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Maintenance as a Service Provision in Irrigation - The Example of the “Neste System” in Southern France -

Division 45
Rural Development

MAINTAIN – Case Study No. 2

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Abbreviations

ASA	Associations Syndicates Autorisées
CA	Conseil Administratif
CACG	Compagnie d'Aménagement des Côteaux de Gascogne
CEI	Contrat de fourniture d'eau d'irrigation
CM	Coordination mechanism
CN	Commission Neste
DDAF	Direction Départementale de l'Agriculture et des Fôrets
DDE	Direction Départementale de l'Equipement
DIREN	Direction Régionale de l'Environnement
EdF	Electricité de France
EP	Eau potable
EU	European Union
FF	French Franc
GERSAR	Groupement d'Etudes et de Réalisations des Sociétés d'Aménagement Régional
GTZ	Gesellschaft für die technische Zusammenarbeit
CB	Collective bargaining
O&M	Operation and Maintenance
PAC	Politique Agricole Commune

Measures

m	meter
m^3	cubic meter
L	liter
S	second
Ha	hectare

Preface

This case study was conducted within the framework of the GTZ sector project ”*Maintain*”.[1] The prime aim of the study is to demonstrate key tenets of the ‘Maintain’ framework concept by using examples from everyday irrigation practice. This concept is breaking new ground in that it no longer regards maintenance as solely a technical activity that aims to uphold or rehabilitate a technical infrastructure to a predetermined status, but additionally views maintenance as a provision. Expanding the concept of maintenance in this way might not seem a particularly significant development at first sight; however, in reality, it has far-reaching impacts on the analysis and design of maintenance programs. In addition to the technical and financial requirements, a whole range of new aspects are suddenly brought into play which have hardly ever been taken into consideration in the past when dealing with the complex problem of maintenance.

Who is providing which services for whom? Who is offering and producing these services? Who is generating demand for them, who is going to pay for them, and who will benefit from them? Which additional actors will have to participate and which support measures will they have to provide to ensure effective and efficient maintenance? What kind of service relationships have to exist between the actors concerned for such a scenario to develop in the first place? In other words: who or what is ”governing” the network of active players? What mechanisms are ensuring that the exchange of services in this network is taking place in a manner conducive to ”good” maintenance? To what extent can the various actors exert their influence on events and what incentives are there to make them act for the good of the system as a whole? These questions more or less pose themselves when the concept of maintenance is extended as described above.

This case study looks at these questions and, using the example of the Neste System, a water-management system in South-west France, demonstrates how vitally important such deliberations are for the analysis and design of maintenance measures. We would like to emphasise the fact that an approach of this kind which focuses on the institutional aspects of service relations in no way attempts to deny or diminish the importance of the technical, economic, or organisational aspects of maintenance. However, it is the opinion of the authors that service relations be accorded greater attention in the future than has been the case in the past.

[1] GTZ PN 92.2076.5: Maintenance Strategies in Irrigation (“Maintain”).

The information provided relates implicitly to the conceptual framework of the *Maintain* approach. We therefore recommend reading the concept document, but would like to point out that not having done so will not impede your understanding of this case study in any way. Indeed, reading this and other *Maintain* case studies can actually be a way getting acquainted with these conceptual deliberations and ultimately lead to a deeper understanding of the framework concept.

1. Introduction

For some time now, the World Bank has been talking of a ”maintenance crisis”: more than two thirds of World Bank financed irrigation projects whose operation and maintenance performance were investigated in greater depth, revealed considerable deficiencies. Indeed, the World Bank 1995 study on irrigation concluded that ... *”poor maintenance, by leading to poor performance was a major factor behind irrigators' reluctance to pay water charges and thus to violate cost-recovery covenants. ....O&M problems can be seen in the Bank's financing of so many rehabilitation projects. Almost all of them, when scrutinized, turn out to be deferred maintenance projects”.* [2]

This problem scenario is reflected in *Maintain's* case studies on maintenance. The studies conducted to date in Turkey[3], Pakistan[4], and Jordan[5], have spotlighted numerous deficits and clearly show how often technical symptoms of poor maintenance have their roots in institutional weaknesses, more specifically, in a lack of or deficient coordination mechanisms between the participating actors

Against this background, it was thought expedient to compare *Maintain* case studies with the analysis of irrigation systems in which no or hardly any maintenance problems were detectable. The close scrutiny of ”best-practice” models would then, or so it was hoped, underpin *Maintain's* key conceptual theses by demonstrating them under (almost) ideal circumstances.

The opportunity to conduct a best-practice study came about more or less of its own accord through *Maintain's* work: GTZ contributions to the international irrigation forum within the framework of ”Water Berlin 1997” were dedicated to the theme of maintenance, whereby contact was made with the Compagnie d'Aménagement des Côteaux de Gascogne (CACG), located in Tarbes, Southern France. It was agreed to test the applicability and relevance of the procedures developed by working together with this large regional organisation responsible for irrigation and water-supply. It was deemed feasible to expect a best-practice model, since the CACG does not consider itself to be facing any maintenance problems worth mentioning at the present time. Indeed, it is the first large-scale, regional water-management organisation in Southern France that can claim to break-even financially by covering the costs incurred in operating and maintaining its various sub-systems. Furthermore, the CACG did not

[2] Jones (1995)
[3] Scheumann, Vallentin (1999a)
[4] Scheumann, Vallentin (1999b)

have to be painstakingly convinced of the positive spin-offs of an approach that focuses on the importance of service provision, service relations, and aspects of service management. This is because the CACG regards itself explicitly as a service provider and, having fully internalised this way of thinking, demonstrates this understanding of its role in many ways.

The authors of this document were on site in Tarbes from July 27 to August 1, 1998, where they visited the main infrastructural facilities of the approx. 300,000-ha irrigation system, talked with farmers' representatives and technical employees and held meetings with the General Director and top-level management staff.

We would like to thank the CACG and its staff members at this juncture once again for their readiness to discuss this concept with us and for their constructive cooperation and candidness, and, last but by no means least, for the heartfelt hospitality that we experienced during our stay in Tarbes.

[5] Huppert, Urban (1999)

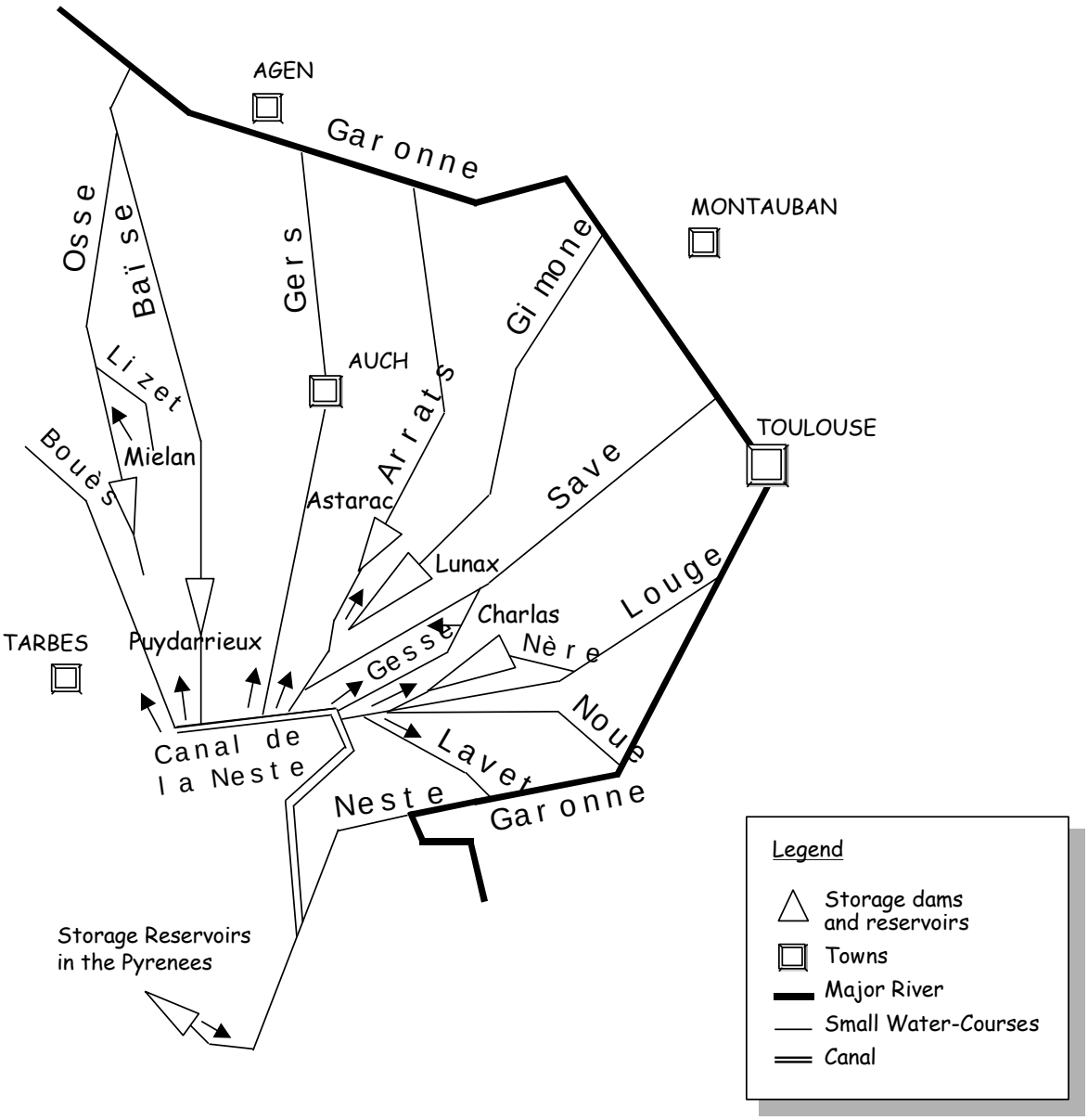
2. Compagnie d'Aménagement des Côteaux de Gascogne and Its Role

The Compagnie d'Aménagement des Côteaux de Gascogne, hereinafter referred to as the CACG, was founded in 1960 at the same time as the Compagnie d'Aménagement du Bas-Rhône-Languedoc and the Societé du Canal de Provence as a "societé d'économie mixte" – a quasi-public company. CACG is mandated to promote what is regarded as the somewhat underdeveloped region of Midi-Pyrénées, primarily via measures in the field of agricultural hydraulic engineering. In regional terms, the area of intervention is marked in south by the Pyrenees, in the west by the Atlantic Ocean, in the north by the Garonne River and in the east by the "Région's" administrative border. It thus encompasses a total of 9 Départements (largest French administrative subdivision presided over by a prefect). The core area of activities focuses on the Côteaux de Gascogne surrounded by the Pyrenees, the Garonne and the river Adour (see map on next page). The hilly landscape stretches from the south to the north and is interspersed with a total of 17 small rivers and streams, which, owing to the morphological structure, only have extremely small water-catchment areas. As a result, water flow would, under normal conditions, not be possible all year round. To improve the availability of water, both for agricultural purposes and for drinking-water supplies to the cities and local communities in this area, a link canal (canal de la Neste) was built as long ago as the middle of the last century. This canal is fed by storage dams in the Pyrenees and carries water both to the river Neste and to the other watercourses in the system. At 29-km in length, this canal permits the provision of an additional 48 million m^3 of water a year, enabling the rivers and streams to carry water throughout the year. Extra storage facilities in the hills mean that spring rains can be exploited, making a further 52 million m^3 available.

The CACG mandate is varied in scope and includes:

- managing water resources
- harnessing and developing new water resources
- agricultural development
- supplying towns and local communities with (raw) drinking water
- providing water for industrial purposes
- developing the region's touristic potential
- ensuring minimum flow rates into streams and rivers in keeping with environmental and ecological concerns (e.g. fishing)

Figure 1: Sketch of the "Neste System"



CACG operations concentrate on the field of infrastructure planning, implementation and management, although it also sees itself as a consultancy and coordination organ that acts as an intermediary between the various interest groups and institutions as well as state and para-state authorities.

Those bodies that inspect or control CACG activities or that, as representatives of specific interests, have a say in decision-making activities within the CACG include:

At the state level:

- Ministère de l'Economie et Finances (Ministry of Economics and Finance)
- Ministère de l'Environnement (Ministry of the Environment)
- Ministère de l'Aménagement du Territoire, de l'Equipement et des Transports (Ministry for Land-use, Construction and Transport)
- Ministère de l'Agriculture, la Pêche, et de l'Alimentation (Ministry of Agriculture, Forestry, Fisheries and Food)
- Sécrétariat d'Etat au Développement Rural (State Secretariat for Rural Development)
- Ministère de l'Intérieur (Ministry of the Interior)

At a regional level:

- Region Midi-Pyrénees
- The departments and their prefectures
- The Chambers of Agriculture
- Regional representations of the specialist ministries, such as the Direction Départementale de l'Agriculture et des Fôrets (DDAF), the Direction Départementale de l'Equipement (DDE), the Direction Régionale de l'Environnement (DIREN), the regional water agencies ("Agences de l'eau")
- Local authorities (cities, towns)
- "Commissaires aux comptes" (state certified auditors), that can be commissioned at both a state and regional level.

Decisions in the water-management sector are also influenced by nature-conservation groups, angling clubs, water-sport associations and industrial companies etc.

The CACG has a nominal capital of approx. FF 10 million, an annual turnover of about FF 220 million and employs some 188 staff members (approx. 80% of whom are engineers and technicians).

In addition to the tasks outlined above, the CACG can also employ its personnel within the framework of consulting orders; to this end, the GERSAR (Groupement d'Etudes et de Réalisations des Sociétés d'Aménagement Régional) was founded as an association of regional development companies.

3. The Neste System

The Neste System, which is essentially the prime focus of our investigations, is a network of hydraulic infrastructure located at the core of the area for which the CACG is responsible and consisting of a great many storage basins, canals and water courses. The system starts with a series of storage dams in the Pyrenees, which supply the river Neste and then there is the river Neste itself. Another part of the system consists of the Canal de la Neste (Neste canal) and a canal system measuring 90 km in all between this man-made canal and the natural water-courses that allows 14 of the 17 natural streams and rivers to carry water all year long, and 4 storage dams in the hilly area with a total holding capacity of 52 million m^3, as mentioned above.

This system has to meet the following needs:

- Supply ca. 47,000 ha with irrigation water
- Supply ca. 150,000 people with drinking and service water
- Maintain a minimum flow into the 14 stretches of water in order to dilute wastewater from sewage plants and to conserve the stocks of fish and game etc.

The Commission Neste, which has been set up to coordinate activities and arbitrate disputes on behalf of the Neste System, comprises the following actors:

- The CACG as service provider
- State representatives, DDAF, DDE, DIREN
- Representatives of the local authorities
- Representatives of irrigation farmers
- Chambers of Agriculture
- Anglers, etc.
- Representatives of the drinking-water supply companies

The Neste System has only one concessionaire, namely the CACG, which is thus fully responsible for operating and maintaining (O&M) the infrastructure generated and can be held liable for any deficient outputs caused by incorrect decisions at the operative level. For this reason, there is constant coordination with the EdF (Electricité de France), which operates and manages the storage dams in the Pyrenees. If, owing to low precipitation levels, these dams are not full enough to meet the system's above-

mentioned flow requirements, reduced supply rates have to be agreed with the departmental prefects to meet demand. This, in turn, affects the water-supply contracts between the CACG and the various users and influences the amounts that users may withdraw (authorisations de prélèvement).

4. Breakdown of Maintenance Requirements

According to the CACG definition, maintenance includes inspection and systematic upkeep activities (”entretien systematique”, also known as ”petite entretien”), as well as ”conditional” and ”corrective” maintenance inputs (”maintenance conditionelle” and ”maintenance corrective”). Conditional maintenance refers to those measures that are implemented in response to the effects of wear or ageing, or whenever materials or constructional deficiencies indicate possible damage in future. Corrective maintenance applies to any unforeseen, ad-hoc interventions that are needed to keep the system running in the event of different types of functional break-downs or when over-ageing means parts have to be replaced. Smaller inputs such as changing water meters or replacing slides etc. are listed as ”exploitation”, i.e. part of every-day plant operations.

Given the fact that this study is not so much interested in the technical aspects of maintenance but more in the service relations between the various actors concerned, no distinction will be made in the further body of the text between the various forms of maintenance. The term ”maintenance” as used here can thus, depending on the context, refer to individual types of maintenance or the sum of all maintenance inputs together.

In this study, it is more important to differentiate between various areas of maintenance in which a different set of actors each enter into service relations with each other. In this context, the CACG distinguishes between three key types of operating systems:

- The Neste canal system
- The irrigation perimeters ”en concession” (concessional or franchise perimeters)
- The irrigation perimeters ”en ASA”, i.e., perimeters operated by water user associations (associations syndicates autorisées)

The CACG bears full responsibility for the **Neste canal’s** operational capacity, and for the distributors located within it, and is in charge of the canal system that feeds the natural water-courses, including the hydraulic structures located at the feed points. Since the storage dams situated in the hills also serve to replenish the watercourses to a great extent, the CACG is obliged to conduct any maintenance work on them that may arise. The riparian are mostly responsible for the upkeep of the watercourses, provided they are “cours d’eau non domaniaux” (not state owned); most owners are organised in informal maintenance associations.

The **périmètres en concession** are irrigation systems that were set up at the initiative of a government authority which commissioned the CACG with their generation and operation. This franchise also includes a 10-year operational mandate plus an automatic annual extension, unless the users expressly request its termination. As a rule, development includes areas, which prior to completion of the irrigation system have not been assigned to any specific farmer. In all, the franchise perimeters with approx. 70,000 ha in 10 units account for the major part of the CACG'S total operating area. The CACG remains the owner (or concessionaire) of all the facilities, right through to the field hydrants. Thus, maintenance requirements include the pump stations that lift the water from the natural watercourses, the supply pipes to the areas to be irrigated and the corresponding distributors and field hydrants.

Irrigation perimeters "en ASA" (associations syndicales autorisées) are set up at the request of a limited number of farmers (as far as possible, no more than 50) and usually cover an area of less than 1,000 ha. In such cases, only those farming areas are equipped for irrigation that are assigned to the farmers submitting the request. During the construction period and the first year of operation, the CACG assumes the same all-encompassing responsibility for the operation and maintenance of these areas as it does for the franchise perimeters. However, it then hands over all responsibility (as of the water-intake point) to the ASA, whereby the ASA can contract the CACG or another company to conduct the operational and maintenance inputs on the basis of market prices.

In addition to these three types of operating systems, that are the most wide spread, there are other ASA which take water directly from a hill lake or **lac collinaire** and are thus independent. In such cases, the CACG has mostly (although not always) provided the hydraulic infrastructure and plants, leaving the ASA responsible for operation and maintenance.

Yet another operating system is that of "**affermage"** or leasing. This type of system is set up when an ASA decides that it is not able to keep the system running and in good working order through its own efforts. When a system is leased, O&M functions are all (including the renewal of system components over the age of 10 years) transferred to the CACG for a 12-year period.

5. Analysis of Maintenance Systems

5.1 Maintain's Analytical Approach

The *Maintain* approach does not view maintenance solely as a technical measure designed to keep up a physical infrastructure, but also as a service provided for clients or beneficiaries – in the case of irrigation, mostly the water users. An entire 'maintenance system' involving the groups and organisations concerned, the services and support services, and the service relationships mechanisms is required to actually generate and provide the services. Given this fact, *Maintain* focuses on analysing complex service systems of this kind, its presumption being that, in the majority of cases, maintenance problems are generated by dysfunctions within the social framework. *Maintain* thus focuses on an analytical aspect that has seldom been the subject of intensive scrutiny, but which is of central importance for the generation of services: namely, the interactions, or, to put it in more precise terms, the service relations and exchanges of services between the actors involved in maintenance. In so doing, it turns the spotlight on services or returns – either already provided or to be provided - as well as service-provision mechanisms ensuring that the exchange takes place in the prescribed manner.

When applied to the Neste system, three main questions arise when analysing the maintenance system:

- Who provides which service(s) for whom? i.e.:
    - Which *services* are being provided?
    - Who is *offering/producing* them?
    - Who is *receiving* them?
- What is being provided *in return* for each service?
- Who or what is making sure that these services and returns are actually being provided in a way that suits those concerned? In other words: What kind of *coordination mechanisms* are on hand for service delivery? To what extent can the service providers influence the recipients or, conversely, the recipients the service providers, when it comes to upholding their respective commitments and obligations? What incentives do the respective sides have to act "in conformity with the system"?

These are the questions that are looked into in this analysis. For readers with just a general interest in this field, it is less important to delve into the details of just how each individual service is produced and provided. Indeed, it is more important to see that every individual service has to have a certain - often several – coordination mechanisms in order to ensure that service provision meets the demands made of it by the providers and the recipients, not to mention the overarching requirements of the system as a whole. The fact that, in the case of the CACG, coordination systems of this kind are on hand and in use across the board illustrates the ”best-practices” character of CACG maintenance systems.

As a guide through the jungle of services and service relations in complex networks of this nature, and to help systematically track down any deficits in such a dense mass of interrelationships, it has proved best to present information in the form of graphs, in line with the proposals by *Herder-Dorneich* (1986). These are used throughout the text as follows (Figures 2,3 and 4):

- the actors concerned (organisations, groups, and individuals) are presented as ovals;
- services (and support services) are symbolised by a straight (red) arrow complete with an S plus a letter and/or figure as an index;
- financial (returns) services are always indicated by (blue) arrows in broken lines marked by an f plus a letter/figure. In the case of direct payment, the same index is used as has been the case for the service itself;
- coordination mechanisms between two organisations, i.e. the way in which service provision between two actors is coordinated/regulated, is depicted using a dotted (green) line, plus a rhomboid shape containing either a number that is explained in Chapter 6 or a direct description of the mechanism;
- the CACG is framed by a rectangle in which various units may be listed;
- an S or an f with an index and an asterix (see Fig. 3.) indicate that a service or (financial) return is being rendered that has already been listed elsewhere, but that this time certain specific features have been changed.

5.2 The Neste Canal System

Within the scope of the ”concession rivière”, i.e. the franchise for natural water-courses in the Neste canal system, the CACG provides three major services:

- On the one hand, it guarantees the ”service de restitution”, in other words, it ensures the supply of water all year round to those streams and rivers which,

under normal conditions, would otherwise only carry water for a short period of time, thus securing the ongoing supply of specific amounts of water for specific users. This service is depicted as **S1** in Figure 2.

- Furthermore, the CACG is also responsible for ensuring that specified minimum flow rates are available which have to be observed for reasons of hygiene and environmental protection. This service is presented as **S2**.

- On the other hand, the CACG undertakes the task vis-à-vis the state, or mandatory, of maintaining the entire infrastructure in the Neste canal system in full working order (sauvegarde du patrimoine national). This service is described as **S3** in Figure 2.

Since the maintenance service **S3** (and the service **S2**) are essentially financed by the service **S1,** it is important when trying to understand the overall system not just to focus on the maintenance service alone, but to consider the service of water provision as well.

5.2.1 Service S1: Ensuring the Supply of Specified Amounts of Water in the Water Courses

a) Service Contents

Within the framework of service **S1**, i.e. the provision of specific amounts of water to watercourses (service de restitution), the following flow rates are provided for the various users:

- 30m^3/s for authorised users in the irrigation or industrial sector (**S1A**), whereby irrigation concerns a total of approx. 47,000 ha (25% of which is for ' périmètres en concession', about 25 % for water provision for independent ASAs – water-user associations – of which 50% is for individual users, and the remainder for the industrial sector)
- 1m^3/s for (raw) drinking-water supplies (EP eau potable) to villages and local water-supply companies (**S1B**)

In addition to the above flow rates, which the CACG is obliged to provide, there is also a user waiting list with a total demand potential of some 6m^3/s which cannot be met at present.

S1 thus refers to the service of water provision rendered by the CACG for itself (in 'périmètres en concession'), for the ASAs, for individual irrigation farmers and for industrial plants (**S1A**) and also water-supply companies (**S1B**). **S1** also encompasses "tactical" as well as "strategic" management tasks. Within the scope of "gestion tactique", the CACG ensures that water supplies are adjusted in line with demand in real time. In contrast, "gestion stratégique" is all about planning how to harness new water resources, so as to be able to meet future demand.

b) Returns/Financing

The return for the CACG's service S1 for the users named above takes the form of user water charges (f1A and f1B), which finance the major part of this service (and also services S2 and S3 see below). These fees are made up as follows:

- for individual users and ASAs: FF 300/l/s with a supply of 4,000 m^3 per contracted l/s (f1A)
- for (drinking) water-supply companies: FF 0.08/m^3; the same rate applies to industrial plants (f1B)

c) Coordinaton Mechanisms

It is very interesting to look at the many different ways in which the exchange of CACG services and user returns/fundings is secured by various coordination mechanisms (see Figure 2):

Service provision and fee-levying are laid down in contracts (coordination mechanism **CM 1A** and **1B**) in which the above-mentioned quantities of water to be provided, the rates and maximum intake quantities are all laid down as follows:

- For individual users and ASA (**f1A**) the fee is, as stated above, FF 300/l/s with an intake limit of 4,000 m^3 per contracted l/s. Once the intake limit is exceeded, a drastically higher special rate has to be paid. Thus, this works as an incentive not to exceed the set amounts. In addition to this fee, a rental fee is charged for the water meters. Damaged water meters have to be replaced by the user.
- For drinking-water supplies (**f1B**), the water-supply companies have to pay FF 0.08/m^3. There are no supply limits (drinking-water supplies have greater priority). The same rate applies to industrial plants.

The responsible state entities at department level (DDAF), which have the corresponding sovereign rights, and thus the power to impose sanctions (”police de l’eau”), ensure that the contractually agreed regulations are implemented and that the users pay adequate charges (**CM ”police de l’eau”**). The DDAF also penalises the illegal withdrawal of water.
System users can appeal against sanctions imposed by the ”police de l’eau”, however, only via the usual legal channels.
Both sides are able to exert their influence on the type and scope of service provision and rate-setting thanks to the generation of an umbrella commission (Commission Neste) (**CN** in Figure 2). This commission includes representatives of the CACG as service provider, as well as elected representatives of the irrigation farmers, representatives of the Chambers of Agriculture, representatives of the (drinking-) water-supply companies, inter alia, as recipients of a CACG service, and state organs (DDAF, DIREN, DDE, local authorities) as representatives of public interests. The commission plays a key role in coordinating activities and negotiating conflicts between the CACG and its customers. I.e. via a process of collective bargaining (**CB** in Figure 2), the commission decides on: the water rates to be set, the water-intake limits (quotas) and coordination in crisis situations. It also decides on new infrastructural developments.
An additional coordination mechanism governing the CACG’s rendering of service **S1** consists in the fact that the media will make a political affair out of any water-supply difficulties, since they pick up on these particularly fast, especially in the drinking-water sector, thus possibly leading to considerable political upset.

5.2.2 Service S2: Maintaining Specified Minimum Flow Rates in Water Courses

a) Service Contents

Service **S2** can be regarded as a service provided for the state water agency (Agence de l’eau) and consists in maintaining a minimum flow into streams and rivers (salubrité/public health). In addition to an absolute minimum flow of 4 m^3/s, the cumulative total of a further 5m^3/s (in autumn and winter, this figure is set at 6.5m^3/s) has to be maintained in the 14 re-supplied streams and rivers at the point of entry into the Garonne in order to sufficiently dilute the sewage waste that has been released. Minimum flows of this kind are enforced by the state for reasons of hygiene. Furthermore, account is thus taken of ecological aspects, such as the conservation of natural flora, as well as the concerns of the fishing industry.

b) Returns/Financing for S2

In return for maintaining minimum flow rates, the water agency grants the CACG a subsidy known as ”aide à la gestion des étiages” (subsidy for managing minimum water levels) (**f2**). This subsidy is financed from a water duty, i.e. a fee paid to the water agency, which currently amounts to FF 0.03/m^3/s for irrigation water (**f2A**) and FF 0.15/m^3/s for drinking water (**f2B**).

c) Coordination Mechanisms

The CACG has a considerable incentive to maintain the agreed minimum levels, since the level of subsidy provided to the CACG by the water agency is linked up with certain ideal hydrographic standards of water provision in the canal system, which are monitored directly by DIREN. If the CACG fails to keep to the defined levels, it will face a cut in subsidy payments from the water agency (**CM2**). Consequently, the CACG makes every effort to adhere to the regulations governing water supplies.

5.2.3 Service S3: Maintaining the Infrastructure in the Neste Canal System

a) Service Contents

The second major service by the CACG within the framework of the ”concession rivière” is to keep the entire infrastructure in the Neste canal system in good working order (**S3**). As already mentioned, this task is, albeit indirectly (via water provision **S1**), a service provided for the water users; de facto, however, it is a direct service to the state, since it serves the public interest (”sauvegarde du patrimoine de l’état”). Above all else, this service is concerned with maintenance work throughout the entire system of the Neste canal.

In addition, as a special service on behalf of the DDAF, the CACG prepares the annual authorisations for water withdrawal; these, however, have to be adjusted to the system’s hydraulic capacity.

b) Returns/Financing

Canal-system maintenance by the CACG is financed by reserves (”provision de maintenance”, see below), which are themselves generated by user-fees (**f1A** and **f1B**). Given the fact that maintenance services within the CACG are provided by the ”Service Exploitation/Agences” and by the ”Service Ingénerie” (**CM 3A**), the provision of funds

from reserves can be regarded as a financial service (**f3A)** by the CACG to the sections named above (Figure 2).

A de-facto subsidy towards these costs is given in that the state has been financing a large-scale special rehabilitation programme for the entire Neste canal since 1990 (**f3**). Most of the programme components have long been completed, and the outstanding inputs are scheduled to finish in the near future. Various state entities have contributed to the programme: the central authorities (about 50%), the water agency (about 20%), the region and the departments (about 10% each) and the European Union (about 10%).

c) Coordination Mechanisms

What kind of coordination mechanism is in place for service **S3**, i.e. what is **CM3'**s underlying design? A key coordination element is that the CACG is able to act as state concessionaire or state authority, and is thus free to conduct the maintenance tasks on its own responsibility and in line with its own specific capacity and planning requirements. For its part, the state is able to monitor CACG service provision via the CACG supervisory board, on which departmental representatives also sit, as well as in its capacity as certified auditor (**CM3**). Nevertheless, the question still remains as to how to ensure that the CACG really employs sufficient funds **f3A** for maintenance and does not use them for any other tasks. To this end, the following internal coordination mechanism is in place (**CM 3A**):

To be prepared for any unforeseen interventions, the CACG is obliged to earmark an annual "maintenance reserve" (provision de maintenance) in its budget, which should be able to cover the costs of the work likely to be required. In this connection, the state stipulates an upper and lower limit each year for all large-scale infrastructures in the country in an effort to rule out any excessive preventive maintenance whilst also ensuring that larger maintenance jobs are not put off for years to come. The latter scenario, for example, would unnecessarily increase the risk of damage to infrastructure and thus breakdowns in operation whilst the accumulation of delayed maintenance work would over-exceed the capacity of the annual budget at a later point in time. The given, state-specified limits for maintenance reserves are based on the fixed assets and the age of the investment object and vary depending on the type of investment (e.g. buildings, canals or electro-mechanical facilities). State benchmark figures are on average (for 1991) 0.24 % and 3.12 % of the overall fixed assets. For security reasons, the CACG sets its own regulations which further narrows the distance between maximum and minimum limits (e.g., in 1991, 0.7 or 1.5 %). The actual amount of these

maintenance reserves called upon (”reprise de provision”) was just under FF 19 million in 1997, i.e. not quite 10% of annual turnover of CACG.

5.2.4 Service S4: Drinking-water Supplies

a) b)c) Service Contents/Financing/Coordination Mechanisms

The following chapters deal with the water-provision and maintenance services the CACG itself and the ASA provide vis-à-vis the individual users of irrigation water. Corresponding services in the drinking-water supply sector are looked at here:

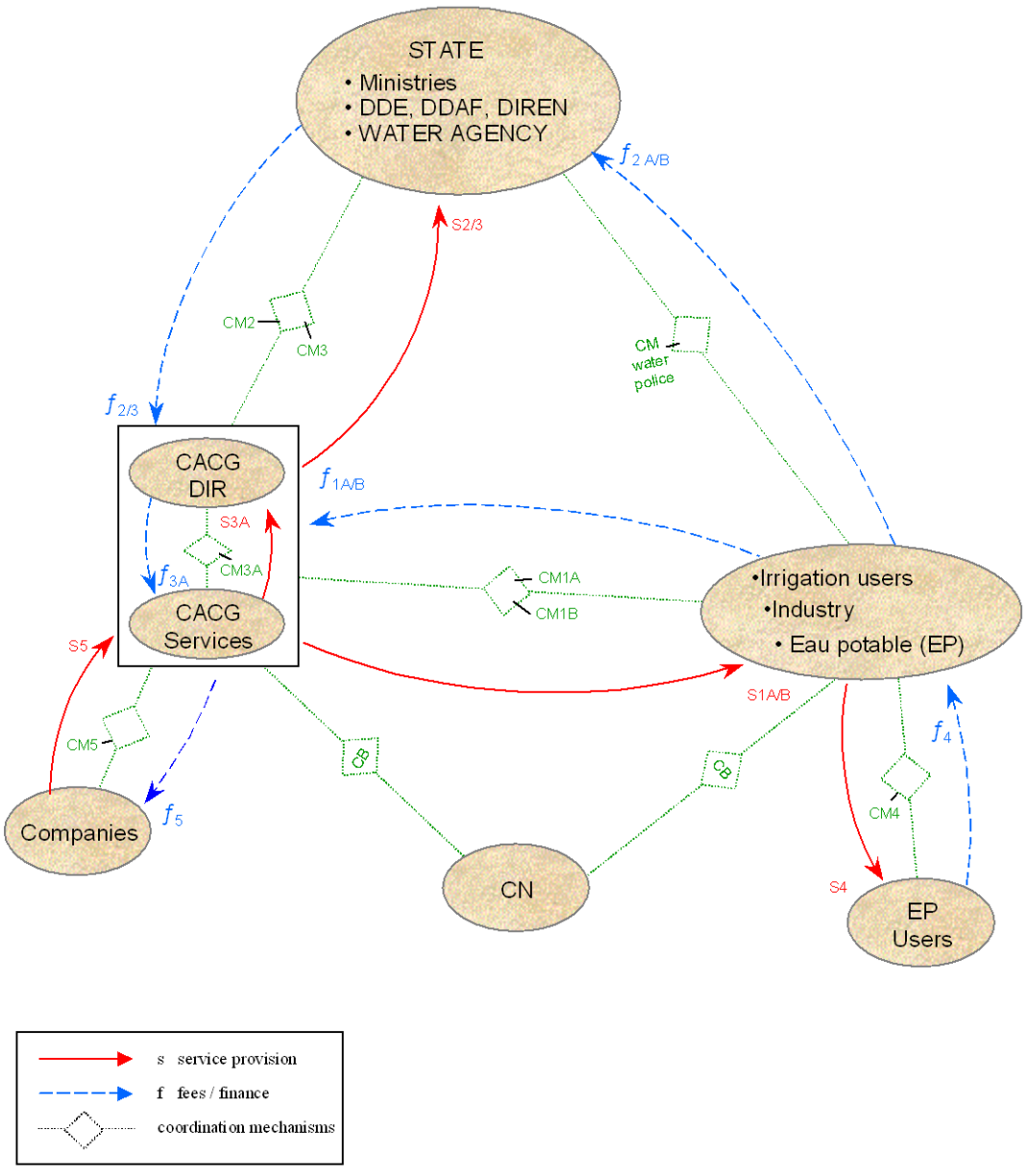
S4 in Figure 2 depicts the service that communal or inter-communal water-supply companies provide for drinking-water consumers. The service essentially comprises the withdrawal of water from the watercourses, its treatment and distribution as well as the collection and treatment of sewage water. The water users pay the supply companies corresponding fees (**f4**) which vary a great deal but are presently between FF 6 and FF 25/m^3. As stated above, the supply companies have to transfer a certain amount of these fees to the water agencies (**f2B**). The only kind of coordination mechanisms presently in place are the individual water-connection contracts (coordination mechanism **CM 4**); no top limits have been set for withdrawal.

5.2.5 Service S5: External Supplies and Construction Inputs

a) b) c) Service Contents/Financing/Coordination Mechanisms

To carry out the maintenance work described under **S3**, the CACG engages suppliers and construction companies via tendering procedures and contracts (**CM 5**) that are able to provide the corresponding delivery or construction service and are remunerated pursuant to the contract with **f5**.

Figure 2: Key services and service relations in the *"concession rivière"* – franchise for natural water-courses in the Neste canal system.



5.3 ”Périmètres en concession” – Franchise Perimetres (see Figure3)

As already outlined in Chapter 4, this type of irrigation perimeter covering some 70,000 ha constitutes the main part of the irrigation areas managed by the CACG. The CACG is commissioned by the state to generate and operate such an irrigation perimeter via a 10-year mandate, which is extended automatically each year, unless the water users wish for some other arrangement.

Some of the CACG services for the Neste canal system that were described in the preceding chapters are concomitantly services for the ”périmètres en concession” or franchise perimeters and thus have to be looked at from the angle of these services and service relations; i.e.

- Service **S1**: the provision of set quantities of water specifically to the franchise perimeters which – as mentioned before – makes up 25% of the water supplies not destined for the drinking-water sector.
- Indirect service **S2**: i.e. maintaining minimum flow rates into streams and rivers
- Indirect service **S3**: i.e. maintaining the Neste canal system infrastructure. This service, which is provided for the state, enables the adequate provision of water to the irrigation perimeters.

The following services relate specifically to the franchise perimeters:

5.3.1 Service S6: Operating and Maintaining the Irrigation Perimeters

a) Service Contents

Service **S6** consists in providing water at previously agreed flow and pressure rates to the field hydrants of individual water users. Thus, the CACG is responsible for operating all system components right through to the individual point of withdrawal and also for any maintenance and repair work. The special feature of this type of service provision – in contrast to that of the ASA – is that the CACG has a direct service relationship with the *individual* water users and not with a user association. Nevertheless, the CACG still supports the respective associations in their administrative and bookkeeping activities, services which are summarised as **S6** in Fig. 3.

b) Returns/Financing

The above services are funded by the contractually agreed fees the irrigation farmers pay the CACG (**f6**). These fees cover the entire service package and are made up of basic rate of FF 2000/l/sec and a cubic-metre price of FF 30. The water duty that has to be surrendered to the water agency (see 5.2.2.b above) constitutes a transitory item and is forwarded by the CACG to the agency. (**f2A**).

It should be noted that, nowadays, the irrigation infrastructure built by the CACG in ”périmètres en concession” is generally financed by up to 50-60% by the state (the former rate was 80%).

c) Coordination Mechanisms

A key coordination mechanism is to be seen in the actual franchise that the state grants the CACG (**CM ‘concession’**). A franchise agreement regulates the individual rights and duties of the CACG whilst a ”Conseil Administratif” (**administrative council CM CA**), which includes representatives of important groups (see above), ensures its correct interpretation and implementation.

Water provision itself is agreed with each individual farmer separately within the framework of a contract governing the supply of irrigation water (contrat de fourniture d’eau d’irrigation, CEI, **CM 6**). This contract covers the operation of all system components right through to individual field hydrants and corresponding maintenance and repair work by the CACG. As a consequence, within the scope of its franchise, the CACG has to plan for a maintenance reserve (“provision de maintenance”, see Chapter 5.2.3) in its budget to cover the costs of such inputs. Provisions of this kind are not related to individual perimeters but are based on the requirement of larger groups of perimeters and must be capable of meeting in full any repair, maintenance or renewal work that might be necessary.

The incentive for the CACG to provide a good and reliable service centres on the possibility of the franchise being extended. As for the water users themselves, the franchise perimeters are an attractive alternative to a self-run ASA in that they are not dependent on the operational capacity of a membership-based organisation, or not at its mercy should it lack such capacity, but can rely on the agreed quantities of water being supplied to the edge of their respective fields. Although no specific organisational structure is in place to govern any supra-ordinate issues within the ”périmètres en concession”, they all, without exception, have a formal or informal association that

discusses general issues concerning the perimeter with the CACG, and, on the other hand, is also represented on the Neste Commission - an important discussion forum in this context too (**CN**).

The franchise perimeters differ decisively from other forms of operation in that the function of ”police d’eau” has been transferred by the state to the CACG (**CM** ”**police d’eau**”), a role it executes via state certified experts (”agents assermentes”).

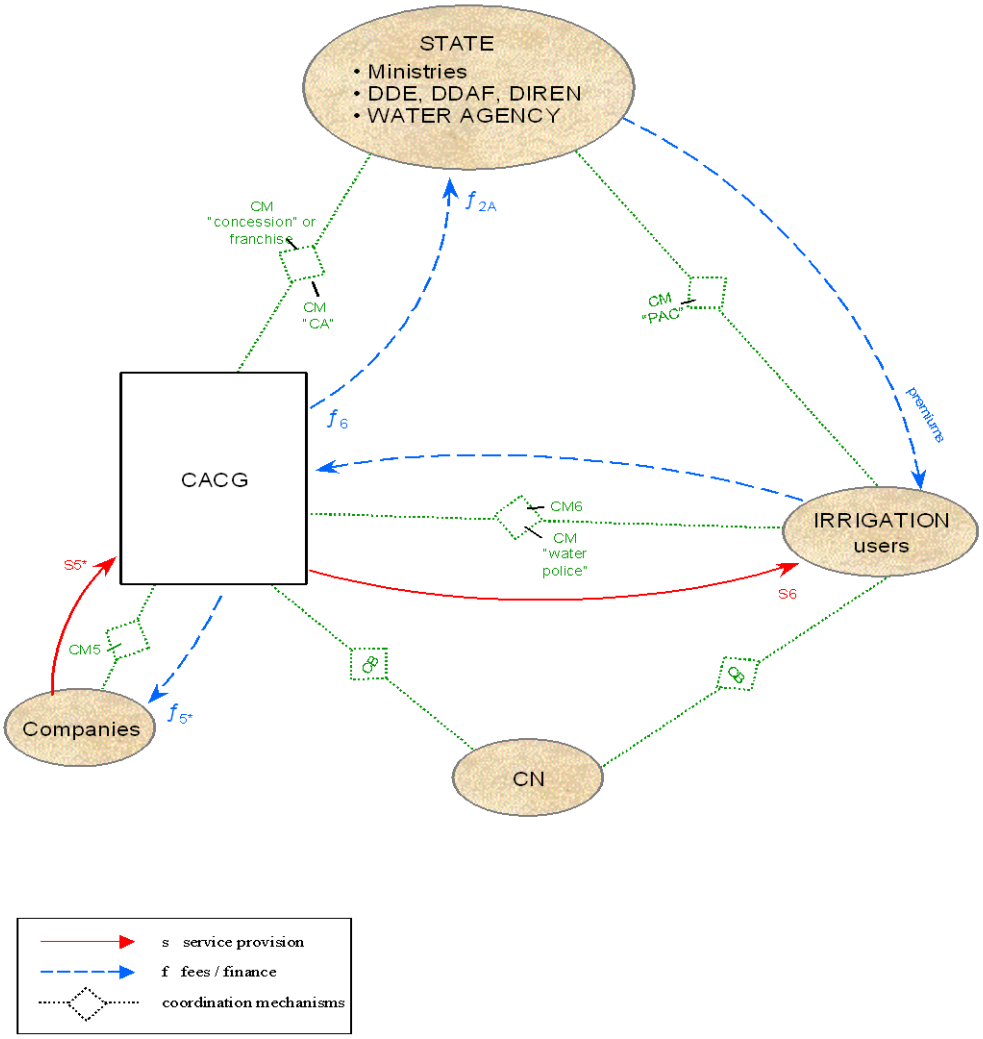
Another marked incentive for the farmers to contract water from the CACG concerns the system of premiums offered by the EU’s agricultural policy. I.e. certain premiums can be obtained depending on the amount of water contracted and/or the standard rate of flow (in the Neste system 0.6 l/s/ha) (**CM, PAC** – Politique Agricole Commune). These premiums are paid directly to the water users via the state.

5.3.2 Services S5*: External Services and Supplies

a) b) c) Service Contents/Financing/Coordination Mechanisms

To operate and maintain the franchise perimeters, the CACG also buys in external support services and supplies (**S5***) on the ”market” at the usual rates (**f5***).

Figure 3: Key services and service relations in the *"périmètres en concession"*, i.e. irrigation franchise schemes (overlap with services and service relations in Fig. 2)



5.4 Irrigation Perimeters ”en ASA”

As already mentioned in Chapter 4, the perimeters, which will be referred to below by the abbreviation ASA (“associations syndicates authorisées”); refer to areas between 500 and 1,000 ha which are managed and maintained by farmer associations on their own responsibility as of the pump station. There are presently some 65 or thereabouts of these irrigation units, covering a total surface area of approx. 40,000. The procedures for establishing an ASA are laid down in clear and precise terms and contain a gradual contractual obligation on the part of the members to become actively involved in such an association in the medium term. Whilst the ASA is being set up, the CACG takes on an advisory role, and also conducts preliminary studies to determine the irrigation system’s technical specifications and the manner in which it is to be integrated into the overall system. The results of such studies are then discussed and agreed on with the ASA members. Only once the ASA has become legally established in line with specified statutes, which are usually supplemented by an internal body of regulations (règlement intérieur), does work start on the construction of the irrigation system (pump station, main distribution network up to the field hydrants), to which end, the CACG employees suitable communal companies. The costs of the irrigation infrastructure are usually subsidised to up to 60 – 70% by the state. The CACG remains responsible for the operation and maintenance of all the afore-mentioned system components for the first year after commissioning, but then hands them over to the ASA. The points mentioned below relate to the period following hand-over.

As with the franchise perimeters, the services **S1** (provision of agreed quantities of water by correspondingly supplying streams and rivers) and indirectly **S2** (maintaining minimum flow rates) and **S3** (infrastructural maintenance in the Neste canal system), are all part of CACG’s service package to ASA members.

Furthermore, the following services and service relations also play a role in the O&M of ASA perimeters:

5.4.1 Service S7: Flexible Service Package

a) Service Contents

Once the irrigation systems have been handed over to the ASA further service provision is
left to the ‘market’ to be arranged. CACG usually offers various O&M service packages for ongoing support. These offers can range from basic service packages for control and smaller maintenance jobs (”convention de contrôle et d’entretien”) through to support for the operation, maintenance and administration of the irrigation systems (”convention de gestion et d’appui comptable”). Given the ‘market arrangement’, ASA also have the option of commissioning a private company of their choice.

b) Returns/Financing

In case CACG is selected, it enters into a contract with the respective ASA – and not with the individual water users as in the case of the franchise perimeters – which pays for the services in keeping with the contractually agreed scope of service delivery (**f7**). Water provision itself is remunerated within the scope of service **S1**.

c) Coordination Mechanisms

Coordination of service provision is based on one-year contracts, which the CACG concludes with each ASA individually (**CM7**) and which can be extended by one year at a time. Should the ASA fail to meet its payment obligations, the dispute is referred to the DDAF, which has sovereign powers in this respect.

In general though, the close interaction between the CACG and the ASA and the regular presence of CACG employees play a significant role in steering the exchange of services **S7-f7**, whereby the CACG adheres to a philosophy known as ”auto-gestion sans abandon”, i.e. never give up on an ASA that is operating independently. The CACG thus feels obliged to provide a certain sort of ”backup support”, such as the provision of information and small support services at no extra charge. The ASA are in actual fact not a particularly profitable branch of activity for the CACG, representing as they do only 3 to 4% of the CACG’s overall volume of business.

In contrast to the franchise perimeters, the contractually agreed quantities of water withdrawal are overseen not by the CACG but by the DDAF, which thus takes on the role of the ”water police” (**CM, ”police d’eau”).**

Another important coordination mechanism is that of the ”percepteur” (tax official) whose role and function is described in greater detail further on.

The importance of the Neste Commission (**CN**) as a steering instrument, representing all actors involved in operation and maintenance, is expressly reiterated at this juncture.

5.4.2 Service S 8: Services Provided for the ASA by Various Companies

a) b) c) Service Contents/Financing/Coordination Mechanisms

In addition to the service relations with the CACG, the ASA usually buy in services from specialised companies, such as electrical engineering firms for pump-station maintenance, as well as building, excavating and insurance companies. All of these services are summarised under **S8** in the Figures. ASA’s financial returns (**f8**) and the contracts governing them (**CM8**) are in keeping with customary market practice.

5.4.3 Service S9: ASA Services for Its Members

a) Service Contents

ASA services for its members include the provision of water in line with the agreed allocation base and at the requisite pressure, plus the conclusion of contracts with the CACG or other companies, organisational services involved in the preparation and holding of general meetings, representational services vis-à-vis the ”percepteur” or tax officer (see below), coordination of small maintenance inputs, pump operation as well as general coordination tasks (**S9**).

b) Returns/Financing

f9 refers to the total of all fees and contributions paid to the ASA by the individual members, as well as the coverage of costs incurred at association level, e.g. remuneration for the pump attendant (”préposé à la station de pompage”).

If a larger-scale breakdown of a system component occurs on an ASA-operated site necessitating repair or maintenance inputs that are not covered by the ASA budget, the costs either have to be met by the ASA members in line with the agreed allocation base or a supplementary budget has to be passed.

c) Coordination Mechanisms

ASA relationships with its members are regulated by the statutes and the internal body of regulations known as the ”règlement intérieur” (**CM 9**) which lays down all of the members’ rights and duties as well as the procedures for decision-making, representation of interests and conflict negotiation.

An important role in the process of coordination both internal and external ASA services is played by the state tax official (percepteur) (**CM 10”tutelle financière/administrative**”). The tax official has the job of approving and officially counter-signing the annual budgets agreed at the general meetings and of ensuring that the associations manage their finances in keeping with the approved budgetary framework. Thus, the tax official more or less fulfils the role of a treasurer or an officially commissioned bookkeeper, who makes sure that the ASA does not ”live beyond its means”. Although, on the one hand, the tax official is not there to judge the meaningfulness of any given type of expenditure, s/he is nevertheless obliged to examine whether the ASA’s ongoing financial commitments are tenable against the backdrop of its given monetary situation. Whenever an ASA’s deficits become chronic, the tax officer is bound by duty to inform the prefect. If a supplementary budget has to be passed (see above), the tax officer’s approval is required.

5.4.4 Service S 10: Tax Official’s Control Services

a) b) c) Service Contents/Financing/Coordination Mechanisms

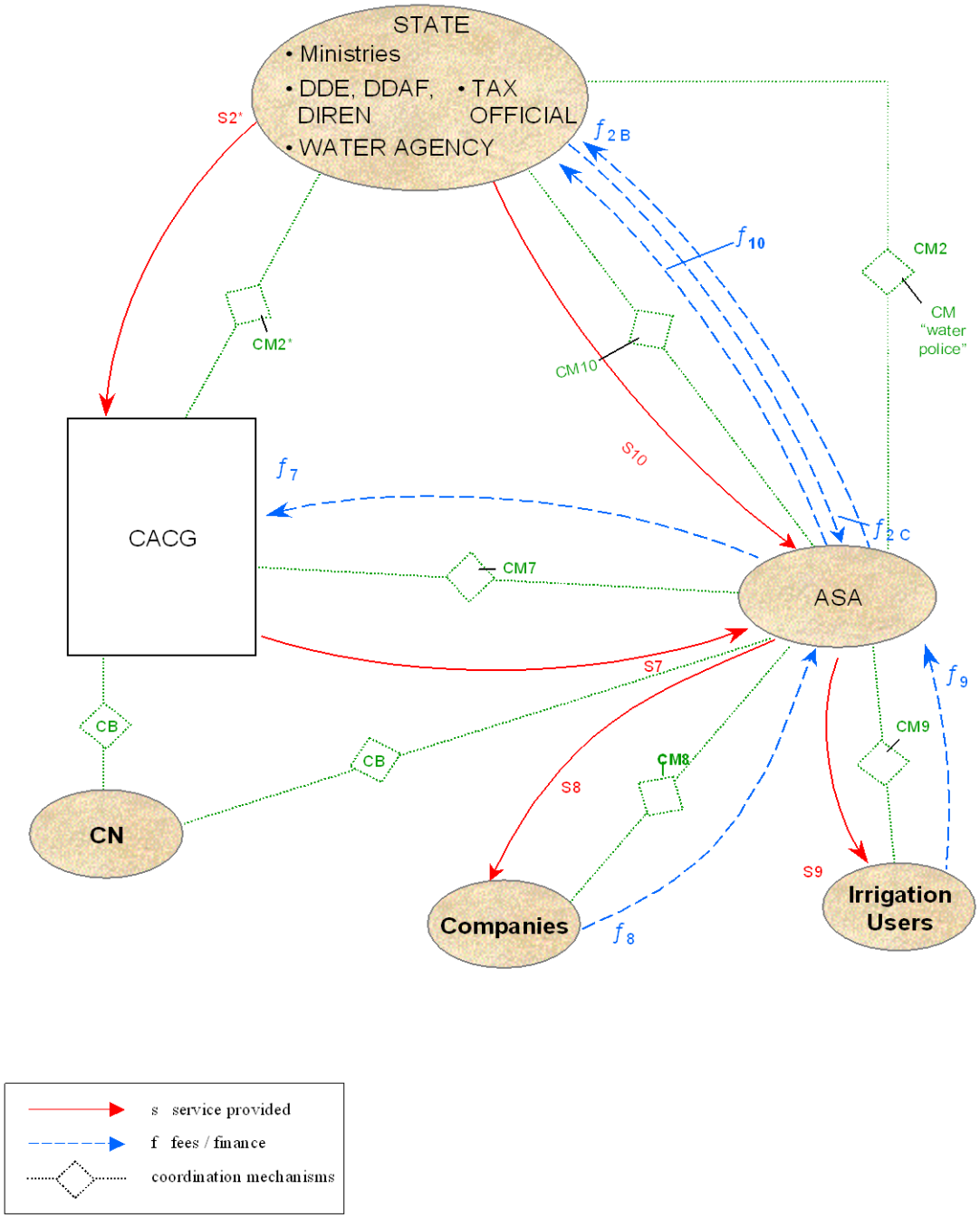
The tax official’s services (**S10**) constitute an important coordination mechanism for both internal and external ASA services and have therefore already been listed in the preceding section under c). These services are remunerated via a fully negotiable fee (the ”indemnité au trésor” as it is known **f10**). The regulations governing interaction between the ASA and the tax official are laid down in the ASA statutes (**CM 10 ”tutelle financière/administrative**”).

5.4.5 Other Services

In keeping with its statutes, the ASA has to pay the water duty of FF 0.03/m^3 irrigation water to the water agency (**f2B**). As mentioned above, the purpose of this duty is to finance service **S2**, i.e. the upkeep of minimum flow rates required on hygienic and ecological grounds. Another instrument that helps ensure the correct collection of the water duty is the fact that the CACG provides an unofficial service for the agency, by

procuring information on the quantities of water withdrawn by the ASA (**S2***), a task it fulfils on a semi-official basis (**CM2***). Furthermore, the water agency can offer incentives to the ASA within the framework of the EU agricultural policy – although these are not to be regarded as a direct returns – in the form of subsidies (**f2C**) for the procurement of water-saving system components (e.g. sprinklers) (**CM PAC**).

Figure 4: Key services and service relations in the irrigation schemes *"en ASA"*, i.e. operated by water-user associations (overlap with Fig. 2)



5.5 Maintenance Systems in Comparison

When analysing the various systems described above, it becomes clear just how much the CACG has consolidated its role as service provider. Its services and service relations for the different operating systems in which it is involved – and thus for the different clients and beneficiaries of its services – are clearly defined and specified. Virtually all service relations form a closed circuit, i.e. a service is provided in exchange for another, clearly defined (financial) return. Furthermore, a variety of coordination mechanisms are in place which regulate the relationships between service provider and service recipient, whilst also offering sufficient incentives to maintain these relationships. Given these circumstances, it is hardly surprising that maintenance problems in the CACG's sphere of responsibility are kept to a minimum. Moreover,- as mentioned at the beginning - the CACG can claim to be the first water-management organisation in southern France that is also able to recover the costs incurred in operating and maintaining the infrastructure in its care.

The following mechanisms, as named above, have proven to be the particularly important coordination aspects in this connection:

- A corner stone of maintenance services in the **Neste canal system** is the CACG's commitment to earmark and accordingly adjust an annual "maintenance reserve" (provision de maintenance) in its budget. Funds from this budgetary item that are not used in a given year are carried over to the next, and cannot be reemployed for other purposes. State-prescribed upper and lower limits for the funds cumulated under this item, together their supervision by an administrative council, prevent the implementation of a maintenance policy that is either too wasteful or too careless. This coordination aspect is shored up by a rate- and fee-charging system which, after an initial start-up phase, is geared to cost coverage and which, in cooperation with all those concerned, is firmly anchored in the Neste Commission (CN). A key factor facilitating the above is transparency, both with regard to the ongoing status of service provision for the various customer groups and in respect of budgetary planning.
- In the **franchise perimeters**, the CACG conducts virtually all the operation and maintenance tasks on its own. The decisive features of this system are the clear contractual basis regulating the CACG's service obligations and the fact that the CACG itself can act as "police de l'eau". Infringements of the contractual regulations by individual water users, in particular when it comes to defaults on payment, can thus – with official support – be followed through quickly and

unbureaucratically (e.g. by turning off the water supplies). In spite of this, the water users are still able to exert a reasonable amount of influence via their representatives on the Neste Committee.

- According to the CACG, its operation and maintenance services for the **perimeters ”en ASA”** cannot be regarded as a profitable venture as things presently stand. The underlying idea of this type of service relationship is that the CACG is one of many service-providers offering their O&M services on the "market”. However, this approach is being undermined in certain regions owing to the lack, both in number and qualification, of alternative service providers and the large distances separating the various ASA. The basic market-principle is thus being softened in practice by the policy of ”auto-gestion sans abandon” which essentially means that the CACG provides the ASA with an intensive support service that contradicts the tenets of this market-based philosophy. This kind of service is, in turn, only feasible in conjunction with services in other operating systems. However, it is worth noting that the ASA are not organised in federations at present, an option which is currently under discussion.

6. Conclusions and Transferability to Developing Countries

One of the key conclusions from the above analysis, and indeed a basic tenet of the *Maintain* concept, is that a successful approach to maintenance in the irrigation sector can only be achieved if this function is not regarded in purely technical terms. The examples show how important it is to adopt a more holistic, service-oriented approach, which perceives maintenance and operational concerns in the context of multi-actor service systems. Thus, identifying these actors, defining the services and support services and the corresponding returns rendered in this network and analysing the pertinent coordination mechanisms all constitute an important step in the diagnosis and improvement of maintenance issues. Indeed, it is part of the basic understanding of the *Maintain* concept that such steps are not meant to replace technical, financial, economic or organisational analyses and recommendations, but are designed to complement them.

Yet another important conclusion that can be derived from the preceding analysis is that coordination mechanisms should not be regarded – as is often the case – either purely from a market-oriented or state/hierarchical position or solely from the perspective of self-administration/cooperation. The different operating systems presented in this analysis show that, in each case, market-related, state as well as cooperative governance mechanisms are all brought to bear within the scope of a *single service system*. With our plea for a ”multi-governance” approach to maintenance systems, the authors, are referring back to the work of Herder-Dorneich (1986), who has explained and presented the need for such diversified coordination mechanisms in detail.

The fact that the conclusions drawn here are equally valid for irrigation systems in developing countries is obvious to see. However, investigations by *Maintain* have shown that analyses of this kind have hardly been conducted at all in the irrigation sector. Indeed, in many areas with ongoing maintenance systems, the coordination mechanisms were not only operating poorly but, in some cases, were not even in place.

The authors of this text are convinced that a major cause of maintenance problems in the irrigation sector in developing countries is due to the fact that no or merely rudimentary importance is attached to service relations and their coordination within the network of actors involved.

References

Herder-Dorneich, Philipp. 1986: Theorie der sozialen Steuerung. Die Theorie der Scheine. Nomos Verlagsgesellschaft. Baden-Baden, Germany.

Huppert, W. and K. Urban. 1998: Analyzing Service Provision. Eschborn, Germany.

Huppert, W. and K. Urban. 1999: Institutional Analysis of Water Delivery and Maintenance Service Provision in Irrigation: The example of the Jordan Valley. Maintain Case Study No. 3. GTZ. Eschborn, Germany.

Jones, William I. 1995: The World Bank and Irrigation. The World Bank Operations and Evaluation Study. World Bank, Washington, D.C.

Lesbats, Roger, Tardieu, Henri and Heritier, Michel. 1996: Associations d'irrigants dans le sud-ouest de la France et leurs relations avec C.A.C.G.

Scheumann, Waltina, Vallentin Artur. 1999a: Institutional Analysis of Maintenance in the Lower Seyhan Irrigation System: Turkey. Maintain Case Study No. 1. GTZ. Eschborn, Germany.

Scheumann, Waltina, Vallentin Artur. 1999b: Institutional Analysis of Maintenance in the Irrigation Systems of Punjab: Pakistan. Maintain Discussion Paper. GTZ. Eschborn, Germany.

Tardieu, Henri. May 1991 : La CACG, organe de gestion de l'eau: un instrument technique et un lieu de concertation. Coteaux de Gascogne No. 83.