special difficulties. On the contrary, her approach to water supply issues has added a feminine touch and thus it has enriched the community.
- **Sense of ownership** - After the construction of the basic network, taps still occasionally ran dry during some days or weeks in summer. During such a dry period in 1947, a private person with a small truck (the only motor vehicle in the village) offered to fetch water from a neighbouring village and deliver it to households. This was accepted as an emergency measure, but it also showed the lack of secure water resources. The anecdote illustrates the highly developed sense of ownership in this community. Two years later, the connection to a neighbouring village with more groundwater resources was completed.
- **Emergency procedure** - Without being formalised, a standard procedure in the case of a pipe burst has evolved. As soon as a burst pipe is detected, the caretaker is called (he or the deputy caretaker can be reached any time of the day.) The caretaker commissions a company specialised in leak detecting. They can often locate the pipe burst to an accuracy of one metre, which reduces the cost and time spent in digging. The actual digging and fixing work is carried out by another company in collaboration with the caretaker. Before he starts his work, he has to shut off the affected area from the network and inform the affected households. Often an interim solution has to be found until the pipe is fixed and the isolated house or area can be reconnected. If a house connection develops a leak, the owner must cover the costs of repair by a contractor.

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FURTHER INFORMATION

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Weinfelden a municipal administration in charge of the water supply network

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INTRODUCTION

Weinfelden is a village of about 9,000 inhabitants in the eastern part of Switzerland, about 10 km from Lake Constance. The landscape of the region is dominated by vineyards, forests, general agriculture, and some industries. For many centuries, Weinfelden has been a trading centre for the region - the village is mentioned in documents as early as AD 124. Since the 19th century the importance of industry has been growing. The River Thur played an important role in supplying hydropower as well as water for textile and paper factories. Today, trade, industry and services employ around 6,000 people in the village.

Weinfelden always has been a relatively wealthy community, due to different reasons such as the vineyards and the central trading function of the village. Regarding water supply, the village is in the fortunate position of being situated close to a major groundwater flow. This enabled agriculture to flourish, and many fountains have been existing for centuries. Today, Weinfelden is not only the location of the state (canton) administrative court, but also the state parliament's winter session takes place in the village.



FACT BOX WEINFELDEN

Population today (2002):	9,300
Population in 1891:	3,000
Length of water supply pipes:	75 km
Water consumption today:	300 litres per capita per day (including industry)
Owner of distribution network:	Municipality, Technical Operations section
Operation and maintenance:	municipal staff and private service suppliers
Management unit:	managers of the Technical Operations section
Annual turnover of water section:	SFr 2.4 million (SFr: Swiss Franc, 1 SFr = 0.6 US\$)
Connection fee:	SFr 800 per connection, plus SFr 200 per flat (apartment)
Water charges:	yearly standing charge of SFr 125 per flat or house, plus SFr 1.15 per m ³ water used

KEY EVENTS

1398:	First mention of a dug well
1836:	Construction of a trench from a source to a well in the centre of the village (150m)
1885:	Petition for a common water supply project rejected by the communal assembly
1890:	Community buys local sources
1891:	Construction of communal network
1905:	Drought year, construction of groundwater pumping station
1964:	Establishment of regional water supply association
2001:	Petition to turn the Technical Operations section into a publicly owned company is approved



THE BEGINNINGS OF THE WATER SUPPLY

For centuries, farmers relied on the local springs and wells, and farms only were built where there was water. There are reports of dug wells in the centre of the village since AD 1398. Water was used mainly for drinking purposes (by people and cattle) and only in exceptional cases for irrigation. There was a large number of wells in the region, most of them privately owned, only few being owned and maintained by groups of users. In those days, pipes were made of hollow trees, a technology that required a high level of maintenance and frequent renewal.

Water rights were often the cause of disputes. There was a large number of regulations and contracts between different users and landowners, and the ever-increasing population kept the pressure on the water resources high. Especially in dry years, not all the demands could be met, and new sources were looked for. Water was not only needed for household purposes, but it was considered an important protection against fires. Most of the farmers used their own sources for different purposes.

In 1884, a forester was asked to assess the ground water resources in the local forest. His report confirmed that there was some ground water available. However, the proposal to tap these resources was rejected by the communal assembly in a vote. However, the need for more water remained, and it was decided to execute a more thorough assessment of the ground water resources of the region (River Thur Valley).

INITIAL SET-UP

After the dry summer of 1887, it was obvious that there was a need for a more sophisticated water supply system. Some progressive citizens (a wine trader, a pharmacist, a factory owner, the president of a regional bank, a lawyer, two tradesmen, the owner of a hardware store, and the mayor of the village) organised a meeting to discuss the issue of community water supply. During that meeting it was decided to establish a water committee and commission it to develop a project proposal. After years of negotiations, this project proposal was ready in 1891. At a communal assembly in March of that year, it was decided to establish the communal water supply network.

Prior to this meeting, the committee had collected money on a voluntary basis. 54 inhabitants had contributed to a total of SFr 10,000 - the equivalent of around 10 years' wages of a typical employee in the industrial sector. This money was used to acquire land that included water sources. These sources would form the basis for the first project of the communal water supply.

In only 10 months, the basic system was built, including a 600 m³ reservoir and a main distribution network of cast iron pipes. An integral part of this distribution network were 84 hydrants for fire-fighting purposes. After this first period of construction, the water committee was dissolved and the whole project handed over to the municipal administration.

DEVELOPMENT AND GROWTH

The first decades of the communal water supply were dominated by fast growth in demand by private households as well as by industry and small businesses. 1905 was a dry year and the demand exceeded supply for some days in summer. Over the years to come, the availability of electricity and new pump technologies enabled engineers to tap the lower-lying sources in the river plain to meet the growing demand.

As the village was spreading out on the hills, the water supply network had to be split up into several pressure zones, and today there are three different pressure zones. To meet the ever-increasing demand, more reservoirs and pumps were continuously installed. This led to a decrease in the ground water level to an extent that the lower-lying pumps were at risk of running dry. The surrounding communities were facing similar problems, especially those situated on higher elevations on the surrounding hills. In this situation it was decided (in 1964) to develop a regional solution to the water shortage problems. This regional water supply body was made responsible for ensuring that the most feasible water sources are developed and made available to the group of communities. It remained a very important body in the management of the water resources of the region. All the current needs can be met, but further planning is needed in order to enforce regulations for well protection and to meet the increasing quality standards.

Today, the municipal administration of Weinfeldern is still in charge of the water supply network of the village. The section responsible for the network has grown into a self-reliant

institution with highly qualified personnel. In the following sections, the administration and other important stakeholders of the water supply will be described in more detail.

THE ACTORS

In Weinfelden, the Technical Operations unit of the municipality has three important functions - owner of the network, operator of the network, and management unit. It also sends a representative to the Regional Water Supply body. This is a network of several villages that manages the regional water resources. Households and industries are the customers of Technical Operations. The contractors may be engaged to support Technical Operations or actually execute the work. The fire insurance bureau is important only in network extension projects, as it can provide funds to meet the additional infrastructure requirements for fire-fighting. This network of stakeholders is depicted in the following diagram, and it will be described more thoroughly in the following sections.

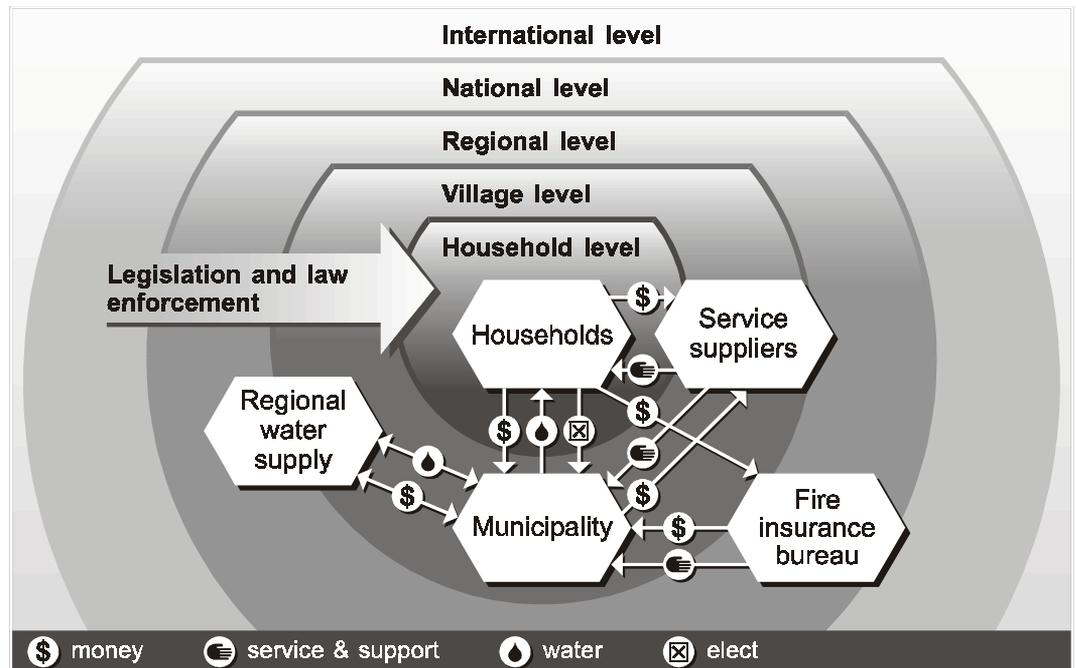


Fig. 1: The main stakeholders in Weinfelden and their interactions

MUNICIPAL ADMINISTRATION

The municipal administration is the most important stakeholder for the water supply of Weinfelden. One section of the administration deals not only with water supply issues, but also with the gas, electricity and cable network of the village. Today this section - called 'Technical Operations' - operates independently, meaning that they can neither receive funds from other administrative sections nor transfer any surplus for use by other sections.

Technical Operations are the legal owner of most of the network, from the sources to the water meters. Therefore, they also are responsible for the operation and maintenance of this network. The section employs some 30 people, two of whom are responsible specifically for the water supply network. The water section alone is responsible for an annual turnover of about 2 million Swiss Francs (around US\$ 1.3 million).

The person responsible for the water supply network (called the 'Brunnenmeister') was originally a lay person from the community who was elected by the communal assembly. This position was usually occupied by a reputable farmer, since the business of water supply is a delicate issue wherein the trust of the users is essential. In the records of the municipality, there is no example showing that this trust has been abused or even doubted. Today, the caretaker is a highly specialised professional. In yearly courses (organised by the association of water network caretakers) he updates his knowledge and exchanges experiences with colleagues from all around the country. This is an important source of know-how and experience and enables the caretaker to stay on top of recent technological developments.

The water meters are read twice a year. For this purpose, temporary staff are hired (mostly housewives) and sent to all the households. They read the water meters and also report back irregularities (such as noise of trickling water). Most of these women have been doing

this for many years and thus do not need much training. They appreciate this activity as a way to generate some income for a couple of days a year.

Everything to do with wastewater and drainage is managed by a different section of the municipal administration. This section in turn is part of an assembly of administrations which jointly run the regional wastewater treatment plant. These two sections of the municipality of Weinfeldern only have one point of contact in that the households are charged for water and wastewater according to their consumption of water. Other than that, the sections operate completely separately.

The Technical Operations section is headed by a director. He is supervised by a committee of five people. This technical committee is elected by the council of the village. The member of the Village Council responsible for water supply is ex officio the president of this committee. The committee serves as an advice and support unit to the political manager (member of Village Council) as well as to the technical manager (head of Technical Operations).

The section operates a 24-hour on-call service for emergency cases for all the different networks. In the case of an emergency (pipe leakage, etc.), the caretaker is on site within minutes. He then decides if he can fix the problem himself or if he needs to hire a contractor.

REGIONAL WATER SUPPLY

During the 1950s, the sinking level of groundwater threatened to let some of the lower-lying pumps run dry during the summer months. This situation was similar in several communities of the region. It was therefore decided to join forces with other communities and try to develop a regional solution. Along with two corporations (public water bodies outside the administration) and the municipal administrations of fourteen other villages, an association was formed. The purpose of this association (called 'Regional Water Supply') was the planning and implementation of a common water distribution network.

A private engineering company and a hydro-geologist were engaged to analyse the regionally available water resources and make proposals on how to develop them. It soon became obvious that there was enough high-quality groundwater available in the region and that it was necessary only to identify the optimal site for the wells. In addition, a large amount of money was needed for the construction of the regional network. This was injected by the member villages of the association according to an arrangement that previously had been agreed on. This arrangement is still valid today and it is used to split costs of all new infrastructure investments needed for the regional network. Only if a new member (municipality or corporation) joins the group, must the arrangement be modified. Today, the water needs of all the member villages (plus one small city) can be met with the existing facilities. The network consists of around 30km of connecting pipes between the village networks.

HOUSEHOLDS

Today, almost every house is connected to the communal water supply network. Only a few farms still have their own private sources. If the development of a new area in the village is planned, the extension of the water supply network is integral part of the planning procedure. Developers or their architects are required to submit their plans for new houses to the Technical Operations section. The section decides on the technical details and charges the one-time connection fee to the house owner, based on the size of the plot. After completion of the house connection, ownership is transferred to the municipality of Weinfeldern, which is then responsible for the operation and maintenance of the complete network.

All the adult inhabitants of Weinfeldern are eligible to elect the municipal council. One of the council members is responsible for water supply, and the director of the Technical Operations section directly reports to him. The council also has to approve the water tariff and investments above a certain limit. These mechanisms ensure the political control of the technical section. Another way that citizens can influence operations is to make a complaint to the municipal administration. This is a very direct form of feedback, which may be used if there is some concern about the water quality (such as colour or taste). However, this option is rarely used; the water quality in the village meets all the required standards.

PRIVATE SECTOR

There is a number of private companies working in the water sector in this area. As most of the repair jobs arise on a short-term basis, they often cannot be put out to tender. In many cases, the Technical Operations section employs individual workers who are available at that time. The workers have to prove their technical skills (e.g., with certificates) before they are engaged. This procedure is part of the quality management system of the administration.

As the Technical Operations section runs not only the water supply network, but also the electricity, gas and cable networks, it is often possible and advantageous to combine and co-ordinate work on the different networks. This combination of tasks is very cost efficient. Contractors need to have experience with several of the different technical systems.

INDUSTRY

The region around Weinfeldern was one of the earliest in the country to take up industrial development. This started as early as 1850 with the development of factories along the River Thur. Hydropower was the major energy source before the development of steam engines. Many factories directly used the river to power their production lines (e.g., the textile industry) and so such factories quickly spread along the river. In spite of the country-wide move away from industry towards services over the last century, Weinfeldern has retained some of its industrial nature. Today, there are still six enterprises employing more than 100 people each, one of them being a railway company. The largest water consumer of the public network is a waste incineration plant. Two other large water consumers (the public swimming pool and a paper mill) have their own concessions and pumps.

The process of industrialisation was important for the water supply network on several levels. First it enabled people to locally produce cast iron pipes and valves, and later pumps. The taxes of the enterprises were an important source of income for the municipality, and the money was partly used to subsidise construction of the network in the early years. Furthermore, the process of industrialisation had created some private wealth, which in turn was used to finance the start of the water supply network before the municipality stepped in.



The caretaker on his weekly tour of all the springs and reservoirs.

FIRE PROTECTION INSURANCE

The fire insurance bureau of the Canton (state) is a semi-public institution. The parliament of the Canton controls the executive council, and there are laws and regulations that directly influence the business of this institution. It has a monopoly within the Canton, and it is compulsory for house-owners to make a contract for insurance with this bureau. However, the prices are fixed (and periodically readjusted), and the bureau can neither give a surplus to shareholders nor accumulate reserves over a certain limit.

The fire insurance bureau uses part of its funds to subsidise the main distribution lines and reservoirs. Depending on the importance of a specific network component for fire-fighting purposes, the insurance agency may cover 10 - 20% of the initial costs. In this case, the design of pipes and reservoirs must take into account the additional needs for fire-fighting purposes.

The Canton has two important bodies that influence the business of water supply networks: the state water analysis laboratory and the environmental protection agency. The laboratory is responsible for testing the water in all the supply networks for a number of chemical and biological parameters. It also advises and supports the local service operators, and they jointly decide on the water sampling scheme.

The environmental protection department is responsible for the enforcement of the groundwater protection regulations. In Weinfeld, these regulations now require the municipality to move two sources further away from the agricultural area and from buildings. This is going to be a major undertaking in the years to come.



The caretaker checking the network electronically. All the pumps and reservoirs are monitored by a computer network.

FACTORS FOR SUCCESS

- **Range of responsibilities** - The Technical Operations section not only operates and maintains the water network, but also the networks for gas, electricity and television cables. This combination enables them to tackle different problems in a particular location at one time. Especially where heavy machinery is needed to dig trenches, this combination of different tasks saves time and money and reduces disturbance.
- **Lean staff structure** - Technical Operations section employs only as many people as are needed to run the 24-hour emergency operation plan. For everything that goes beyond the working capacity of these staff, contractors are hired.
- **Training of staff** - All of the current staff members have been working for the municipality for many years, some even for decades. The continuous training in periodic courses has enabled them to take the right decisions regarding choices of material and proper design of networks. As the staff are often in the position of supervising contractors, they need to be thoroughly familiar with all aspects of the business.
- **Standardised qualifications** - If a contractor is hired, the most important aspect is the qualification of the person doing the actual work. For example, a welder working on a gas pipeline has to show a qualification from a certified institution confirming that he is able to weld to a standard that will pass x-ray testing before he is allowed to start his work. For the water supply network caretaker, there are similar qualifications.
- **Continuous renewal of the network** - Every year, 1-2% of the pipes are renewed. This means that the network will be completely renewed every 60 years, which is the expected lifetime of polyethylene pipes – a lifetime backed up by the manufacturer's guarantee. The policy of constant renewal of the oldest parts of the network helps to keep water losses down to an estimated 6% of the water supplied.

CHALLENGES

Recently the Technical Operations section tried to become an independent body of the administration in the form of a state-owned company. A petition was handed to the communal council and approved by a public vote in December 2001. An interim executive board was appointed, consisting of three members of the municipal council. They will now have to set up the company and appoint the definitive executive board. 100% of the stock will belong to the municipality of Weinfelden. It is expected that the new set-up will enable the organisation to take decisions more quickly and handle budgets more flexibly.

As groundwater is readily available in the region, there is always the option for large consumers to get their own concessions and pump the water directly from the aquifer. Under the new arrangement, the water system operator will be able to make more flexible offers to such large consumers. This in turn will benefit all the customers, because as more water is delivered the unit price becomes lower. Other aspects of this reorganisation will only become obvious in the near future and the challenge remains to keep the service at the current level of quality and reliability.

ISSUES OF INTEREST

- **Trust** - During all the years of public water supply, it has always been important to keep a high level of public trust. All the staff members of the Technical Operations section have direct contact with the customers. Furthermore, the section organises many guided tours around their facilities for schools or other interested institutions and groups. The staff also has close links to the fire-fighting brigade - an organisation of high social importance.
- **Public vote** - In December 2001, the general public of Weinfelden voted to decide if the Technical Operations section should be changed into a stock company, 100% owned by the municipality of Weinfelden. The management and staff were in favour of this option as it would give them more flexibility and a leaner structure. They communicated their opinion openly, and the public followed their advice - another sign of the trust that exists between this administration section and the public. Staff were dismissed by the public administration and the same people were then employed on long-term contracts by the company.
- **Security of supply** - Security of supply has been an issue of high importance over the last few decades. Over a long period of time it was appreciated and considered normal that the public should have access to the drinking water in reservoirs. As concerns about the security of such systems started to rise, the security measures at the reservoirs were increased - by additional gates, and more recently by sensors connected to on-line security systems. To take this even a step further, new reservoirs are built in a way so that it is impossible to open the doors as long as there is water inside.
- **Competition** - The manual work of repair and maintenance of house connections is done by small contractors, under the instructions of Technical Operations. As there are eight such contractors in Weinfelden, there would be considerable scope for competition. However, Technical Operations always contracts house connection repairs to the company which undertook the initial construction of the house connection. This was asked for by the customers as they prefer to deal with only one company. In this way, one company is responsible for the water connection of each household. This example illustrates that competition amongst service provider works on the level of quality of work and reliability of service rather than on price.
- **Gender balance** - Even though a long series of the minutes of communal meetings are accessible in local archives, not much information about the different roles of men and women over the centuries can be found in these documents. However, in a very similar setting in Bülach (with about one thousand inhabitants, and some industries), the female citizens presented a petition to the local government and asked them to 'strive for a common water supply' in 1876. More than 100 women had signed the document, which started with the following introduction: 'Knowing that the female gender has to bear all the weight of dragging water to the house, a number of women have decided (...) to work hard to achieve the goal of a common water supply network.' This shows not only that women were responsible to procure water but that they also found ways to influence the communal executive. In 1884, the communal executive proudly announced the completion of the construction of the water supply network.

ACKNOWLEDGEMENTS

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FURTHER INFORMATION

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Wittenbach where a club for a few evolved into a co-operative for all

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INTRODUCTION

Wittenbach is a village 10 km from the city of St.Gallen in the north-east of Switzerland. Today, it has about 8,000 inhabitants. In spite of its vicinity to a city it has retained much of its agricultural character. For most of its history the community consisted mainly of farms, each with its own water source nearby. In the centre of the village there were some additional dug wells. Towards the end of the 19th century, more intensive farming practices were introduced and more cattle had to be provided with drinking water. This process, along with a period of dry years, was the main push that initiated the development of a common supply network for drinking water, similar to the systems that had been introduced in many cities country-wide during the second half of the 19th century.



FACT BOX WITTENBACH

Population today:	8,000
Population in 1891:	900
Length of network today:	49 km
Daily Water consumption:	270 litres per capita (including industry)
Owner of water supply network:	Water Supply Group (Association of several village networks)
Operation of network:	Local private company
Management unit:	Water corporation (Community-based organisation)
Annual turnover of management unit:	SFr 1.8 million (1 SFr = US\$ 0.6)
Connection fee:	2/3 % of the building value
Water charges:	standing charge of 0.025 % of the current building value, plus SFr 1 per m ³

KEY EVENTS

- 1897: Foundation of the Water Corporation as a private club. The 26 members injected substantial amounts of money, according to the number of cattle they owned.
- 1898: A loan from a regional bank for the construction of the first project was approved.
- 1908: Due to his neglect of duties, the caretaker ('Brunnenmeister'- literally 'master of the wells') was replaced by another in a democratic election.
- 1908: The credit for the first project (1898) was paid back to the regional bank. Thereafter the surplus of the Corporation was distributed amongst the members or set aside for extension projects.
- 1912: Installation of water meters for all users within three years.
- 1932: The Water Corporation is forced by a court decision to become a public body.
- 1941: A company from central Switzerland was hired to supply the first electrical pump to satisfy the increased demand.
- 1971: Formation of a joint venture of the water corporation with 6 surrounding municipal projects to form the 'Water Supply Group'. Construction of pumps and electronic regulation of the whole network. A connection to a large lake water treatment plant is completed for increased security of supply.



INITIAL SET-UP

The initiative for a common water supply network came from a group of villagers, and within a short time they had set up a co-operative - **a private association with a public purpose**. Their main motivation was the luxury of having a piped supply of water in their houses for themselves and, during dry periods, for their cattle. Initially, the Co-operative consisted of a local elite of only 26 land owners who covered the costs of the first project. Large amounts of money were injected for this project (up to the equivalent of an average industrial wage for a year), and, in addition, the water fees were high by today's standards. In turn, members were charged at a lower rate than other consumers.

HISTORICAL DEVELOPMENT

Subsequently, more house connections were added and the Co-operative was obliged to accept new members, even against the will of the majority of the current members. The main uses of water were domestic consumption, water for cattle, and fire fighting. For this reason, funds from the fire protection insurance payments were made available for developing the main network and hydrants. The network grew larger every year and it was necessary to connect new springs to the system. With the availability of pumps, lower-lying sources of water could also be developed. Today, every house in the village is connected to the supply network (except for some farms with their own supply), and safe water is available without interruption.

THE ACTORS

All the important actors form a well balanced association that has evolved over a long period of time. The main stakeholders are the water users, the water Co-operative, the Water Supply Group, the local service provider (a private company), and the fire insurance provider (see Figure 1). These actors and their relationships will be briefly described in the following sections.

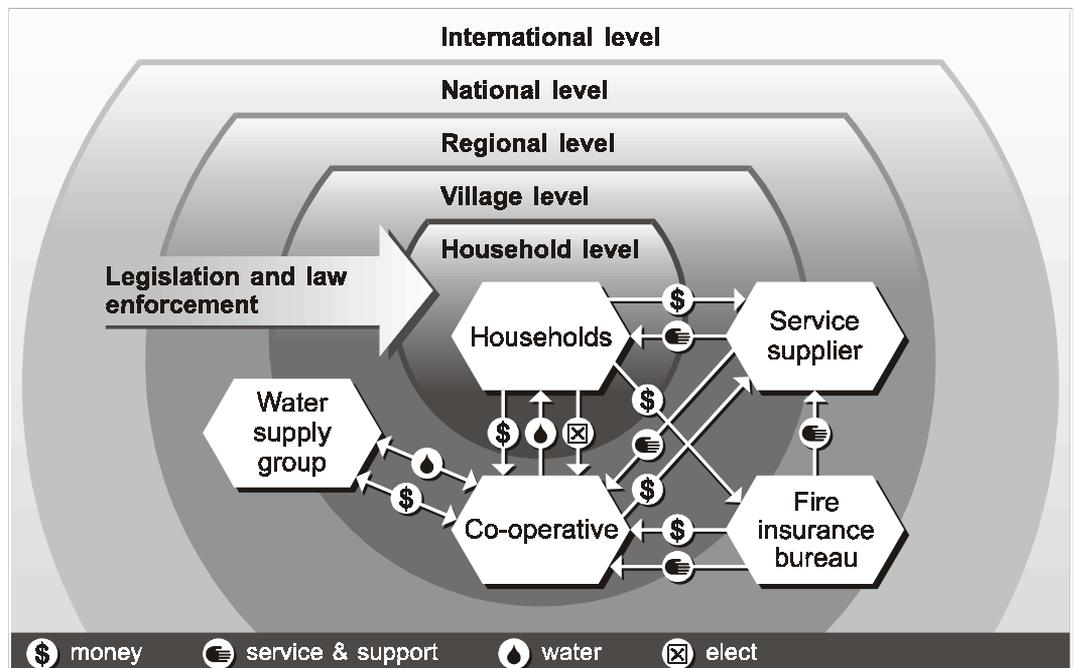


Fig. 1: The main stakeholders in Wittenbach and their interactions

HOUSEHOLDS

Households form the majority of the water supply customers. They use the water and pay fees to the Co-operative. The connection fee is a one-time payment, and the annual fees consist of a fixed charge and a volumetric charge. In buildings with several tenants the owner pays the bill and charges the tenants. Every adult inhabitant of the village is member of the Co-operative and can elect the members of the Executive Board (or become a member of the Executive Board). However, the right to vote and elect officials is utilised only by a minority, mainly by the landowners. Other members (especially women) of the community usually stay away from the Member Assembly, often out of a lack of interest, or because they are happy with the business as it is.

CO-OPERATIVE

Founded in 1898 as a private club, the Co-operative was required to become a public body¹ in 1932 to make it eligible to receive subsidies. Today, its legal and organisational framework are defined in bylaws, which are reviewed every five to ten years.

The Co-operative consists of three bodies: Members, Executive Board, and Accounting Control Unit. All inhabitants and land-owners of the village are members and therefore have the right to elect members of the Executive Board. The Executive Board is the most important unit and takes the strategic decisions during the monthly meetings. All positions of the Executive Board (except the President) are on a voluntary basis, only a small compensation is paid for attendance at the meetings. The President receives a small salary as he has to do most of the daily business. Another member of the Executive Board checks and reads all the meters. Candidates for the Executive Board are proposed for election at the annual Member Assembly by the current Board members. There are no regulations on the Constitution of the Member Assembly (e.g., quotas according to sex or economic status). The proposed candidates are usually elected. Executive Board members may stay for 20 years and more, but their appointments must be reconfirmed every year.

The President is the principal of the Executive Board. He is required to approve short-term interventions, which are carried out by a private company. He has to make sure that the expenses stay within the budget limits and that resources are used efficiently. The budget has to be approved by the annual Member Assembly. Tariffs are set by the Executive Board and are supervised by the financial administration of the Canton.

It is worth mentioning that the Co-operative always succeeds in attracting community leaders who volunteer to devote **a great deal of time and effort** to get the best out of the limited resources of the Water Co-operative. For this work they are paid only a small fee. This readiness is due to the good reputation associated with involvement in the important business of water supply.

WATER SUPPLY GROUP

Since its foundation in 1898, the Co-operative has sometimes struggled to deliver sufficient amounts of water, especially during dry periods. To increase security of supply it joined forces with six more water supply networks in the region to set up a 'Water Supply Group' in 1956. This association of seven water supply bodies buys and sells water from external supply networks (mainly a large lake water treatment plant) and manages water resources within the Group. Today, it delivers water to about 14,000 people. While the Group owns all the infrastructure from the springs to the meters, the individual water suppliers (municipalities or delegated organisations) are responsible for the operation and maintenance of their part of the network.

Each of the seven water supply undertakings delegates one member to the Board of Representatives. This Board takes all the decisions on the group level and appoints the works superintendent. This usually is someone from a company specialised in installing and running electronic equipment. The day-to-day business is defined in a long-term contract, but special investments must be approved by the Board of Representatives.

SERVICE SUPPLIER I

The local service supplier in Wittenbach is a family-run private company that has been working in the region for almost a century. The original founder was a blacksmith, who specialised in the manufacture of pipes. Later, the maintenance of water supply systems became a growing business opportunity, and the maintenance of electricity and gas networks was added. The company today also plans and implements house connections and can proactively intervene if there is a need. The duties of the service supplier are listed in detail in a contract, and they are controlled by the Executive Board of the Co-operative. Experience shows that the **long-term interest** of the company to survive is a strong motivation to **deliver high quality services and products**. During the decades of co-operation between the Executive Board and the company, a **high level of mutual trust** has evolved. This enabled the company to grow continuously and to offer similar services to other communities in the region. Today, there is a staff of 25 people in two branches.

¹ Previously the membership of the Co-operative had been restricted to only a few, so it was called a private club. In 1932 it was required to open the membership to all residents of the village who had the right to vote (i.e. adults citizens)



A one man enterprise specialised in welding of PE pipes an house installations



Often, working on the gas network is combined with renewing the water distribution network.

Competitive tendering is only applied in the case of new housing developments. In all other cases, it is the local involvement of the service supplier and his long-term interest that guarantees the quality of his services and products. So far, the experiences with this model in Wittenbach have been very positive.

In order to keep up with the latest developments within the sector, the service supplier actively participates in a national association of service suppliers. This association organises conferences, meetings, and training courses. It also is an invaluable source of personal contacts for exchanging information

OTHER SERVICE SUPPLIERS

Another company is responsible for operation and maintenance of the Water Supply Group network. They run and maintain the operating system, which depends heavily on computer assistance. The same company is responsible for an emergency service at the regional level, including the 24-hour-a-day availability of personnel, 365 days a year.

For the design of the network (extensions, renewals), engineering companies are contracted. They are usually medium-size companies working in the region. For construction projects such as the development of new land or the connection of a source to the network, the local service supplier also sub-contracts small, local companies specialised in technical areas such as pipe-fitting. Thus, there is typically a number of companies working together on a construction site, and their collaboration is managed by the main contractor (service supplier I).

MUNICIPALITY

The municipality of Wittenbach is by law responsible for the water supply of the village. However, this task is completely handed over to the Water Co-operative. On the other hand, the municipality is responsible for the drainage and wastewater treatment of the village. The costs for this service are charged by the Co-operative to the consumers - based on the drinking water usage - and then forwarded to the municipal administration. The Co-operative can charge the municipality for administration costs. Besides the lean and effective management, this helps to keep the running costs of the Co-operative at an exceptionally low level (1 to 2 per cent of the annual turnover).

FIRE PROTECTION INSURANCE

The fire insurance provider is a very important and unique stakeholder. Founded in 1807 as an administrative section of the Canton, it is today an independent public institution. Provided with a regional monopoly, it is tightly controlled by laws and regulations. The funds of the insurance provider come from the house owners in form of yearly charges, based on the value of each house.

Since the first project, water networks have always been designed for the double purposes of drinking water and fire fighting. The fire insurance provider funds the additional infrastructure needed for fire fighting purposes. This infrastructure includes hydrants, reservoirs, and larger main pipes. These funds are made available only after the insurance provider has approved the technical details of a project. The insurance provider is therefore an **important provider of technical knowledge and supervision as well as financial redistribution**. This set-up enables the efficient control of infrastructure design without a separate control

body - projects that are not approved are simply not supported financially. Profits may be accumulated by the insurance provider to a certain degree above which they must be re-distributed to the customers.

CANTON (STATE)

The Canton (state) provides backup support on several levels including laboratory services for chemical and bacteriological analysis of water samples. The same laboratory must approve the sampling plan of the Water Supply Group, and it enforces the national quality standards for drinking water. Furthermore, the financial administration of the Canton checks and approves the tariff structure of the Co-operative.

Another function of the Canton is to monitor the efforts of municipalities to ensure protection of the sources. The municipalities appoint a hydrogeologist to determine the extent of protected zones around springs where certain land use activities are restricted. Land owners have the right to compensation by the Water Co-operative for any resulting loss of agricultural production. In Wittenbach, such compensation only accounts for a very small part of the annual budget (less than 1 percent).

FINANCIAL ASPECTS

For the construction of the first part of the network, private investment was needed as well as a credit from a regional bank. This was paid back over ten years. The income (connection fees and annual charges) always had to meet all the expenses of the Water Co-operative. Any surplus was set aside for extension projects. This clever investment policy has saved the Co-operative from paying interest rates from bank loans.

The annual fees were adjusted once in a while, but new fees needed the approval of the communal Assembly. Today, the Co-operative has an annual turnover of about 1.8 million SFr. (US\$1.2 million). The costs for administration and management account for less than 2% of the expenses. This is due to the fact that the compensation paid to people holding offices in the Co-operative is very small, and specialists are hired only for specific jobs. There are two types of fees water consumers have to pay: a connection fee and annual charges. Compared to the annual charges, the connection fee is expensive. It is based on the value of the house - and the formula (0.66% of the house value) has stayed the same for more than 100 years. This formula is a simple way to take into account the financial strength of different users.

TECHNICAL ASPECTS

In the beginning of the 20th century, the main material used for pipes was cast iron. Today, most of the new pipes are made of polyethylene (PE). Experiences with this material have been very positive over the last decades. Pipe manufacturers guarantee their PE pipes to last at least 50 years. As the supply network is designed generously, it is realistic to expect that the pipes will actually stay in the ground for at least this long. The joints between pipes are the critical points. Therefore, highly specialised professionals are needed for making the joints.

Industrialisation was another very important factor in the field of technology. It provided energy (hydro-power), resources (e.g., iron) and technological know-how (e.g., pump construction) needed for the construction of large networks.

FACTORS OF SUCCESS

The history of the Water Supply Co-operative in Wittenbach over the last 100 years is marked by struggles followed by successes. Starting as a private 'club' of land owners, it slowly developed into a public body with democratic structures. Today, it supplies water at one of the cheapest prices of the region and has a very low leakage rate (2-3 % of water use). What were the main factors leading to this success?

■ **Legal framework** - especially in the beginning of the development of water supply networks, the existence of a basic legal framework and consistent law enforcement was crucial. The right of the individual to own, buy and sell, and similar laws for groups of individuals are part of this legal framework. This framework is very important not so much for profit making but to give potential investors a guarantee for their money.

It was also the legal framework that forced the Co-operative to transform itself from a private club into a public body. Other parts of the legal framework such as the source protection laws and quality monitoring regulations evolved over a long period of time.

More recently they became important driving factors for continued technological upgrades such as UV-filters in some springs.

- **Balanced public private partnership** - Operation, maintenance and rehabilitation of the network are executed by the private sector. While the duties for operation are clearly defined in contracts, the companies still need the permission of the President to act on any complaint from the public. Their dependence on contracts from the Water Co-operative is a guarantee for high quality service and products. During the long time of collaboration between public and private partners, a high level of mutual trust has evolved. It has brought benefits to everyone involved, including the water consumers.
- **Private initiative - public ownership** - The process of constructing and managing a water supply network was user-driven from the beginning because tapped water was a high-priority need of the villagers. A strong sense of ownership evolved in the community, nourished by the benefits felt by all. These factors provided a high degree of motivation to the people who maintained and operated the network, doing most of the management tasks for a small compensation.
- **Involving the local elite** - The first project would not have been possible without the monetary contributions of the wealthier people of the village. This fact also gave the project a high profile and motivated everyone to contribute to the well-being of the shared water supply.
- **Continuing investments** - The Co-operative constantly keeps renewing the water supply network. Pipes which have been repaired more than twice are replaced by new ones. This eliminates the need for a complete network renewal and also keeps the loss rates at a very low level.
- **Availability of money** - The first project in 1897 was partly paid for by a loan from a regional bank. Due to large initial payments by the land owners and high water charges, this fund was paid back quickly. Afterwards, money was always set aside by the Co-operative before a project was started. The process of accumulating capital provided additional income through interest payments and prevented the Co-operative from paying interest for bank loans.
- **Support on an intermediate level** - The fire insurance provider has several important functions. It raises money from all house owners and redirects it to additional infrastructure (hydrants, reservoirs) of the water supply network. It also assists the Co-operative in quality control of network design and operation. Furthermore, the regulatory framework of this independent, public organisation required the Co-operative to become a public body. Funding by this insurance provider has reached 12 to 18% for some construction projects, but has never exceeded that proportion.
- **Prospective design** - Apart from the very first project, the engineering company designing the network followed an approach of designing the supply networks very generously so that they would be able to meet the quickly rising demand. This approach was strictly followed, the company preferring to reject a project rather than designing it with less generous margins. These large designs enabled the networks to keep up with increasing demands over decades and proved to be very cost-effective over the long run. Furthermore, only highest-quality material and workmanship were used. Some of the pipes laid 90 years ago still are in use today.

UNSUCCESSFUL APPROACHES

- **Design for short term demand** - The first network consisted of only one main pipe and some house connections. The pipe was designed for the actual water demand. Demand rose very quickly in the beginning - the average daily demand per person increased from 100 litres to 300 litres within the first 10 years! As a result the pipes soon had to be replaced by bigger ones. Renewing these mains proved to be very costly and also obstructed road traffic.

ISSUES OF INTEREST

- **Restricting access or public good?** - The Water Co-operative was founded as a private club of investors. The founders tried to limit access to the club and charged non-members higher prices than members. This was based on the argument that the founders had injected large amounts of money into the first project. Financial pressure from the fire insurance provider to support only public bodies forced the Co-operative to be-

come public, and all water purchasers from then on were automatically members. This was a process that took several years, culminating in a court decision that the Co-operative was obliged to become a public body - against the will of a majority of its members.

- **Water use** - Since the very first communal water supply project, the networks were always designed to carry water not only for household demand but also for fire fighting purposes. This required the networks to have bigger pipes and reservoirs but enabled fire fighters to be more efficient, saving infrastructure as well as the lives of humans and animals.

Between 1898 and 1923, a considerable amount of water was used not for drinking but for wetting a road in order to keep the dust down. The costs of this task were split between the Co-operative and a wealthy company located beside the road.

Piped water was hardly ever used for irrigation - partly because of the rainfall pattern, and partly because the water was too expensive compared to the small increase in yield that could be achieved by irrigation. Also, many farmers use their private, local springs for occasional irrigation.

- **Dynamics of the process** - In many larger cities in Switzerland, municipal water supply networks were set up during the second half of the 19th century. In the region near Wittenbach, there were only five water supply networks in 1881, but 60 in 1900. The legal, economic and knowledge conditions were in place for a fast propagation of the technology, and a real boom was generated within a few years. Thus, it became a real asset to a village to be able to offer a communal water supply network delivering drinking water to each individual household.
- **Conflicts** - Water has been the source of many conflicts between neighbours over the last century. This was also the case in Wittenbach, especially in respect to the local sources still used by individual households. Some legal disputes over water rights are still ongoing. In many cases, the Co-operative had to act as a peacemaker, and often the only solution was to connect all parties to the water supply network. In this context, a very important factor is the judicial system of the government, which should provide a coherent, consistent, and stable legal framework.
- **Gender balance** - In the first decades of the Co-operative, the water supply network was a 'men only' business, and it still has this nature to a large extent today. Even though women have the right to vote, they usually do not go the yearly assembly meetings. All of the people directly involved with water supply in Wittenbach are men.

PLANNING PROCEDURE

If a new area is to be connected to the existing network, the following steps are taken: 1. The Water Co-operative appoints an engineering company to draw a first draft of a network plan. 2. This company often seeks the advice of the local service supplier as the head of the company has been working in the area for decades and knows the existing network very well. 3. The draft is then forwarded to the fire insurance provider for approval. Only approved projects are eligible for partial funding by the insurance provider - usually about 15 % of the construction costs (this is assumed to be the average cost of the additional infrastructure needed for fire fighting). 4. Once the plan is approved, the Co-operative can also ask the municipality for financial assistance.

This mechanism has stayed more or less the same over the last 100 years and proved to be very efficient and non-bureaucratic, but it also requires the insurance provider to have in-house engineering expertise in water supply-networks.

OPERATION & MAINTENANCE

The routine operation and maintenance work is governed by a contract between the Water Co-operative and the private service supplier. All duties are clearly defined in this long-term contract. For emergency repairs, the President of the Water Co-operative needs to order the service supplier to take action. In practice, water users usually first call the service supplier as he is associated with 'the water business'. He must then seek the approval of the President. In this way, most failures of the water supply network, such as leaks or blocked pipes can be fixed within hours. However, this requires the service supplier and the President (or the Vice-president) to be available at any time.

OUTLOOK

Over the last century, Wittenbach has been a case of balanced development. During this time, a complex matrix of people and institutions has evolved. The challenge into the future is to maintain the current high level of service quality at affordable costs.

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FURTHER INFORMATION

This document forms part of a series of case studies introducing community management of small water supplies in Switzerland. The series highlights a striking diversity of institutional frameworks that have all contributed towards more than a century of successful investment, operation and maintenance, rehabilitation and renewal of water utility infrastructure. For more information on this publication or to access other documents in the same series, please contact Skat Foundation at the address below.



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