DEPARTMENT OF THE COMMISSIONER GENERAL FOR SUSTAINABLE DEVELOPMENT

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le point sur

Tax on water abstraction:

how can it be used in the quantity management of the resource?

Tax on water abstraction are an economic instrument in the quantity management of water and aim to achieve a better balance between the demand and the volumes available. They are collected by Water Agencies, their rate being defined for each hydrographic basin within the limits of a national legal price ceiling. Although each river basin is unique in terms of the availability of the resource and its uses, current tax still does not reflect local scarcity or the pressures exerted by each type of user (households, industry and agriculture). The Water Agencies' 10th intervention programme, which is currently being put together for the 2013-2018 period, may be an opportunity to review the rates of this tax in accordance with their objectives. However, certain technical constraints limit the effectiveness of this instrument and the socio-economic impact of these rates must also be taken into account in any decision.

ECONOMIE ET EVALUATION

RESOURCES

Tax on water abstraction constitute the main economic tool implemented in France for the quantity management of water. This is complemented by regulatory and planning instruments for the prevention and management of crisis situations experienced locally.

In an average year, France generally has enough water resources for its various uses; this signifies that, on one hand, they are able to satisfy the demands of its main users, which are households, industries (including energy producers) and farmers and, on the other, to maintain ecological equilibrium and the quality of watercourses. However, even without drought conditions, these resources can be occasionally or locally insufficient. This scarcity of the resource leads to economic losses and conflicts of use (externalities). In effect, use by an economic user limits the possibility of use by other users or threatens the proper functioning of aquatic environments. The costs incurred when the demand for water is greater than the resources available* are what we call water scarcity costs.

Tax on abstraction, an economic instrument for the quantitative management of water

The water quantity management policy* aims, in particular, to reduce this imbalance between the resources available and the resources abstracted. Water tariffs can contribute if they reflect scarcity costs. In France, the tax collected by Water Agencies in relation to abstraction are a component of the price of water, which is supposed to integrate scarcity costs. This is the case for all uses.

As with all water tax collected by Water Agencies, the tax on abstraction is based on the principles of the directive 2000/60/EC (or the Water Framework Directive, WFD, transposed into French law in 2004), which institutes a European framework for a policy aiming to achieve good ecological status for all waters. Article 9 therein, requires Member States to take into account the principle of cost recovery* so that users cover the costs of using the water and, in particular, the environmental costs.

As such, the WFD encourages the implementation of an incentive-based tariff, which, by integrating the different environmental costs in the price of the water, aims to influence users' behaviour in the sense that they exert less pressure on the resource (abstractions creating conflicts of use and pollution emissions).

Management by hydrographic basin

Water management is organised at the hydrographic basin level (7 basins in mainland France managed by 6 Water Agencies).

The *Loi sur l'Eau et les Milieux Aquatiques* [Law on Water and Aquatic Environments] (or LEMA) of 30 December 2006 specifies the basis for calculation of the water taxes and fixes the ceiling price (*box 1*) as well as the criteria for adjusting the rates of these taxes. It is then the responsibility of the River Basin Committee* and the Water Agency's governing body to decide upon a zoning policy and to adopt tax rates within these limits. The Agencies' 10th intervention programme, which is currently being put together, must set the tax rates for the 2013 to 2018 period by the end of 2012.

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Tax as just one of the instruments used for water quantity management

Besides the economic instrument of abstraction tax, the quantity management of water resources also relies on regulatory and planning instruments. Some aim to prevent crisis situations by organising the use over the longer term (*Schéma Directeur d'Aménagement et de Gestion des Eaux* [Master Water Development and Management Plan] - SDAGE, *Schéma d'Aménagement et de Gestion des Eaux* [Water Development and Management Plan] - SAGE, etc.). Others are intended to limit the impact of crisis situations through the implementation of restrictions on water uses (prefectural orders) (*box 2*).

The high number of restrictive water measures imposed each year demonstrates the importance of crisis management whereas the balanced management of resources* should call upon these regulatory instruments occasionally.

Tax rates are inadequately adjusted in accordance with local and seasonal availability

One of the adjustment criteria for the rate of the abstraction tax for each of the river basins is the availability of the water resources. Higher rates are applied for bodies of water where there is a serious imbalance between the volumes abstracted and the availability of the resource (Water Apportionment Areas, WAA), than for those that do not present any particular hydric deficit (outside WAA) (*box 2 and maps 1 and 2*).

This criterion introduces a "geographical scarcity" tariff. Yet, there is no rate adjustment season by season, even though the availability of water resources varies throughout the year. In theory, abstractions when the water level is low could be subject to a "peak tariff". However, the implementation of seasonal adjustments does have practical implications, particularly with regards to measurement. In effect, it requires the regular collection of reliable information on the demand for water as is the case with electricity.

A tax based on abstraction volumes that do not reflect precisely the pressure on the resource...

Abstractions* (*graph 1*) provide an instant indication of the pressure exerted on the availability of water resources. However, this indication is not sufficient to appreciate the global impact on the water system: it does not take into account returns into the environment, which vary depending on the use, or the difference in impact depending on the origin and return environments of the collected water.

Water consumption*, which corresponds to the difference between the volume of water that is abstracted and the volume that is returned to the environment, would be a better indicator of this pressure but it cannot be used as it is difficult to calculate it precisely. Despite these measurement constraints, it has been established that irrigation returns a very small portion of its abstraction to the environment [2] and this usually occurs during periods of deficit. This is in contrast to volumes used for cooling open circuit* thermal and nuclear power plants (33% of volume abstracted in 2009) whereby more than 90% is returned to the watercourse. Water used by households is also almost fully restored to the environment after treatment.

Box 1: Tax and the internalisation of costs

Tax on:	Basis for calculation/users concerned	Externality concerned	Totals in 2009 (in € Millions)
Abstraction from water resources	Volume abstracted/ all uses (for hydroelectricity, the height of the drop is incorporated into the calculation of the tax)	Conflict of use (scarcity cost)	329.5
Domestic pollution	The volume of water invoiced to the domestic user or similar	Pollution	832.0
Non-domestic pollution	The total of pollutants contained in industrial effluents The number of animals kept for livestock farmers	Pollution	74.9
Pollution emitted (previously the TGAP [General Tax on Polluting Activities])	The mass of substances contained in phytopharmaceutical products or in the seeds processed by these products	Pollution through phytosanitary products	53.1
Protection of the environment (previously known as the *taxe piscicole* [piscicultural tax])	For fishing (amateur or professional) in fresh water	Reduction in fish stocks	9.6
Network modernisations	Volume of drinking water/all users connected to a municipal water supply system	Reducing leaks	595.0
Reserves for periods when the water level is low	Volume of the pondage/Owners of reservoirs along watercourses	Reducing output from watercourses	0.1
Obstacles in watercourses	The basis integrates the difference in height from one side of a structure to the other as well as physical characteristics	Blocking sedimentary transit and the migration of fish	0.2

Source: LEMA & PLF 2012

Box 2: Regulatory instruments [1]

For prevention

River basins classified as being in "quantity deficit" in SDAGEs and SAGEs

Water management is planned at different levels: the aims and priorities for action are defined at the hydrographic basin level via the *Schémas Directeurs d'Aménagement et de Gestion des Eaux* [Master Water Development and Management Plan] (SDAGE) and then applied to the sub-basin level via the *Schéma d'Aménagement et de Gestion des Eaux* [Water Development and Management Plan] (SAGE). The River Basin Committee in each of the seven large hydrographic basins approves the SDAGE. The Water Agencies convert the objectives of these master plans into 6 year financial programmes approved by their River Basin Committees. Voted in by Parliament, they are then written into finance laws. River basins deemed to be in "quantity deficit" are incorporated into the SDAGEs and SAGEs and are more likely to be classified as Water Apportionment Areas (WAA).

Water Apportionment Areas (WAA)

A classification implemented in 1994, WAAs are river basins, sub-basins, sections of hydr0graphic sub-basins and water-bearing systems characterised by a chronic lack of available water in relation to uses. It is the prefect of the "department" who lists the municipalities affected by the WAA. The aim is to improve the relationship between water supply and demand. It enables local authorities to implement stricter water management measures (lowering abstraction authorisation thresholds or introducing abstraction declarations and increased abstraction tax rates), for which social acceptance is not always easily gained. Also, not all zones in structural deficit are classified as WAAs.

Distribution procedure for abstractable volumes

Since the LEMA, it has become necessary to assess the abstractable volumes (offer) and use (demand) so that the sustainable distribution of volumes between the different users can be integrated into the SAGEs (defining, in particular, usage priorities). This work is currently in progress at the river basin level.

For crisis management

Localised scarcity management orders

Since 1992, the prefect of a "département" (local sub-regional level) has been able to put in place temporary measures (in an order) to limit or suspend certain uses of water to counter drought threats. These measures are based on the identified need for restriction, which is classified at four levels: vigilance, alert, high alert, crisis. The prefectural orders are generally created following a "drought unit" meeting in which the different water stakeholders in the zone concerned are represented.

Municipalities can take out orders to reinforce these measures.

These temporary measures can be coordinated by framework orders that define the thresholds for the implementation of usage limits and ensure harmonisation with local orders.

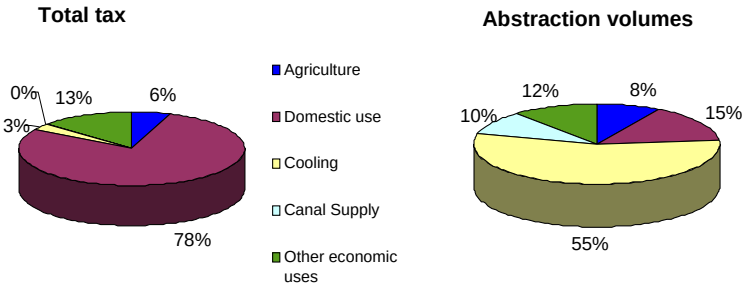
The pressure on the resource also depends on the environments of origin and of return of collected volumes. For example, drinking water is often abstracted from groundwater (63 %) only to be returned to rivers, whilst for cooling open circuit power plants, abstractions are taken from surface water and returned to the same place.

Thus, the pressure exerted by cooling is less than that exerted by drinking water, which in turn is less than that exerted by irrigation.

... and are not always metered

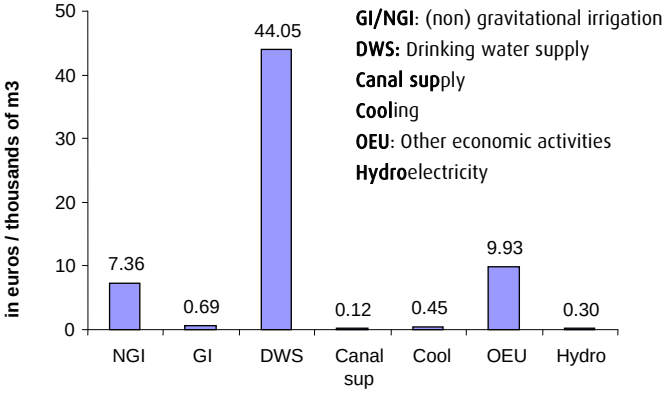
Moreover, so that tax on abstraction encourage users to conserve water, the level of these must reflect the actual volumes abstracted. Yet, in some cases, the volume of water abstracted is not measured by a volumetric meter, but is estimated. So, for example, for irrigation, 10 % of the volumes declared in 2009 were the result of a so-called fixed tariff (this tariff depends on the surface and type of cultivation).

Graph 1: Distribution of abstractions and tax on abstraction by type of use (excluding hydroelectricity)



Source: Water and Biodiversity Directorate, Water Agencies in 2009

Graph 2 : Average rate of tax for abstraction per type of use (all basins together) weighted by the volumes abstracted



Source: Water and Biodiversity Directorate, Water Agencies in 2009

Note 1: The rate applied for hydroelectricity is in euros per millions of m3 x m.

Note 2: These average rates mask a significant degree of variation depending on the basin. It is for non-gravitational irrigation and cooling that the relative standard deviation is the most significant and for drinking water use that it is the least.

The rate of the tax is not always consistent with the type of use

The comparison of the volumes abstracted with the tax paid by use reveals an imbalance (*graphs 1 and 2*). This fact, which has already been highlighted many times in the past [3], seems to persist in light of the most recent data. Each type of user (industries, farmers and households) does not contribute appropriately to the financing of water services in accordance with its use, contrary to the objectives of the WFD.

Looking at the tax totals illustrates this imbalance: they are highest for water used for "drinking water" purposes whilst the corresponding abstraction volumes are not the most significant (it accounts for 77% of the total tax compared to 9% of volume). For example, in Adour-Garonne, the abstraction is higher for irrigation than for drinking water (1 billion m³ compared with 0.75 billion m³). And yet, the total tax is less for "irrigation" use, for which a lower tax rate is applied (€6.59 /1,000 m³ for irrigation compared with €47.83/1,000 m³ for drinking water).

Tax adjustments do not reflect the hierarchy of pressures exerted by each user on the scarcity of the resource (*graph 2*), as explained previously. In effect, the impact of cooling and drinking water on the resource is less than that for irrigation and yet the rate charged for using drinking water is the highest.

For cooling, the very low rates are more consistent with the very low pressure exerted by this type of use.

The tax rate does not always reflect the local scarcity of resources

There is currently no reference value for the scarcity costs on which tax rates on abstraction could be based. Therefore, it is difficult to judge their level of significance with regard to the aims of balanced quantity management. Nevertheless, some data exist that may shed light on this matter.

In certain areas, the abstractions are greater than the resources available * (*cf. maps*):

- The Parisian river basin for the production of drinking water and for irrigation (Beauce);
- The Southwest and Atlantic coast (from Poitou-Charentes to the Pyrénées-Atlantiques) for irrigation.

The significant pressure exerted on the water resources in these river basins by certain types of user does not always lead to the establishment of higher rates of tax on abstraction (*graph 4 per basin*). Whilst the average rate for non-gravitation irrigation* in the Seine-Normandy river basin is clearly the highest for mainland France (€15.80 for 1,000 m³), in contrast, this rate is low in the Southwest (€6.59 for 1,000 m³ in the Adour-Garonne river basin). It is less than the rate applied in the West (€11.76 for 1,000 m³ in the Loire-Brittany river basin), where water availability problems are less of a concern.

For drinking water, the rates applied in the Seine-Normandy and Adour Garonne river basins are at the high end of the scale (€51.44 and €47.83 for 1,000 m³, respectively), which suggests that, relatively speaking, they are better in reflecting the scarcity cost for this type of use.

More generally, the Adour-Garonne river basin - a basin whose water resources are subject to significant water deficit pressure- has average tax rates (combining all types of use), lower than those for the Loire-Brittany and Artois-Picardie river basins which experience less pressure (*graph 3*).

The small part of the scarcity costs in the price of water

The tax on water abstraction is a component of water prices that aims to encourage a more efficient use of water.

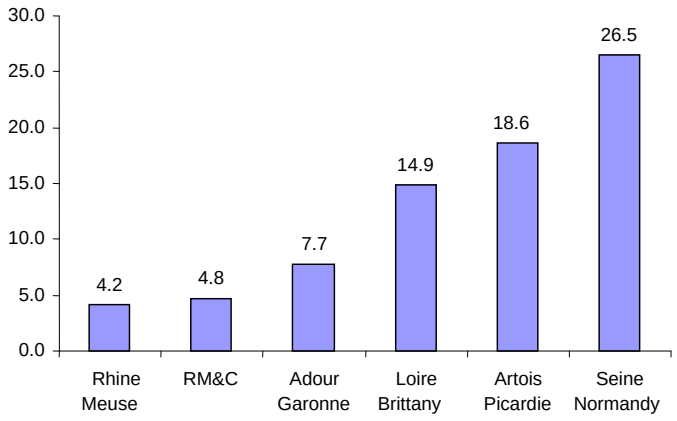
It constitutes part of the price of water paid by households, in the region of 1.3% (based on the average price of €3.4) [5]. It represents the full price of water paid by economic users (agricultural and industrial users) when they aren't connected to the drinking water network and collect water directly from the water environment, a price to which the costs related to potential water conveyance and processing are added (as well as pollution taxes).

The poor price sensitivity of the demand

For abstraction tax to offer an incentive the demand for water must be elastic, this means that it varies depending on the price of water. The agricultural demand for water for irrigation, for example, is most certainly not elastic in the short term, particularly in the dry season.

In the longer term, cultural changes and improvements to irrigation systems may occur as a result of increases in water prices. Thus, increasing the rates of abstraction tax could encourage farmers to adopt production systems that are better adapted to the available water resources. The

Graph 3: Average weighted rate of tax on abstraction (all uses combined – in euros/thousands of m³)



Source: Water Agencies, activity data for 2009

Note: As the rate of drinking water tax is much higher than those applied for other uses, the classification of different basins using the average rate is consistent with that based on the proportion of drinking water in the abstractions.

situation in Israel provides a good example of this. It has implemented a progressive water tariff based on quotas allocated according to the type of agricultural operation, leading to an average increase of 68% in the price of water used for agricultural purposes between 1995 and 2005. Cultural practices have adapted permanently to this price variation (more efficient irrigation techniques, using recycled water, etc.) as only three quarters of the quotas were used in 2005.

For the Midi-Pyrénées region, for example, the elasticity of the demand for water for irrigation has been estimated at 0.3 [4], which means that a 10% increase in the price of water would lead to a 3% reduction in abstraction for irrigation in the short term.

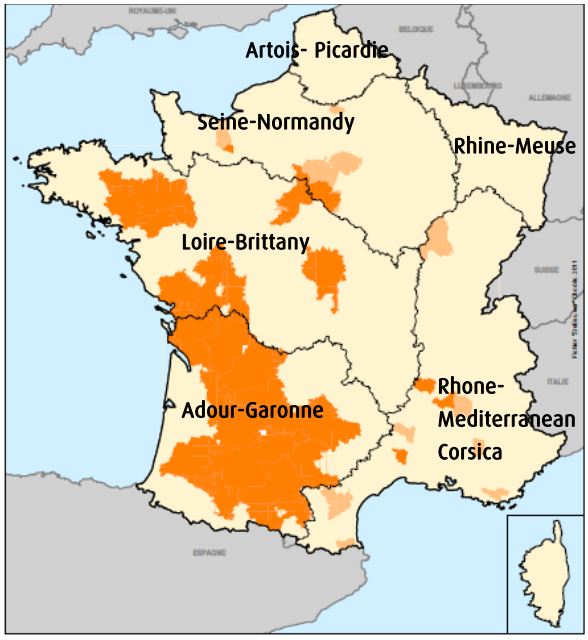
This suggests that for irrigators to effectively reduce their level of abstraction, we need, with the help of this model, to significantly increase the tax. Such a price increase is likely to have a significant economic and social impact. Moreover, Article 9 of the WFD requests the implementation of an incentive-based tariff, which would help to achieve the WFD's environmental objectives, and an appropriate cost recovery, taking into account the economic and social consequences.

A need for complementary instruments to encourage a reduction in water consumption

Due to their design, low rates and lack of sensitivity of the demand in the short term, tax on abstraction is not currently a perfect incentive-based pricing. As the legal ceilings have not been reached, rate increases would help to rebalance the distribution of scarcity costs between types of use. However, pricing cannot be considered as a water quantity management solution on its own. It must be used in conjunction with other instruments, notably those relating to planning. The procedure for the distribution of abstractable volumes provided by the LEMA should improve planning, as well as drawing upon accurate information and updates regarding the resources available and users' needs.

Aside from the tools already mentioned, there are other ways in which water savings can be achieved, for example, through awareness campaigns, leak reduction (in progress in France) or the implementation of incentives or regulations for the installation of more water efficient appliances.

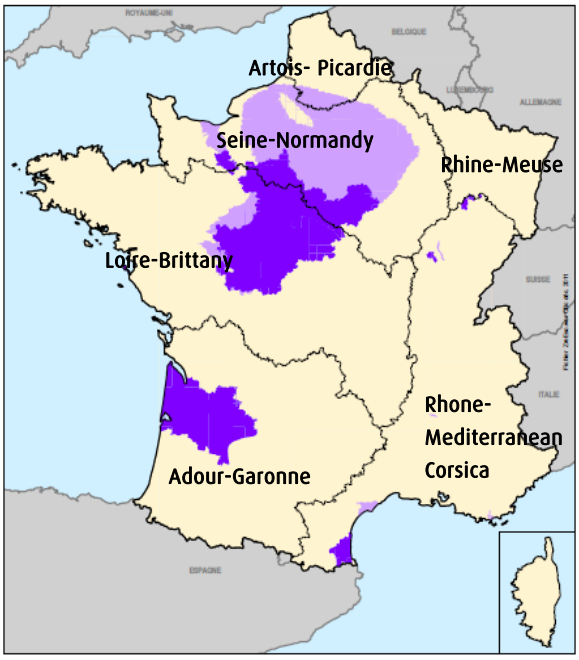
Map 1 – Surface Water Apportionment Areas



Source : MEDDE/ DGALN

WAA 2009
WAA 2010 (provisional data)

Map 2 – Underground Water Apportionment Areas



Source: MEDDE/ DGALN

WAA 2009
WAA 2010 (provisional data)

Note: The WAAs defined in 2010 are to be added to the 2009 WSZs. Some river basins may since have been classified or declassified.

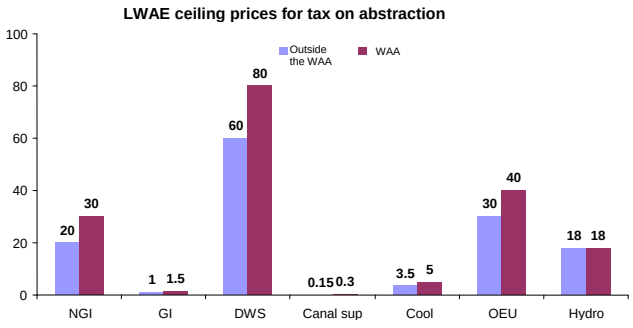
Graph 4: Volumes of abstracted water, total amounts and rates of tax on abstraction per river basin and per use

Key:

GI/NGI: (Non)gravitational irrigation
Canal sup: Canal supply
OEU: Other economic uses
DWS: Drinking water supply
Cool: Cooling thermal and nuclear power stations
Hydro: Hydroelectricity

LWAE: Law on Water and Aquatic Environments / WAA: Water Apportionment Areas

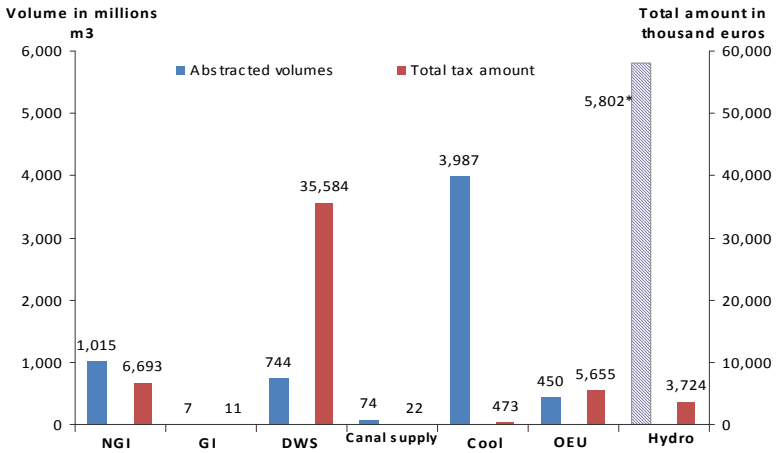
*** The scale on the left corresponds to the basis for calculation of the abstraction tax which equates to the volumes abstracted for all uses except water used hydroelectricity For this use, the basis for calculation is equal to the volume abstracted multiplied by the height of the drop. As such, this is not a representation of volume and it is not comparable to the volumes abstracted for other uses.**

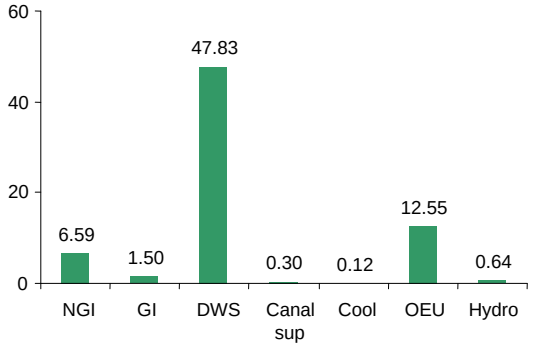


Water abstraction by volume and the corresponding tax total amount

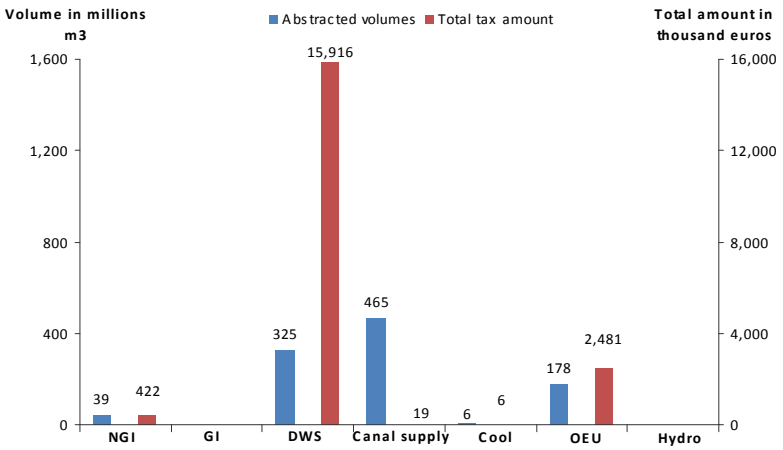
Average rate of tax on water abstraction by basin and per use (euros/thousands of m³)

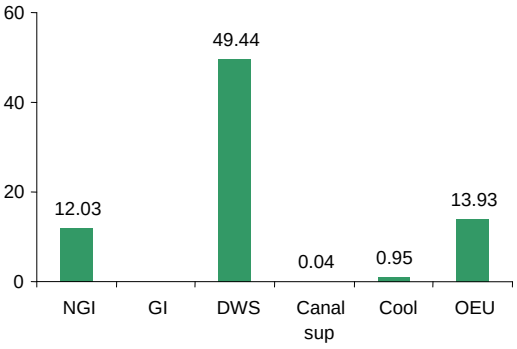
Adour-Garonne River Basin



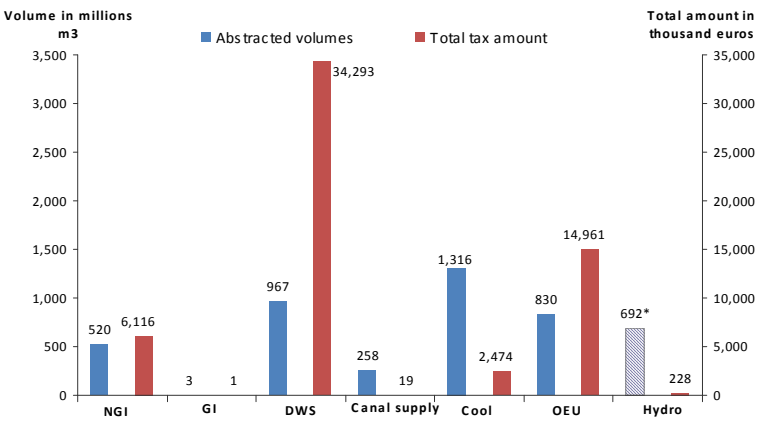


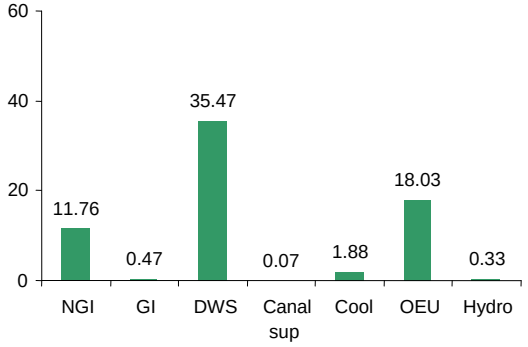
Artois Picardie River Basin



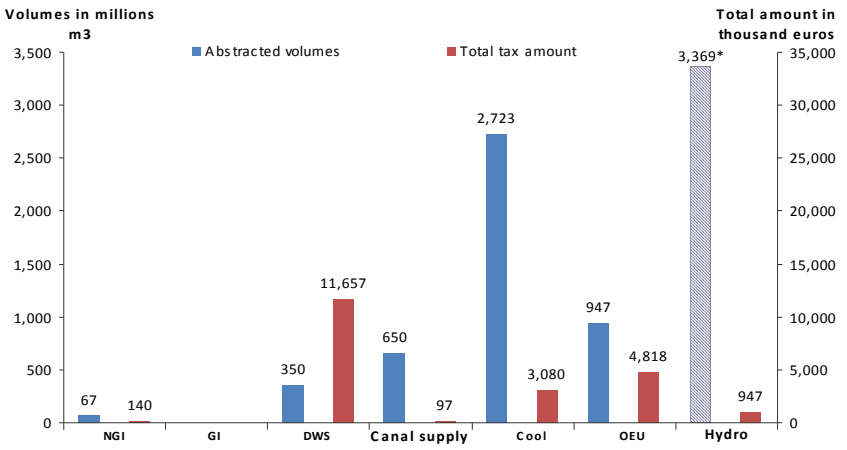


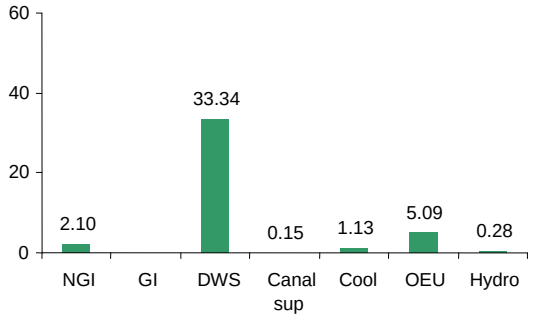
Loire Brittany River Basin



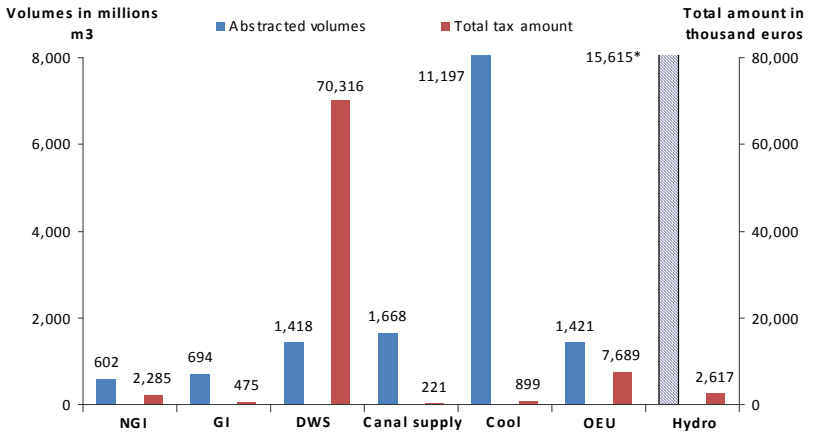


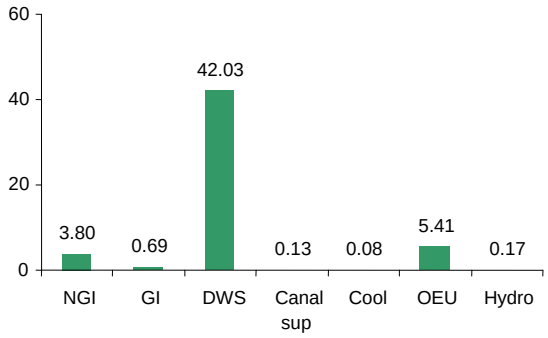
Rhine-Meuse River Basin



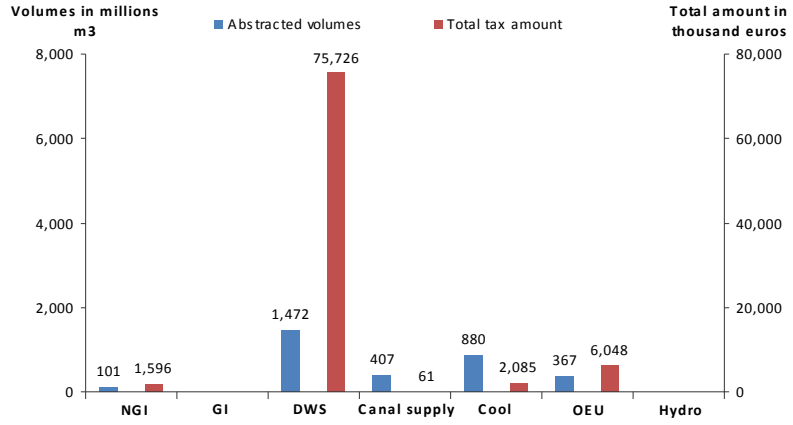


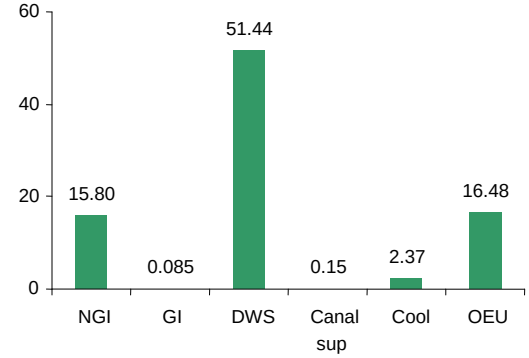
Rhône-Mediterranean-Corsica River Basin





Seine-Normandy River Basin





Interpretation: The graphs on the left depict the volumes collected along with the total abstraction tax per type of use. The users who collect the most do not always pay the most. This observation suggests that the environmental cost recovery contributions made by some categories of users are not equal to the impact generated by their abstraction. However, abstraction is not a good indicator of the pressure exerted on the resource.

The graphs on the right show the rate of tax per type of use. The imbalance between contribution and abstraction observed is the result of significant differences in the rate of tax depending on the type of use. The difference in rate is particularly significant between the Drinking Water Supply and other uses. The ceiling rates fixed by the law –LEMA- are also shown for reference. These thresholds vary depending on whether the zone has sufficient resources (WAA) or not (outside a WAA).

Warning: The scales used for the charts representing the abstraction volume and total tax are not the same for each river basin. However, a ratio of 1 to 10 between the volume scale and the total amount scale has been maintained. The rates shown for each basin are the average rates resulting from the division of the total tax by the volumes abstracted.

Glossary (*):

The water quantity management policy aims to reduce the imbalance between demand and the resources available, and to anticipate floods.

River Basin committee: An authority composed of stakeholders from local authorities (40%), users and associations (40%) and the State (20%). It develops, among other things, SDAGEs [Water Development and Management Master Plans]/ SAGEs [Water Development and Management Plans] and intervention programmes.

Water abstraction: The volume of water taken directly from the natural environment, either for direct supply or to produce drinking water.

Water consumption: The volume of water abstracted minus the volume that isn't returned to the environment after use (for example, evapotranspiration for plants).
NB: In some cases water cannot be returned to its original environment; this is the case for water consumed by households, which is often taken from groundwater and returned to surface water.
Generally, water is not returned to the environment in an "identical" state; its quality or its temperature may have been altered, which could impact upon the restitution environment.

Cost recovery: The principle relating to what the water users pay, via the price of water, costs relating to its use (investments, operating and redemption costs, environmental costs, etc.).

Intervention programme: A Water Agency programme lasting several years that provides a framework for operational measures and their financing, together with the strategic programmes defined by the river basin committees. In particular, it defines action priorities and the rates of tax.

A water resource is subject to **balanced quantity management** when, statistically, eight years out of ten on average, the maximum volumes or outputs authorised or declared for this resource, whatever the intended use (irrigation, drinking water supply...), can be abstracted whilst ensuring the proper functioning of corresponding aquatic environments (memo of 30/06/08 relating to the restoration of quantitative deficits in relation to water abstraction and the collective management of irrigation abstraction).

Available resources: The quantity of water that it is possible to abstract without harming the ecological state of the water and does not lead to a significant deterioration of the associated terrestrial ecosystems (WFD).

Open circuit operated power plant : A power plant whose cooling processes are assured by a third circuit that exchanges water (abstracts and rejects what hasn't evaporated) directly with the surrounding environment (river, sea, etc.), as opposed to closed circuits which re-use water multiple times for cooling purposes and only abstract water to compensate for losses associated with evaporation.

Gravitational irrigation: An irrigation method whereby the water is transported to the edge of and into the fields via channels built in line with the natural gradient.

Non-gravitational irrigation: Other types of irrigation, such as pressurised (pressure thanks to pumping and distribution via sprinklers) and "drop-by-drop" irrigation, using more modern technologies.

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For further information:

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