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Economic models for water management and pricing in Europe: Synthesis

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On behalf of Europa

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CONTENT

1. INTRODUCTION

This document follows on from the analysis of the situation with regard to water management and pricing in seven European countries (France, Ireland, the Netherlands, Romania, Germany, Spain and Latvia) presented in separate "country sheets ». It summarises the main elements for each country and concludes with a targeted analysis of the application of the solutions identified in the particular case of Limoges Métropole.

It is part of a global project carried out with the aim of producing a publication for territorial decision-makers and the subject of which is the following: "The management of economic models and the pricing of drinking water services in the face of the need to save water".

This meta-analysis aims to identify the practices put in place or envisaged in the seven European countries to maintain water services in good economic conditions allowing them to meet their duties (i.e. to supply water). drinking water with infrastructures maintained in good operating conditions). Also, it aims to identify the models likely to be reproduced in the French institutional framework and in response to the problem of Limoges Métropole.

2. OVERALL SUMMARY

The price of drinking water and sanitation is increasing and will probably continue to increase significantly. This is due to various factors, the main ones being:

- the increasing complexity of processing,
- the maintenance and renewal of the installations necessary to ensure the maintenance in operational conditions of the installations which must operate 24 hours a day, 7 days a week and to provide a service of constant or even increasing quality,
- the adjustment of the size of the installations in the event of a reduction in consumption per inhabitant (extension of the territory served, reduction in size or restructuring of the production installations, etc.)
- the scarcity of the resource or an increasing variability of its availability during the year already visible in certain regions in France but also on a European and international scale, which will require adjustments (creation of reserves, development of alternative resources even unconventional to meet certain uses, in particular those not requiring drinking water, etc.),
- the increase in certain production costs: energy, treatment products, devices used in the structures, including quality monitoring or security actions.

All of the countries surveyed show great diversity in their approaches to water service pricing:

Country	Sector management mode (prioritized)	Economic regulator	Tarifs	Pricing method
France	Private delegated	Absence of autonomous regulatory authorities for water and wastewater. The law and parliament regulate the tariff formulas	On average, the price of water is estimated at €4.14/m3, i.e. €2.07/m3 for drinking water and €2.07/m3 for sanitation (SISPEA report in April **2021**)	A fixed part (subscription price) + variable price (depending on the volume of water consumed by the household).
Ireland	Direct public	CRU: Commission for the Regulation of Public Services	With meter: €1.85/m3 of use outside the flat rate for drinking water and waste water services. i.e. €3.70/m3 combined service charge (**2022**)	Price cap: fixed costs (based on household size) + volumes used
Romania	Delegated public	ANRSC : Autoritatea Naţională de Reglementare în Domeniul Serviciilor de Gospodărie Comunală	Drinking water service: from 4.89 lei/m3 (0.99 €) to 7.17 lei/m3 (1.45 €) excluding VAT (**2017**) Sanitation service: 1.11 lei/m3 (0.22 €) to 6.27 lei/m3 (1.27 €) excluding VAT	Only volumetric Annual adjustment with inflation
Netherlands	Mixed: public and delegated private	ACR: Central and Regional Administration	Drinking water service: Waternet = €0.87/m3 excluding VAT (**2022**) Sanitation service: €656/year/inhabitants	fixed costs (based on household size) + volumes used
Germany	Delegated public	Absence of autonomous regulatory authorities for water services. The supply of drinking water and the disposal of waste water are regulated by the federal states.	Drinking water service: Berlin = €1.694/m3 excluding VAT (**2022**) Sanitation service: Berlin = €2.155/m3 excluding VAT	fixed costs (size of the water meter) + volumes used Sanitation: fixed + volumetric (fresh water withdrawn) + runoff fee depending on the land (land)
Spain	Private delegated	Absence of National Regulatory Agency. The MITECO (Ministry of Ecological Transition and Demographic Challenge) carries out political and administrative control	Average = €1.78/m3. (**2020**) Drinking water service: Catalonia = €1.14/m3; Barcelona (province): €1.181/m3 excluding VAT (**2019**) Sanitation service: Average = €0.56/m3 Catalonia: €0.72/m3 excluding VAT (2019)	fixed costs (invoicing of a minimum volume; according to the tariff category (residential, spa); diameter of the connection (for drinking water)) + volumes used
Latvia	Mixed: public and delegated private	PUC : Public Services Commission	In **2020**, the average tariff is €2.27/m3 (drinking water and sanitation service) Ranging from €1.46/m3 in Daugavpils to €3.07/m3 in Talsi In **2022**, the tariffs of SIA "Rīgas ūdes" are €1.20/m3 for the water supply service	fixed costs (depending on the rate of return) + volumes used (water meter)

			(excluding VAT), and €1.21/m3 for the tariff for sanitation services (excluding VAT). Or €2.41/m3 for combined services.	

3. ANALYSIS BY COUNTRY

3.1 Case of Ireland

Strengths	A national public operator with a quasi-monopoly: Irish Water (IW) allowing the sector to operate in a unified way and to operate on a large scale. The introduction of metered domestic water billing.
Weaknesses	Significant and continuous infrastructure deficits have to be addressed in order to meet basic performance standards: high leakage rates (today one of IW's priorities), large cities not respecting the treatment standards of the EU, supply interruptions and untreated wastewater discharges still present. Many users are still reluctant to IW and the restoration of the water bill
Opportunities	Investment in new technologies and renewable energies (mainly through the installation of solar panels and wind turbines) in order to maximize energy recovery and achieve savings. The introduction of the fee on the use of the water resource paid by the users beyond a fixed price makes it possible to initiate an incentive for the preservation of this resource, although the country is not in a situation of water stress. It will also contribute to IW's goal of being self-funded (no longer relying on general taxation).
Threats	The state is being chastised by major cities failing to meet EU treatment standards for its negligence in renewing water service infrastructure. Public water supplies are highly likely to face increasing demand pressures in the long term, due to anticipated economic and population growth and the impacts of climate change. We can also consider the question of double taxation. This is a politically sensitive topic in Ireland today, as most users view the introduction of water charges as a second charge on a service they already pay for through central taxation.

Table 1: Current status of small water cycle management in Ireland

3.1.1 Institutional organisation

Until 2015, legislation provided for the provision of water and sanitation services by local authorities, with domestic use financed by central taxation. Since 2015, the utility company, Irish Water (IW), has become responsible for the provision of water and sanitation services. 82% of Irish people get their drinking water from IW and approximately 65% have access to the sanitation service.

3.1.2 Pricing method

In Ireland there is a policy that domestic water, up to a certain limit, is paid for by the state (Department of Housing, Planning and Local Government) while non-domestic and 'excessive' uses are billed directly to the consumer. This decision stems from the report produced by an independent commission created to examine this very controversial issue of restoring water pricing.

Under the legislation, water consumption above the annual household allowance (213m3) is considered excessive consumption, and customers will be liable for excess usage charges on

the amount above this level. (IW, 2021) The CRU (Commission for Regulation of Utilities) report to the Minister (CRU/17/339) pointed out that the average household demand is 125 m3/year and that this figure includes excess users. It was then concluded between IW and the CRU that the annual household allowance would be set at 1.7 times the average annual household consumption of 125 m3.

Thus, for about 92% of Irish people, the water service is free and only uses that are 70% higher than average domestic consumption are taxed, with user consumption (households and individuals) being measured in m3.

In early 2019, IW submitted its proposal to the CRU (Commission for Regulation of Utilities) which then approved IW's excess usage fee proposal. The CRU thus approved:

- IW's procedure for billing customers with or without a meter.
- Housing with a meter: Apply a fixed charge for excess use of €1.85/m3 (per service). The combined volumetric fee will be €3.70 per m3.
- Housing without a meter: Set the combined ceiling for fees at €500, ie €250 per service.
- To bill customers without a meter according to the number of people per accommodation. (CRU, 2019)

When a water meter is installed by IW and the metered use justifies a load greater than the maximum load: the deductible threshold is 213,000 litres per year for a household of 1 to 4 people. Dwellings with more than 4 residents receive an additional "allowance amount" of 25,000 litres per year, above the threshold, for each additional person living there.

Volumetric excess usage charges are measured from the water meter installed in the home. For IW, the amount of wastewater discharged is assumed to be the same as the amount of water withdrawn from the distribution network. If the property is not metered and is suspected of excessive usage, IW may consider installing a meter or calculating user usage using alternative technology.

If excessive usage is detected, customers without a meter will be charged at the cap (currently set at €500 per year for water and sewerage services), unless a meter is installed. Metered households can view their usage by logging into their Irish Water online account.

The CRU Client Protection Principle states that measures should be considered to ensure that clients who exceed the annual child allowance are protected against unreasonably high charges. Accordingly, while the legislation did not specify a maximum royalty, IW proposed a cap on the maximum royalty:

Annual Maximum Overage Charges	€ per year
Maximum Water Supply Charges	250
Maximum wastewater load	250
Maximum Combined Load of Supply and Water and Wastewater	500

Table 2: Maximum annual overage charges (capped).

IW believes the proposed cap strikes the right balance between encouraging domestic water conservation while ensuring that customers are protected from unreasonably high charges.

In practice, the first excessive water use bills are unlikely to be issued until 2024. Indeed, Irish Water must follow a process that informs and warns the customer before applying a charge.

3.2 Case of Romania

Strengths	Romania is a unitary republic divided into 42 counties plus the municipality of Bucharest. Each county is subdivided into cities and towns, with a mayor and a local council, giving them greater administrative power over local affairs. The drinking water and sanitation services are distinct (different tariffs) and can therefore allow for more representative and adapted differentiated management.
Weaknesses	The major challenge for Romania is improving access to water and sanitation in rural areas (29% having access to piped water and 10% to flush toilets) The OECD has identified Romania as the country with the highest investment needs in the wastewater sector to ensure and maintain compliance between 2020 and 2030. It needs to increase its investments by around 180%.
Opportunities	Completing the regionalisation of water services could help improve the quality of and access to water and sanitation infrastructure for unserved populations, especially in rural areas. This has been designed and planned to overcome the excessive fragmentation of the sector and achieve economies of scale: improved technical capacity, optimisation of available resources, better planning of investments, etc. Many programs and subsidies have been put in place to enable water services to develop: Egis, BEI, EU cohesion policy, etc.
Threats	Water affordability is potentially an issue for the majority of the Romanian population, with the average share of potential water and sanitation expenditure amounting to more than 5% in 2015. Future investment efforts could exacerbate the affordability problem in the future. Current financial resources are limited compared to the need for high investment (need to prioritize these investments, optimize costs, etc.)

Table 3: Current status of small water cycle management in Romania

3.2.1 Institutional organisation

In Romania, the water management sector is in the process of regionalisation. This was designed and planned to help improve the quality of and access to water and sanitation infrastructure for unserved populations, particularly in rural areas, as well as to achieve economies of scale.

From an institutional point of view, regionalisation took place through the reorganisation of existing public services held by municipalities. Municipal utilities can delegate the management of their water and sanitation services to private operators or continue to set up and operate their local services. On the other hand, part of the inhabitants are in autonomous management (38%), the latter having their own wells, springs and watertight pits (the septic tank with spreading being prohibited in Romania (the authorities consider that the conditions are not met for on-site sanitation that properly protects groundwater).

The methodology for calculating and adjusting prices is established by a centralized regulatory authority (ANRSC) and prices and tariffs are based on the principle of full cost recovery, approved by government decision. In the case of delegated private management, contracts set specific formulas or requirements.

Romania's integration into the European Union is relatively recent (2007). This presents a centralized system at state level, in which the intermediate levels have little regulatory power over water services, whether they are the Development Regions (administrative and statistical level created in 1998 for the policy European structure), the Judete (departmental level relaying the central State and endowed with its own institutions since 1968). Municipalities, cities and towns remain the main decision-makers with a fairly high degree of autonomy.

The initial situation for drinking water supply and wastewater treatment was therefore limited to large urban centres, with the rest of the territory presenting very scattered settlements with little or even no wastewater treatment.

There is a gradual increase in the supply of drinking water, the collection and treatment of wastewater, but the country still has a significant number of wells and villages without drinking water or wastewater treatment services.

3.2.2 Pricing method

Tariffs represent more than half of the sector's funding sources. Water and sanitation services largely depend on national budget transfers and funds to finance their investments. Tariffs do not generate enough revenue to cover capital expenditures. More than 70% of capital expenditure is financed by EU funds and loans from international financial institutions (Cohesion Fund, EIB, European Regional Development Fund (ERDF)...).

Water and sanitation tariffs have increased significantly over the past decade. Between 2008 and 2013, average water and sanitation tariffs increased from €0.71 to €1.60 per m3, annual inflation was 5.4%. Tariffs should continue to increase due to the remaining path to reach 100% of the territory connected to the drinking water supply and sanitation network, and to finance the increase in investments and operating costs necessary to meet the requirements of the environmental acquis of the EU.

In Romania, the average price is one of the lowest in Europe; it is 6.22 lei/m3, or €1.33/m3, according to 2017 data from the National Agency for the Regulation of Water and Energy Services. It should be remembered that the price of water in Romania starts from very low levels for drinking water (0.28 €/m3 in 2003), in a system marked by dependence on subsidies; pricing and prices are then instruments of social policy and a lever against inflation.

3.3 Case of the Netherlands

Strengths	By using established indicators for the technical operational efficiency of water utilities, Dutch water companies are efficient. For example, leakage losses are less than 6% (this figure being among the lowest in the world). Drinking water and sanitation services are distinct (different tariffs) and can therefore allow for more representative and adapted differentiated management. The OECD has noted the stability of funding for water policy in the Netherlands. The country does not seem to be confronted with any fundamental problem in terms of financing capacity. Current prices are relatively modest and there is some leeway before price levels generate critical affordability issues.
Weaknesses	Very variable tariffs which can be explained, in part, by a fee for the protection of the environment and the maintenance of the dykes.
Opportunities	Drinking water companies continue to look for opportunities to save energy, such as deploying energy-efficient plants and optimizing water pressure (For example: installing floating solar panels in the water from the Les Evides basins, etc.)
Threats	The increase in the quantity of undesirable substances in drinking water sources entails a treatment effort for drinking water services and an increase in costs associated with energy demand (in particular the need for more sophisticated equipment, etc.) In addition, water policies must adapt to changing conditions so that the Netherlands is able to cope with new risks from rising sea levels and rivers. and worsening pollution.

Table 4: Current status of small water cycle management in the Netherlands

3.3.1 Institutional organisation

The Netherlands has an abundance of water resources, however it is necessary to take into account its fragility due to the presence of shallow aquifers, the proximity of salty sea water and the many problems of agricultural and industrial pollution. .

The overall water policy is defined by the government; and the provinces are responsible for its implementation. Moreover, although the 15 companies in charge of the transport, treatment and distribution of water are private, their shareholders are the local and provincial authorities. Consequently, the Dutch present their water management model as an alternative to the French models of delegated management and the British models of management by the private sector with the presence of an independent public body responsible for regulation.

66% of Dutch drinking water comes from groundwater, mainly in the eastern part of the Netherlands. The remaining 40% comes from surface water. 96% of water users are metered and part of their bill, usually around half, is based on actual consumption.

3.3.2 Pricing method

The water boards have the power to levy taxes and to finance their activities mainly with the receipts from these taxes: a charge for the protection against floods, a charge for the

management of water resources (installation and treatment) and a water pollution charge for wastewater treatment.

In the Netherlands, drinking water is paid for by the volume of water consumed by users. The prices per m3 of drinking water vary according to the regions and, therefore, according to the companies, and include a part which concerns the distribution of drinking water and a part for the collection and treatment of waste water.

Wastewater collection is paid to the municipalities via property and housing taxes (from the WOZ: Property Valuation, therefore according to the property value; the most modest families are exempt) and to the waterboards (Office des Eaux) which ensure the management of canals and rivers and protection against flooding. There is a separate sewage system in the new parts of Amsterdam. This means that rainwater is collected separately from sewage and goes directly into a river, canal or pond (surface water).

The scale includes a special rate for single people and a general rate for a family, based on an assumption of three people, regardless of the actual size of this family.

The average price of drinking water service for consumption in 2020 is €1.61 compared to €1.59 in 2019 (+1.6%).

The drinking water bill for an average household in 2020 (consumption 104.9 m3/year) amounts to €191, compared to €182 in 2019 (based on 101.6 m3/year). Similarly, the annual bill excluding tax on tap water and VAT for an average household went from €132 to €139.

Over the past decade, the price has gone from €1.68/m3 in 2010 to €1.82/m3 in 2020 (+8.5%). Excluding taxes, the price rose from €1.27/m3 to €1.29/m3 (+1.6%).

Municipalities calculate the sewerage charge in different ways: some determine the sewerage charge according to the value of the house while others are based on the consumption of drinking water.

- Example of Waternet : Water company of Amsterdam and its surroundings. It is the only water company in the Netherlands that is dedicated to the entire cycle.

If the home is equipped with a water meter, the user pays for his actual water consumption. In 2022, he pays €0.87/m3, 4 cents more than in 2021. Similarly, the fixed amount on the bill has increased by €6.90/month to stand at €82.82/year in 2022 for a household of two people and an average use of 100m3. This amount is similar to a fee for access to water and is used for the maintenance of water pipes.

Fixed costs	**6,90 €**
Water consumption	7,25 €
Tap water tax	2,99 €
9%VAT	1,54 €
Total, per month	18,69 €
Quarterly	56,06 €

Table 5: Breakdown of average monthly tap water costs per 100 m3 of water use in the Netherlands. (waternet, 2022)

If the accommodation is not equipped with a water meter, the user pays a fixed fee for tap water. This makes it possible to maintain the water pipes (maintenance). The user also pays for the number of 'units' of his home as explained below.

The second part of the tariff: per "unit", is similar to a property approach: If the user has a large house with many large rooms (bathroom, large garden, etc.), he has more units and therefore pays more . If he owns a small house without a garden, he will have fewer units and pay less.

The user can determine the units of his home. The following areas count as 1 unit: each room over 6 m², kitchen, bath, garage or garden over 65 m². Rooms over 30 m² count as 2 units. The sum of all units is the total number of units in the dwelling (house and apartment).

Units	Tap water tax (per year)
1	8,26 €
2	12,92 €
3	26,93 €
4	36,26 €
5	45,59 €
6	54,93 €
7	64,26 €
8	73,60 €
9	82,93 €

Table 6: Tarifs 2022

Example: The user lives in an apartment with 3 bedrooms, a kitchen and a bathroom. Each room is over 6 m². The accommodation is made up of the following units:
• 3 rooms of more than 6 m²: 3 units
• 1 kitchen: 1 unit
• 1 bath: 1 unit
Total: 5 units

3.4 Case of Germany

Strengths	Cost recovery levels are close to or above 100%. Recalibration every 6 years for cold water meters and every 5 years for hot water meters allows a reduction in measurement errors (improved performance in safety, quality, customer service, durability and economic efficiency).
Weaknesses	The main problem identified by the European Commission is that certain sectors (agriculture or water abstraction for cooling purposes) in certain Länder are exempted from the water abstraction charge, which limits the revenue of the services. Infrastructure spending is expected to increase again significantly in many regions in the coming years to meet the needs of the population.
Opportunities	In the mostly sparsely populated eastern German states, systems have been built but cannot be operated economically and impose high fees and charges on consumers. It could be relevant for the country to think about a new organisation of services: with the establishment of decentralized, less expensive and more efficient systems for the treatment (in particular of wastewater) compared to the current central processes with kilometres of collectors main.
Threats	Due to population decline, systems designed for growing consumption are increasingly underutilized and in some cases have already fallen below functional thresholds. This phenomenon is particularly present in the new federal states observed where structurally weak regions are affected by strong emigration movements. The problem is exacerbated in particular by changing consumer behaviour ("saving water") and more efficient household technologies. Climate change puts sewerage or rainwater drainage systems under increased stress due to increased periods of heavy rainfall. On the other hand, longer periods of drought lead to bottlenecks in the regional water supply.

Table 7: Current status of small water cycle management in Germany

3.4.1 Institutional organisation

In Germany, public drinking water supply and waste water disposal are the responsibility of the municipalities. In the dynamics of the distribution of powers that characterizes the Federal Republic, it is indeed the municipalities that have administrative sovereignty concerning the organisation of public service activities on their territory. The federal state (Bund) and the Länder have extensive legislative powers: they implement on their territory (therefore transcribe into regional law) the framework legislation of the Bund on water (Wasserhaushaltsgesetz). The German water market is therefore characterized by a great diversity of institutional players and a great variety of structures. (Zeller, 2006)

Despite the prognosis of increased water consumption, consumption actually went from 145 litres/person/d in 1990 to 121 litres/person/in 2010. In the same period, water withdrawal decreased by 26%, corresponding to a reduction of 1.75 billion m3.

3.4.2 Pricing method

In Germany, all charges and levies must be calculated on a cost-recovery basis. The environmental costs of residual emissions from sanitation services are covered by the

wastewater charge, which essentially corresponds to the quantity and the dangerousness of the polluting emissions (measured or admitted).

There are big differences in the amount of the bill between regions. In Essen, a one-person household pays €256/year. In the neighbouring town of Bochum, the same amount of water costs half as much.

The drinking water supply tariff is made up of a basic tariff and a quantitative tariff. The basic tariff is charged for the supply of the water supply system (pumping stations, pipelines, etc.) and the water meter. This is calculated per day and depends on the size of the main water meter (QN/Q3: Qn = nominal flow in m3/h and Q3 = constant flow in m3/h) as well as the annual water consumption. The following applies: The larger the water meter, the higher the base tariff.

The quantitative tariff is calculated per cubic meter on the basis of drinking water consumption. In Berlin, the quantitative tariff is €1.694/m3 (net)/ €1.813/m3 (gross)*. (Wasserbetriebe, s.d.)

Sanitation tariffs include charges for the disposal of waste water (sewage and rainwater) as well as the disposal of faecal water and faecal sludge.

- **Wastewater:** In Germany, municipal laws govern the calculation of charges for the supply of drinking water and the treatment of wastewater when provided by a public entity. Private water service providers in Germany can also set prices according to their own guidelines in order to recover costs.

Wastewater is billed with a base rate based on the volume of drinking water drawn and a quantitative rate based on the quantity of water drawn. For the municipal water company Berliner Wasserbetriebe (BWB), the quantitative tariff has been €2.155/m3 since 01/01/2022.

- **Rainwater:** Since 01/01/2022, the fee is €1.809/m2 of drained surface for BWB. This fee applies both to combined sanitation systems and to the separate management of rainwater and waste water.

It is part of the split sewerage charge: separate collection of charges for waste water and rainwater.

The rainwater charge is calculated based on the size of the paved area and the waterproof area of a property. Many municipalities use aerial photographs to determine the proportion of these areas on properties and then calculate the fee. As a general rule, between 0.70 and 1.90 €/m2 are charged. For an average single-family house, this amounts to around 150 to 200 euros in rainwater fees per year in most municipalities in Germany.

However, each municipality in Germany has its own ordinance on rainwater charges. This means that it is different in each municipality and that it is also calculated differently: the factor associated with the paved area differs per municipality. Because the municipalities

not only differentiate the base price per square meter, but also the possible areas, their requirements and their discounts. (KRUTZSCH, 2021)

In 2018, the rainwater fee in Berlin was €1.840/m2 while in Frankfurt the same year the rate was €0.50/m2.

In order to take into account floor coverings through which part of the rainwater infiltrates into the water table and not all of it into the sewerage network, the runoff coefficient has been defined: $\Psi = A_O/N$ (actual precipitation/total precipitation).

A partial or even total exemption from the storm tax is possible when implementing decentralized storm water management measures.

- **Wastewater** from watertight pits: Invoiced €2.045/m3 since 01/01/2022 for the evacuation of waste water from collection pits (watertight pits). In addition, there is an individual charge for transportation.
- **Sewage sludge:** Invoiced €11.361/m3 since 01/01/2022 for the disposal of sewage sludge from small wastewater treatment plants, in addition to an individual charge for transport.

Water meter size up to QN	Water meter size up to Q_3 **	Annual consumption in m^3	Net drinking water tariff/day *	Gross drinking water rate/day *	Gross wastewater rate/day*
2,5	4	0 – 100 m^3	0,045 €	0,048 €	0,045 €
		101 – 200m3	0,060 €	0,064 €	0,060 €
		201 – 400 m^3	0,099 €	0,106 €	0,099 €
		401 – 1000 m^3	0,198 €	0,212 €	0,198 €
		from 1001 m^3	0,300 €	0,321 €	0,300 €
6	10	0 – 400 m^3	0,480 €	0,514 €	0,480 €
		de 401 m^3	0,720 €	0,770 €	0,720 €
10	16	-	1,200 €	1,284 €	1,200 €
15	25	-	1,800 €	1,926 €	1,800 €
40	63	-	4,800 €	5,136 €	4,800 €
60	100	-	7,200 €	7,704 €	4,800 €
150	250	-	18,000 €	19,260 €	4,800 €

Table 8: Base tariffs for the drinking water charge depending on meter size for BWB (in Berlin) in 2022. (Net tariff excluding VAT; Gross tariff including VAT).Source : (Wasserbetriebe, s.d.)

QN – nominal flow in m^3/h ; Q 3 – constant flow in m^3/h
* The water tariff is subject to VAT according to the reduced rate for food (7%).
** Emptying prices are not subject to VAT.

3.5 Case of Spain

Strengths	Tariff revisions are generally carried out annually, which allows regular monitoring of changes in the costs and tariffs of water services. The tariffs are calculated on a progressive scale to better take into account the objectives of protecting the resource and providing everyone with a quota of drinking water at a reduced price. Tariffs can be adapted according to seasonality in order to encourage saving this resource in periods of drought.
Weaknesses	The absence of a National Regulatory Agency hinders the development of a regulatory framework for water service policy. The country has unequal drinking water coverage and variable quality of service. Spain needs to correct the past lack of investment in water infrastructure, with a very low renewal rate. Problems with financing urban water services are encountered in less populated municipalities
Opportunities	The trend is moving in the direction of desalination: Spain is the fifth country in number of desalination plants in the world with a total of 900 plants, (for example, the Las Carboneras desalination plant in Almería, the facility from San Pedro de Pinatar to Murcia, etc.) In total, these plants have a capacity of 1.45 million cubic meters per day. In addition to environmental taxes, the country may introduce in exceptional cases and during drought years, a drought charge applied to the water bill to deter high levels of water consumption.
Threats	According to the OECD, Spain should increase its investments by around 50%. The drought already present will be exacerbated and will undoubtedly lead to greater water shortage problems. In this context, desalination and the reuse of treated wastewater will probably become widespread and therefore lead to an increase in investments for the development of these sectors, leading to an increase in production costs and therefore in prices.

Table 9: Current status of small water cycle management in Spain

3.5.1 Institutional organisation

According to Spanish water legislation, each municipality in the country is competent to provide water services in its area of jurisdiction. In carrying out this responsibility, municipalities can choose either to provide these services on their own or integrate public communities called local water entities (entidad local del agua) in order to provide water services. in a larger area.

In Spain, there is no National Regulatory Agency. Consequently, the Spanish regulatory framework is less developed than in other countries. This implies political and administrative control by each municipality. Prices are collected by the Comisiones de Precios (Price Commissions) of each Autonomous Region. The Ministry of Ecological Transition is the national water resources management authority.

3.5.2 Pricing method

Water financing is complex in Spain, where each stage of the water cycle (capture, distribution, treatment, planning) is managed by a separate entity, which could lead to a loss of efficiency and a lack of transparency. . The prices are not the same from one autonomous community to another.

In 2013, the unit cost was €2.73/m3 in Murcia, compared to €1 in Castile and Leon, while daily consumption per inhabitant by individuals reached, in 2013, 130 litres per person, down 3.7% compared to 2012 when the average price per cubic meter was €1.83.

In this area, the OECD argues that per capita household consumption, which is already one of the highest in Europe, could continue to grow if prices do not rise, and stresses that urban consumption has been slower in areas where prices increased the most.

Generally, a two-part tariff system has been imposed, with a fixed connection charge and a variable or volumetric consumption charge. These fees are already included in the water tariffs.

The sewerage tariff is collected on behalf of the respective municipalities and is usually linked to water consumption, although one can find tariffs where the basis of calculation is, for example, the cadastral value. Just like the drinking water tariff structure, that of sanitation is based on a fixed part as well as a volumetric part.

The variable charge is based on the volume of water consumed by each household (in cubic meters). Additionally, most cities use an increasing block tariff (IBT) model to design their volumetric water load, with the amount increasing according to the consumption band. Nevertheless, the structure of the IBT differs considerably from one city to another:

city	Billing period	Type of tariff	Number of blocks	Size of the 1st block (m3/month	Size of last block (m3/month)	Price of the 1st block (€/m3)	Price of the last block (€/m3)
Alicante	Quarterly	IBT	4	4,00	21,00	0,01	2,56
Barcelone	Monthly	IBT	5	7,00	18,00	0,61	3,04
Bilbao	Quarterly	IBT	3	8,33	25,00	0,57	3,04
Cordoue	Fortnightly	IBT	3	9,00	18,00	0,79	1,25
Madrid	Fortnightly	IBT	3	12,50	25,00	0,13	0,50
Séville	Monthly	IBT	3	4,00	5,00	0,50	1,61
Valence	Fortnightly	IBT	2	6,00	6,00	0,47	0,55
Valladolid	Quarterly	IBT	5	5,33	15,00	0,27	0,66
Zaragoza	Quarterly	IBT	3	6,00	18,48	0,21	1,26

Table 10: Water tariff structure for some major cities in Spain: volumetric charges. From (Fernando Arbués, 2021)

3.6 Case of Latvia

Strengths	A normative framework developed for setting the prices of drinking water and sanitation services. Despite gaps in water supply coverage, Latvia performs above average in wastewater treatment compliance.
Weaknesses	affordability is an issue in rural areas which also have lower access to safe drinking water, especially quality drinking water and sustainable sanitation services The aging infrastructure built during the Soviet period (more than 30 years ago), is one of the main challenges in complying with the ERU Directive. This situation contributes in particular to the increase of risks for human health. The country is still faced with frequent leaks, infiltrations and breaks in supply and distribution infrastructure.
Opportunities	Direct loans from international financial institutions such as the EIB allow water service infrastructure to initiate modernisation works and repair faulty systems.
Threats	The significant demographic decline leads Latvia to prioritize its actions on the renewal of facilities as well as on the problem of connection and affordability in rural areas. This situation is likely to worsen in view of the increase in tariffs, in accordance with this need for investment and also the increase in the prices of other resources: gas, electricity.

Table 11: Current status of small water cycle management in Latvia

3.6.1 Institutional organisation

Water management in Latvia is composed of two levels: central management and local management.

The central government is responsible for the protection and development of water resources, the formulation and implementation of the national water policy and the national macro-management of water resources.

The local government is responsible for the supervision and management of drinking water and wastewater treatment services. These competences are enshrined in the Latvian Law on Local Governments. According to this Law, local authorities have in particular the obligation to manage the following public services: the organisation of services related to water supply and sanitation, heating, collection and dumping of household waste, etc.

The current model of water management in Latvia is characterized by a large number of drinking water supply and sewage treatment services, which are very different in size and stage of development.

This situation is due to the strong decentralisation, passing from a strongly centralized management controlled by the Soviet Governance to the current situation with public services. Often, these services are not able to meet the water supply and sanitation needs of municipalities, to provide all users with optimal services and reduce risks to human health.

An administrative territory can have several water management service providers. The local government is responsible for providing water management services in its administrative

territory directly or by delegation to private, public or mixed services. The local government, when concluding a contract, then delegates a public service provider to provide water management services in a specific territory.

3.6.2 Pricing method

The tariffs for water management services are determined in such a way that the payments made by the users of the services cover the costs of providing the public service and guarantee the financial profitability of the provision of the public service (approaching the notion of profitability ratio). Tariffs are set for water supply services and sewerage services.

According to the Methodology, the tariffs approved by the regulator should only contain the technologically and economically justified costs (following an analysis), which are necessary for the efficient provision of the relevant water management services. Since only costs related to the provision of services can be referenced, water management tariffs are considered to reflect costs.

In addition, since water management tariffs must cover all referable costs, the principle of cost recovery is also in force.

Fares differ by locality, and these differences are determined by:

- the conditions for the provision of services,
- the technological solutions chosen for the water supply system,
- the compactness of the water supply system and its technical condition, as well as
- geographic, demographic, etc. conditions.
- Characteristics of each agglomeration (relief, construction, number of users, density, etc.).

4. ANALYSIS OF RESULTS

As a reminder, the objective of this study is to achieve a European synthesis of political frameworks and their implementation in some EU countries for the management of the small water cycle. This is to identify examples that could be used in the current context of Limoges.

This analysis should make it possible to highlight the models likely to be adopted in the context of Limoges.

Limoges Métropole is faced with the problem of reducing the m3 of water consumed per inhabitant, leading to a drop in income. This situation may constitute a risk for the sustainability of the service (maintenance work, distribution, etc.) and requires a response from the Métropole de Limoges.

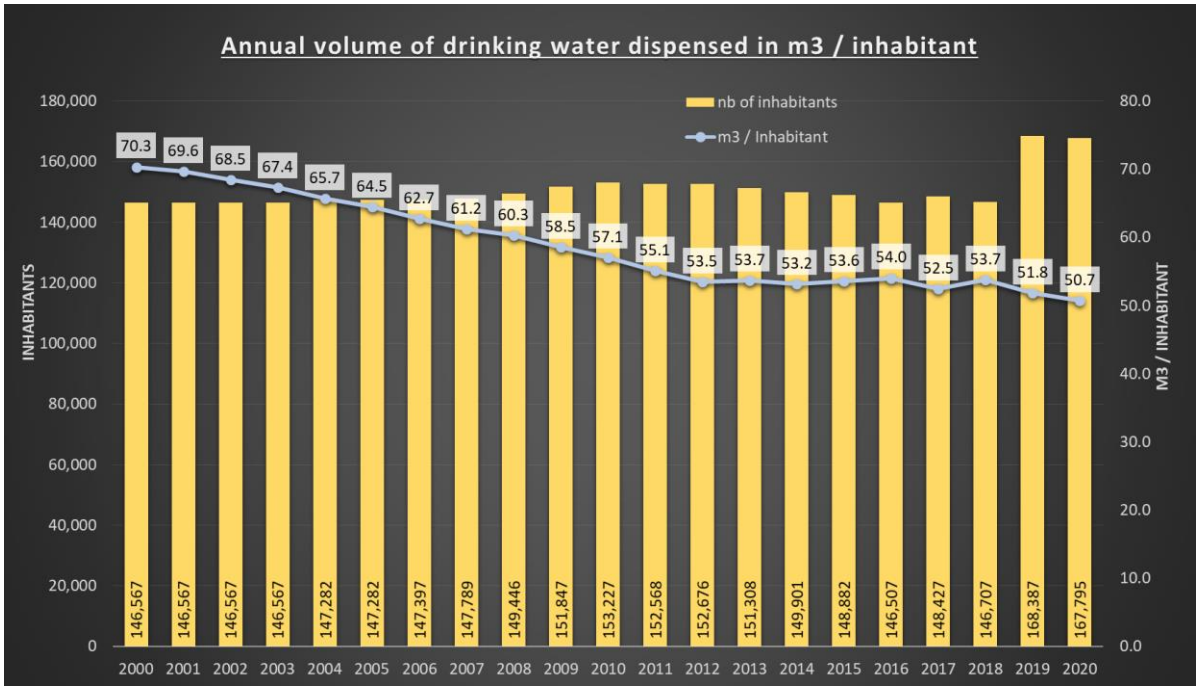

Figure 1: Evolution of water consumption in Limoges Métropole in 20 years

The graph above illustrates the evolution of the volumes of drinking water distributed on the territory of the Metropolis (146,000 inhabitants). There was a very significant drop until 2013 (-24% over 2000-2013) but which has continued since (-4% from 2013 to 2020), despite an extension of the number of inhabitants covered by the service.

The paradox is that the involvement of households and businesses in reducing water consumption leads to an increase in the price of water, which means that their budget devoted to water does not drop significantly. A virtuous attitude is sanctioned by an increase in the price of water. The increase in the price of water is also leading some water services to set up social assistance schemes for the payment of bills for households with too low incomes.

4.1 Lessons learnt by country

First of all, the study of **Ireland** may lead to questioning the interest of a more progressive type of pricing, with the establishment of a “minimum volume”.
As mentioned during the exploration of this country, this type of pricing corresponds on the one hand to replacing the usual water pricing, linear pricing at a constant price per m3 whatever the consumption, by a progressive pricing where the price of m3, variable according to the consumption bracket, increases according to the latter. On the other hand, offering a first tranche at a reduced rate also makes it possible to achieve a social dimension with better consideration for people with a lower income. The higher tariff of the last tranches is used to compensate for the lower tariff of the first.
With this pricing method, users consuming a reasonable share of the water resource would not be charged more. On the other hand, this mode of pricing would make it possible to charge more for higher consumption and thus slow it down (swimming pools, etc.).
The implementation of this progressive pricing presents a difficulty related to the complexity of defining the most appropriate consumption/price brackets in knowledge of the local context. This pricing method includes a first tranche at a reduced price ("social" tranche), often corresponding to a number of m3 estimated to be either necessary or essential to meet the basic needs of a person or a household (hence a first difficulty for its determination according to what is taken into consideration) ...

However and in accordance with French legislation (Water Law (in FR)1992) this mode of pricing cannot be implemented in the situation of Limoges Métropole. The law authorizing, on an exceptional basis, the prefect to implement pricing that does not include a term directly proportional to the total volume consumed, only if the water resource is naturally abundant and if the number of users connected to the network is low enough, or if the municipality usually experiences large variations in its population.

The introduction of this pricing model in the case of Limoges Métropole will therefore require an addition / modification of the legislation, or prefectural intervention.

Romania has a fairly strong dependence on national and European funds. The country has, despite increasing billing, operating prices for water services that cannot be guaranteed. Moreover, if the institutional organisation for water has been partially modelled on the French organisation, municipalities and individuals retain a fairly large autonomy for their choices of management of the small water cycle. For example, there is no general obligation to connect to the networks when they are installed. Similarly, non-collective sanitation is de facto prohibited throughout the territory, while rural housing and many small villages exist, the only possibility of individual or collective management of wastewater being the sealed pit which must be emptied very often. The central State has therefore chosen to connect all inhabited areas to the sewers, which in practice proves to be inapplicable. Very recent work

undertaken in particular by the World Bank has led to a review of these choices in an attempt to have non-collective sanitation accepted and to prioritize investments in the most important dense residential areas.

The recent nature of the development of drinking water and sanitation services means that many rural areas are not yet connected to a drinking water network or a sanitation system. In addition, some users prefer to maintain a system of private wells and springs rather than paying for water services. It should be remembered that the price of water in Romania starts from a very low level for drinking water, in a system marked by dependence on subsidies; pricing and prices are then instruments of social policy and a lever against inflation.

The presence of a national agency in Romania, intervening to set a framework for the price of local water services, makes the sector relatively administered and limits the room for manoeuvre of actors involved in local services. The lack of obligation for the housing units served to connect to the system is a very significant obstacle to the development and budgetary balancing of services. The country will probably have to remedy this problem to continue the development of its water services.

It is probably necessary to give Romania time to continue building the cooperation between municipalities in progress, in order to be able to assess the evolution of its pricing system. Nevertheless, local political capacity is hampered by internal fragmentation and corruption problems (with difficulty of development in rural areas coupled with incomplete decentralisation, making the situation more complex).

Moreover, the desire to pool resources and means carried out in Romania, which can be ensured by an inter municipal union with a single vocation, cannot really be considered as a model for Limoges. The Metropolis has already expanded its area, in particular with the aim of increasing its number of users and thus optimizing the costs and income collected by its drinking water and sanitation service.

In the case of **the Netherlands**, it has an abundance of water resources but weaknesses due to the presence of shallow groundwater, the proximity of salty seawater and the many problems of agricultural and industrial pollution. .

If the home is equipped with a water meter (i.e. 96% of homes), the user will pay for his actual water consumption. In this country, drinking water is paid for by the volume of water consumed (m3) but this comes in addition to a very large fixed part (impacting more than two thirds of the total billing). Independent of consumption, this last part represents more the price of access to drinking water. It therefore makes it possible to finance investments, salaries and maintenance of the water network.

The scale includes a special rate for single people and a general rate for a family, based on an assumption of three people, regardless of the actual size of this family. This system is therefore favourable to modest households and large families.

The Netherlands has different taxes that help cover maintenance costs and take into account many factors:

The tax on water treatment takes into account the number of residents with a tariff for one resident and a second for homes with at least two residents; The tap tax and is calculated either according to consumption (per m3) or with land value (unit).

Taking these parameters into account for setting prices could be an avenue for Limoges Métropole.

In Germany, the water sector is undergoing a constant modernisation process. It is essential for the country to maintain and refine high standards and ensure adequate pricing for customers. Compared to many other countries, Germany has very strict calibration laws regarding the recalibration of water meters. : Every 6 years for cold water meters and every 5 years for hot water meters. It is not possible to recalibrate a meter when it is installed, for this reason water meters in Germany are always exchanged for new meters after the period of permitted use has expired. If a lessor does not comply with the calibration obligation, a heavy fine can also be applied: according to the specifications of the "Eichgesetz" (: the calibration law), fines of up to €10,000 can be imposed. As a result, utilities have improved their performance in safety, quality, customer service, sustainability and economic efficiency.
The operation of drinking water pricing distinguishes between a small fixed part linked to the meter (which cannot cover investments) and a part linked to consumption. Indeed, the drinking water supply tariff consists of a basic tariff calculated per day and depending on the size of the main water meter as well as the additional annual water consumption in certain cases. The larger the water meter, the higher the base tariff. The quantitative tariff is calculated per cubic meter of drinking water consumed.
Residential water consumption in Germany has changed significantly over time. While forecasts made in the 1970s predicted an increase in per capita water consumption to over 200 liters per day, actual consumption between 1991 and 2004 actually decreased by around 13%. This led to oversizing the facilities in anticipation of these changes. The average daily water consumption per capita in Germany in 2004 is 126 l, but the water consumption in the new states is only 93 l compared to 132 l in the old states.
On the one hand, the country is indeed faced with a fall in consumption linked both to the demographic decline and to that of income, which leads to the distribution of fixed costs among fewer consumers, and therefore to increase their bill again. .
On the other hand, the increase in fixed costs linked to the overcapacity of the networks which lead to direct and indirect costs, also contributes to the increase in tariffs.
In response to this situation, the question arises as to whether Germany is facing a real system change in urban collective action (urban planning, planning, management and urban policies). Also, some investors expressly ask for the possibility of setting up their own water distribution and sanitation systems before building in a municipality; perhaps for ecological

reasons, but above all because of the high cost of connection to the central network. It is also a question of turning more and more willingly to decentralized, semi-collective and/or autonomous systems.

Germany presents a situation similar to that of Limoges Métropole. Since German regulations require water and wastewater prices to be set in such a way as to cover full costs, the country is responding to this situation with a slight increase in tariffs for drinking water and sanitation services. .

The country has strict rules for measuring drinking water consumption. Distribution companies must adapt the size of the meter to the average consumption. To put it simply, there are big water meters for big houses and, accordingly, small meters for small houses. The price will change according to the size of the meter: larger ones will lead to a higher price. This model can be a line of thought for Limoges, in order to adapt its equipment and prices to the type of accommodation.

In Spain, the decentralized nature of the water sector results in a complex regulatory and operational structure and processes. This low level of centralisation combined with the existence of different models of administration and management of the water cycle provides a framework where responsibilities are shared between several public and private actors operating at different spatial scales.

Like the water service, tariff regulation is a variable factor depending on the municipalities and the services. In this regard, the Tariffs Commission (an entity depending on the Autonomous Communities) and the administration of the municipality are generally responsible for authorizing the tariffs of the main water services in a locality. In some cases, only one of the two entities makes the decision.

Generally, a two-part tariff system has been imposed, with a fixed connection charge in order to be able to guarantee the sustainability of services and a variable/volumetric consumption charge based on the volume of water consumed (with an increasing block tariff (IBT)).

The criteria used to regulate the water sector are shaped by the political strategies of municipalities, but also by the interventions and interests of higher levels of government, river basin authorities, water agencies, utilities and, finally, of the European Union. This large number of structures is likely to hinder communication and lead to sub-optimal levels of cooperation between the various actors involved.

In addition, the wide range of prices for water resources across the country makes it difficult to comply with European legislation on water pricing and cost recovery.

In addition to the increasing block pricing implemented in and which cannot be adapted to the Limoges context (as explained in the case of Ireland), Spain establishes special rates according to the associated use (domestic or commercial) as well as according to other parameters such as seasonality, water being more expensive in summer in order to encourage saving of this resource.

If pricing by use is not possible in France, a seasonal tariff could be a line of thought for the case of Limoges Métropole.

Finally, in Latvia, the current water management model is characterized by a large number of drinking water supply services and wastewater treatment services, which are very different in size and stage of development.

This situation is due to the strong decentralisation, going from a strongly centralized management controlled by the Soviet Governance to the current situation with local public services. Often, these services are not able to meet the water supply and sanitation needs of the communes. The latter do not allow a connection to all users and may present failures in the development of their infrastructures (insufficient treatment, aging installations). The services therefore encounter difficulties in offering all users optimal services and reducing the risks to human health.

The tariffs for water management services are determined in such a way that the tariff payments made by the users of the services cover the costs of the provision of the public service and guarantee the profitability of the provision of the public service. Currently, in the most urgent cases, water companies repair faulty parts of the systems using revenue from tariffs, however, these revenues alone cannot ensure qualitative and sustainable operation of the systems in the long term.

The price of water is defined with a monthly volumetric tariff, the bill being paid on the basis of the water meter reading of the previous month. The owners of the dwelling house must take the readings of the meters installed in the apartment, non-residential premises, and deliver them to the manager determining the tariffs. The deadlines as well as the procedure to be followed are determined by the amendments to the regulations of the Cabinet of Ministers approved at the April 21 meeting of the Cabinet of Ministers. 524 "The procedure for determining, calculating and accounting for the payable share of each owner of a dwelling house for the services necessary for the maintenance of the dwelling house".

Moreover, with the demographic decline (mainly due to strong emigration), the country will have to find pragmatic solutions to provide the necessary services at the right price: choices will have to be made for maintaining, extending or abandoning drinking water and sanitation networks: better sanitary control of wells used for drinking water and individual sanitation systems, etc.

The Latvian pricing system is similar to the French system: a service tariff comprising a fixed part as well as a variable (volumetric) part. On the other hand, the sanitation tariff takes into account the quantity of wastewater collected from users. In Riga, the amount of wastewater flowing into the sewage system is determined by the amount of water taken from the city water supply, based on the readings of water consumption meters, as well than by wastewater accounting systems. If there are no water consumption meters or wastewater metering devices, the amount of wastewater is determined according to the current water consumption standards and the information provided by the Customer, but not longer than the time specified in the contract. The provisions are grouped in local regulatory act No. 39 "Regulations for the operation, use and protection of water supply and sewerage networks and structures in Riga".

Measuring the quantity of wastewater produced rather than estimating it can be a lead for the context of Limoges.

4.2 Conclusion for Limoges

From these results, different models identified in the European countries surveyed are likely to be reproduced in the French institutional framework. They represent ways of responding to the problem of Limoges Métropole, by allowing the collection of income to ensure the operation and renewal of the infrastructures of the Métropole, in a context of falling consumption:

The introduction of a **stormwater charge**:
This is runoff water that is discharged from built-up or paved land (driveways, terraces, courtyards, paths or parking spaces on users' property) into the public sewer system. In the case of green roofs or grass paving, the fee could be reduced on request. This method will allow the dissociation in the sanitation of the rainwater part.

As France does not have a budget and funding for rainwater, each community must therefore manage this issue without a dedicated budget (this is most often financed from the general budget of the municipality). In this proposal, the idea is to make all those who send rainwater to the network contribute in order to provide an additional source of income. For Limoges, the calculation of the built-up area can be done relatively easily using mapping software. Thereafter, it is possible to take inspiration from the calculation formula used in the Netherlands to define the tariff corresponding to the land area. Also, an adaptation of this calculation formula can be considered for vegetated surfaces or with different absorption of rainwater from built surfaces (as mentioned above). The number of residents in one of the dwellings and/or the surface of the latter, which can be obtained from the mandatory declarations and with the possible additional surveys (mail, surveys, etc.).

The introduction of a **seasonal tariff**, as used in Spain, during the summer period, for example from June 1 to September 30, with the aim of encouraging the rational use of water during the summer months , when supply costs increase due to lack of rain, and which, moreover, are generally accompanied by an increase in consumption. This model would require two additional prospecting for the meter reading: at the beginning as well as at the end of the tariff change. It would therefore require a financial and/or human effort: with the installation of a communicating meter in order to facilitate readings and monitoring of water consumption by users (therefore increasing OPEX and CAPEX costs). Or, the hiring of new employees/temporaries to carry out additional readings over the period determined by Limoges Métropole.

In the same logic, the tariff can take the form of an **additional cost activated after use deemed "abusive"** (waste). Then, the seasonal tariff could be activated automatically during the desired period, when the volume withdrawn exceeds the authorized threshold (30 m3/month, etc.), this variable and staggered according to the observed consumption. However, this pricing method would require a more regular meter reading than that currently in place (once or twice a year). It could be envisaged to implement this model only during periods of water stress (during the summer period such as the drought fee). However,

a similar problem would be encountered with the need either to replace the current meters with communicating meters, or to increase the number of readers for the desired period. Also, we can consider applying this tax according to uses deemed "abusive", especially for swimming pools. These must be declared (for those buried), an additional cost could also be considered for their use in the summer period. On the other hand, users with above-ground pools, which are more widespread, could hardly be located and billed.

Taking into account the **land value of a dwelling**, as developed in the Netherlands. The price would then depend on the "composition" of the dwelling: surface area, presence of a bath and/or shower, number of toilets, etc. This model would require the determination and characterisation of the unit values for the different components of a dwelling as well as the costs associated with the number of units. Here too, it is possible to rely on the costs determined in the Netherlands. Information relating to property value can also be obtained after a prospecting stage (declared for property tax, surveys, etc.). This type of pricing therefore requires a significant research step.

The determination of the tariff can also be based on the **size/type of meter** installed in a dwelling to develop a tariff for access to the service. As in Germany, larger meters corresponding to higher consumption will lead to higher costs. This pricing model may therefore differ, in particular for buildings and collective housing, the latter having larger meters. This pricing model would not require the installation of additional meters (provided that the meters in place are already representative of the volume consumed for the different dwellings). Rather, the costs directly associated with the characteristics of the meters in place should be defined.

The **size of the household** can also influence the water bill. The establishment of a fixed cost (fixed tax) being the same for each subscriber and independent of the actual water consumption. This cost would be based on the number of members of the family and domiciled in the accommodation with a reduction based on this number. The tax can for example be €100, with a reduction of €20 for each family member domiciled: larger families would then be advantaged with a possible exemption in the event of large families (a more "social" tax). This method of pricing would require an effort to research information relating to the size of the household and not financial.

Finally, the implementation **of fixed prices and/or fees** for various services provided on the networks: opening/closing of meters; modifying, moving or deleting a connection; meter rental…

However, in each case, the advantages and disadvantages of the solution(s) adopted must be considered: a higher tariff for a larger meter on a building, for example, could lead users to request tariffs per dwelling, leading to a significant increase in management costs.

As a conclusion of this in-depth investigation in each country studied, we can see that different solutions are used and adapted to specific local contexts. Each solution has advantages and disadvantages and a varying degree of complexity, but all require the collection of information that is not necessarily directly accessible at present. If one or more of these ideas were to be retained, it would be necessary to study its/their application in more detail in a local and French context, among other things to be able to size the necessary effort in relation to the expected benefits. It should be noted, however, that each solution is applied in at least one of the European countries studied, which confirms that it is not incompatible with European law. This document summarizes seven country monographs and all the documents are available in French and English.