

The transboundary aquifer of the Geneva region (Switzerland and France): successfully managed for 30 years by the State of Geneva and French border communities.

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ABSTRACT

The Genevese aquifer is used for the supply of drinking water harnessed from ten wells on the Swiss side and five on the French side. During the 1960's and 1970's, over pumping lowered the groundwater level by more than 7m, thereby depleting about one third of total groundwater storage over a period of 20 years. While technical and scientific studies were being undertaken to resolve the problem of over exploitation, including possible artificial recharge of the aquifer, negotiations were being conducted with various local and national authorities in France. The aim was to engage in a collaborative effort to fund the work and to establish a joint water management system. Although, in the end, the entire operation was financed by the Swiss, the setting up of a cross border committee allowed for the identification of the roles and responsibilities of each side and determined the financial modalities governing the use of the resource. An agreement was signed to that effect in 1978 and a revised version was adopted in 2007, attesting to the success of the joint management plan.

Key words: transboundary aquifer, aquifer recharge, Geneva, aquifer use agreement

1. INTRODUCTION

Geneva's drinking water is provided from the Lake of Geneva (roughly 80% of total supply) and about a dozen wells (accounting for around 20% of supply) by pumping from Genevese groundwater. The aquifer straddles the canton of Geneva in Switzerland and the French department of Haute-Savoie (Upper Savoy) and is currently used on the Swiss side for ten wells and for five wells across the French border (Fig. 1). During the 1960's and 1970's, as a result of uncontrolled over pumping and the lack of coordination among distributing and beneficiary entities, groundwater levels fell drastically, to the point where certain dried out wells had to be closed. That was when the warning bell was sounded in the face of this over exploitation of groundwater resources.

The decision was then taken to set up an artificial aquifer recharge plant so as to recover use of the wells and take advantage of the large volumes of water that could be stocked from the Genevese water table. An artificial recharge system was, therefore, inaugurated in 1980 to abstract water from the Arve River - which is the aquifer's main natural recharge source- treat it and channel it into the aquifer. This operation, effected via drains that are laid underground above the aquifer, ensure the maintenance of high groundwater levels as well as seasonal stockpiling of the drinking water resource. The system has been described in previous articles on artificial recharge (de los Cobos, 2002, 2007).

2. ADMINISTRATIVE MANAGEMENT AND POLICY

Although the artificial recharge plant has been functioning satisfactorily since 1980 and rapidly proved the efficiency of seasonally storing water in the aquifer, it was only after many years of careful thought, tests and experiments on the ground to come up with appropriate techniques and systems that a successful artificial recharge system was established.

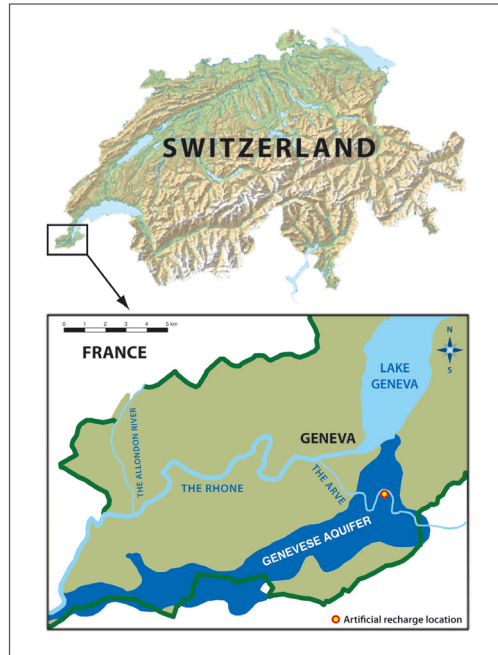


Figure 1: Location of the Genevese aquifer

The political will to develop a cross border project emerged naturally in parallel with the studies and tests that were carried out on the experimental plant. Indeed, although roughly 90% of Genevese groundwater is located in the canton of Geneva, the remaining 10% is to be found across the border in France. In the 1970's water distribution in Geneva was in the hands of two water companies (Société des Eaux de l'Arve, and Services Industriels de Genève - SIG-), whereas on the French side a number of wells were exploited by various communities or syndicates.

Several meetings and discussions were held alongside the studies and drafting of agreements in order to:

- Impose restrictions on use for as long as the diminishing groundwater, threatened with total depletion, was not recharged artificially;
- Establish equitable cost sharing once the recharge plant was completed and operational and would then be of mutual benefit to users on both sides of the border.

From the time the first Franco-Swiss meetings were held in 1972, it was noted that groundwater resources had shrunk dramatically and continued to do so. The problem not only affected Geneva but the entire adjoining French region as well (Fig. 2).

Between 1973 and 1974, efforts were focused on drawing up an inventory of drinking water resources in the region as well as on hydrogeological issues, such as losses, natural recharge, future pumping and fees, and the whole range of factors that needed to be considered in laying the bases of a future Franco-Swiss agreement. In 1975, the French declared that they would no longer use Genevese groundwater and would be turning to other French resources but wished to retain the possibility of later participating in and benefiting from artificial recharge. This decision certainly had an impact on cost coverage because, although SIG pursued their minimum extraction policy, the financial burden fell onto the shoulders of Société des Eaux de l'Arve which pumped exclusively from Genevese groundwater. It was envisaged that the cost of artificial recharge (depreciation, interest, usage and renovation costs) would be spread among all groundwater users, irrespective of the origin of the water; whether natural or artificial recharge. The artificial recharge fee per cubic metre of water extracted could be less than 0.07 Swiss francs when the annual volume of water pumped was in excess of 20 million m³. However, the fee could rise to 0.12 Swiss francs or more if the volume of water pumped was less than 10 million m³.

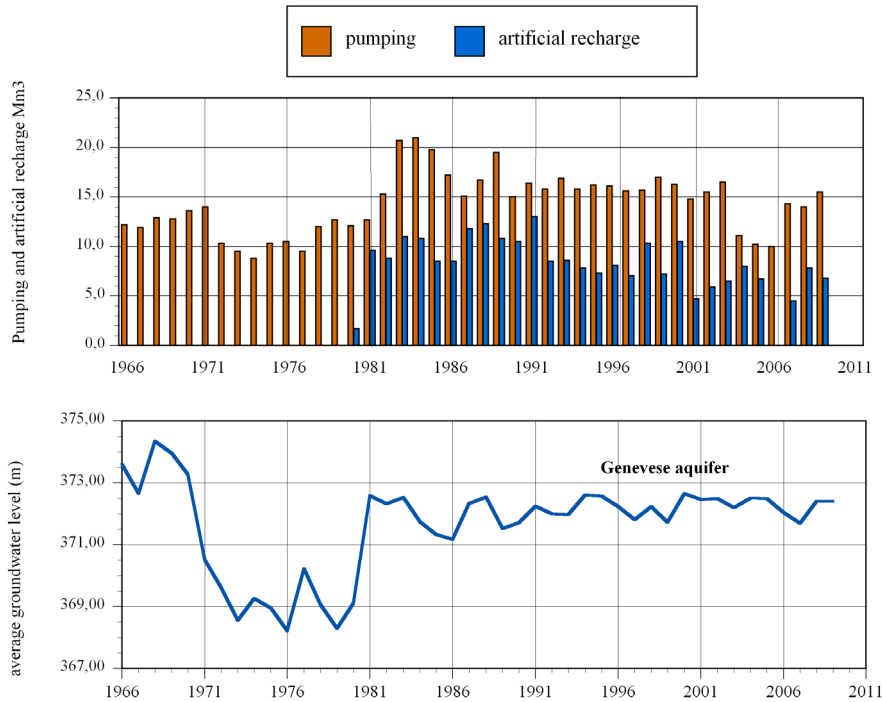


Figure 2: Impact of the artificial recharge on the Genevese aquifer

As of 1977, artificial recharge benefits for users were decided as follows:

- *Société des Eaux de l'Arve*: could continue to expand its network without having to seek out other resources (purchase of water from SIG or construction of a water pumping station to extract water from the lake).
- *SIG*: could exploit all the existing pumping wells (100,000 m³/day) and not have to build a new plant for treating lake water (100 million Swiss francs) which would only be used for a few weeks in the year.
- *French communities*: If necessary, the French communities could extract supplementary amounts of water and pay their part of the costs beyond the annual minimum allowance of 2 million m³ which corresponded to the volumes they extracted before artificial recharge was introduced.
- *All users*: reserves of 15 million m³ of drinking water would be stored in the best possible conditions (underground) to be constantly available in the case of acute shortage in one of their other plants.

Finally, an arrangement between the State of Geneva and Haute-Savoie (Upper Savoy) in France was signed on 19 June 1978 for thirty years. The French authorities obtained an annual allowance of 2 million m³. Once this quota was surpassed, the price per m³ would be calculated on the basis of an equation comprising the following factors:

- the costs of operating the plant (SIG expense): E
- depreciation: A
- total pumping (Swiss +French): VE
- share in natural recharge (7.5 Mm³/yr): AN
- volume pumped by the French authorities minus the quota: V_{efp}

French participation: $P_f = (A + E) * V_{efp} / VE - AN$

Following approval of the arrangement between the canton of Geneva and the prefecture of Haute Savoie, an advisory committee was set up to oversee the management of the recharge of Genevese

groundwater which would also be responsible for dealing with problems relating to the use, maintenance and monitoring of the system as a whole. The committee would regularly assess the status of the resource in terms of pumping and artificial recharge. Stocked volumes of water (the amount of water each user was expected to use for the coming year) were discussed and accepted on the basis of conditions pertaining to water quantity and quality and the operation of the artificial recharge plant.

Initially, from the Swiss side, the committee was comprised of two State Council designated representatives, one representative from the cantonal committee for water conservation and one representative for each water company (SIG and Société des Eaux de l'Arve). Committee members could be accompanied by experts. One of the State Council designated representatives would chair the committee.

The committee would be mainly responsible for reviewing the annual artificial recharge programme (drawn up on the basis of groundwater levels and forecasts of water user needs), the budget that was prepared in line with the recharge programme, the operating costs and the results of water quality control tests. Provisions governing quantities reserved for each party for the coming year, water quality and the warning system in the event of accidental pollution were also matters that would be discussed and adopted by the committee. The committee would meet once to twice per year, alternatively in France and in Switzerland. It could also meet more frequently, if necessary.

In 1988, the water company Société des Eaux de l'Arve was bought out by SIG, as of which point, Geneva had one single water supplier.

3. 2008: EXTENSION OF THE 1978 ARRANGEMENT FOR 30 ADDITIONAL YEARS

Between 2007 and 2008, the groundwater committee found itself facing new challenges, namely, the extension of the 1978 arrangement, after almost 30 years of being in force, and, particularly, on the Swiss side, the transfer of Geneva State assets to SIG and, thus, the sale of the recharge plant to SIG. In view of these important events, a sub-working group of the committee was formed and met several times during 2007. This Franco-Swiss working group, equipped with the necessary legal support, produced a basic document outlining the management of Genevese groundwater for the next 30 years. It was to be ensured, in particular, that the technical specificities agreed on by the parties would be placed within a global context that was recognised at administrative and political levels.

3.1. The new agreement

The first steps consisted of setting up the cross border legal bases for the new agreement. The 1978 arrangement did not have a legal premise that was grounded in cross border cooperation instruments, for the simple reason that there were no such instruments in existence at the time. Several instruments of this type appeared as of 1980 and were ratified by both Switzerland and France (Fig. 3). There were three conventions on which a new agreement governing Genevese groundwater usage could be based, namely:

- the European Outline Convention on Transfrontier Co-operation Between Territorial Communities or Authorities (hereinafter the Madrid convention) of 21 May 1980 (entry into force 21 December 1981);
- the Convention on the Protection and Use of Transboundary Watercourses and International Lakes of 17 March 1992 (hereinafter the Helsinki convention);
- The Karlsruhe agreement on transboundary cooperation between local communities and local state entities of 23 January 1996.

These three international legal instruments do not pursue the same objectives:

- the Madrid convention contains a standard inter-state agreement on transboundary cooperation among local authorities and a standard contract for service supply among “public law” cross border local communities.
- the Helsinki convention lays down the obligations of States parties to cooperate without directly creating institutions or operational structures. The transboundary river contracts, to which Geneva associated itself, after signing the transboundary memorandum of understanding in 1997 to revitalise Franco-Genevise rivers, might have had its origins in this convention.
- the Karlsruhe agreement, for its part, provides for the establishment of operational structures between local communities and/or local public authorities with legal personality.

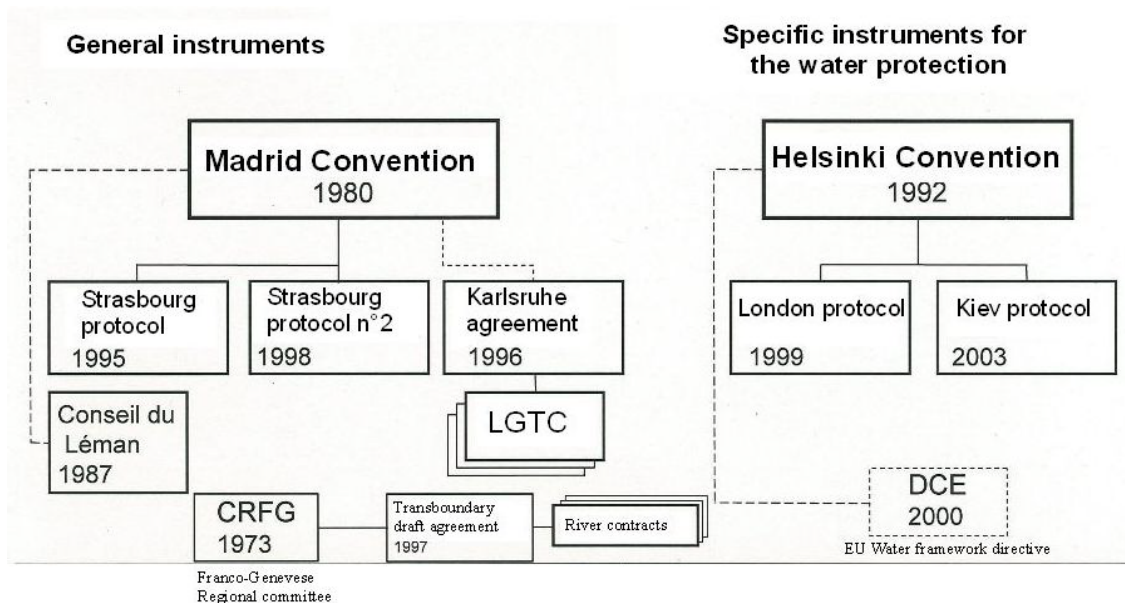


Figure 3: Transboundary cooperation Instruments

Before choosing a transboundary cooperation instrument, therefore, it was necessary to decide on the objective to be achieved. If the aim was to replace the 1978 arrangement, a Local Grouping of Transboundary Cooperation (LGTC), bringing together the local communities of Geneva, the State of Geneva and SIG, seemed to be the way forward. However, when it came to water management, the French entities and the State of Geneva would be the main interlocutors, with SIG’s role being restricted to artificial recharge exploitation. In fact, a simple solution, which was limited to groundwater use and recharge, was advanced in the form of a transboundary agreement among the local communities concerned. On the basis of the Karlsruhe agreement, particularly the possibility stipulated in its article 5 of delegating a mission to one of the local communities, an agreement was subsequently reached between the State of Geneva and the three French communities involved (the greater Annemasse region, the Community of Genevise communes and the commune of Viry). This option was less burdensome and more appropriate than setting up an LGTC. Furthermore, in accordance with the Swiss federal constitution, cantons could sign treaties with foreign bodies within the areas of their competence. Cantons were thus free to act autonomously and themselves conclude international agreements of this type.

Consequently, an agreement relating to the use, recharge and monitoring of Franco-Swiss Genevise groundwater was signed between, on the one hand, the communes of the greater Annemasse region, the Genevise communes and the commune of Viry and, on the other hand, the State Council of the Republic and the canton of Geneva, on 18 December 2007. This new agreement succeeded the 1978 arrangement and entered into force on January 1, 2008 for 30 years. The agreement is a rare example of an aquifer management transboundary agreement between a Swiss canton and European Union communities.

3.2. The asset transfer project

Meanwhile, the recharge plant which, from the outset, had been placed under the responsibility of Services Industriels de Genève (SIG) for technical design and operation was included in the transfer of assets between the State of Geneva and SIG.

The asset transfer project consisted of transferring fixed assets belonging to the State of Geneva to public autonomous establishments. The transfer was both industrial and financial in nature while SIG was allowed to assume complete control of the activity it had previously executed under State authority. SIG thus became the owner of the recharge plant as the State preferred to deal solely with sovereign tasks. As far as the recharge plant was concerned, in addition to the purely accounting and legal aspects, it was also necessary to provide guarantees for the agreements that had already been signed and those yet to be concluded between the State of Geneva and the French authorities (extension of the 1978 arrangement and the new agreement being drafted).

There was need, therefore, to amend the agreement for the use and maintenance of the recharge facilities and related works between the State of Geneva and SIG. The amendment led to the State of Geneva conceding use of the artificial recharge plant to SIG. Lastly, whereas SIG used to pay annual rentals for the use of the Geneva State-financed plant, once the assets were transferred at their book value, annual rentals in SIG's accounts were replaced with financing costs and accounting depreciation. The law on asset transfer came into force on January 1, 2008.

4. CONCLUSIONS

In 30 years of operation, the Geneva artificial recharge system contributed over 250 million m³ of water filtered from the Genevese water table. The choice made in the 1970's between a new plant for treating lake water and the creation of a recharge plant proved to be a judicious one, not only from a financial point of view, but also in terms of water resources management. Transboundary groundwater management, coupled with the technical success of the aquifer recharge system, have guaranteed safe drinking water for Geneva and the surrounding region by diversifying and optimising the quantitative and qualitative potential of existing water resources.

Due to the radical change in demographics over the past five years and the economic attractiveness of the Geneva region, there is an ever greater trend towards establishing a cross border approach. A committee on a "transboundary water community" was even formed in 2007. This water community will be included in the Franco-Valdo-Genevese regional project which will serve to create an environmental common strategic vision across the territory and which will include patrimonial, social and economic aspects.

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