Asociación Caminos

Evaluation of Public Works in Spain

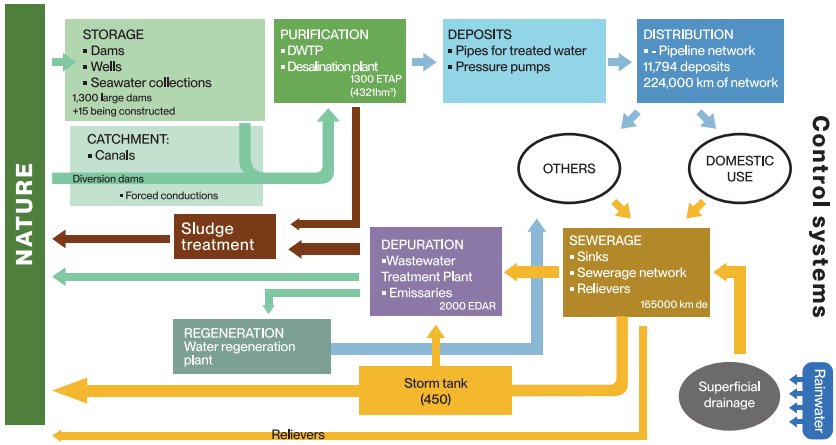
Full water cycle 2023

In Spain, water is a public domain and the regulators are the different public administrations. Water management is very heterogeneous, where the Administration (both state and regional) intervenes, as well as independent municipal regulators and hundreds of private operating entities. The powers are very fragmented.

The management of water supply is distributed between the public sector (35%) and the private sector (33%), mixed public-private management represents 22% and 10% is municipal management.

The complete urban water cycle sector represents 0.64% of GDP, with a turnover of 7,650 million euros.

Direct employment in the sector is 33,000 people, with highly qualified training. According to AEAS data, reflected in its XVII National Study of Drinking Water Supply and Sanitation in Spain (2022), with consolidated data from the sector for 2020, the average price of domestic water is €1.97/ m3, one of the lowest in Europe, and represents an average of 0.9% of Spanish household spending.



Water Cycle diagram

The average consumption of Spanish homes is 131 liters per day per inhabitant. The largest percentage of urban water consumption is for domestic use (67.4%), followed by industrial and commercial use (11.9%), the rest (20.7%) is for other uses. In Spain there are 1,640 drinking water treatment stations (ETAP). The volume of water supplied to the systems is 4,057 Hm3. The sewage system has approximately 190,000 km, with more than 2,232 water purification stations (WWTP) that process a total of 4,066 hm3, about 245 liters of treated water per inhabitant per day.

65% of the water collected for supplies in Spain comes from surface water runoff, stored in some 1,300 large dams; 26% comes from groundwater and the remaining 9% comes from desalinated water (Spain is the fifth country in number of desalination plants in the world with a total of 900 plants that have a capacity of 1.45 million cubic meters per day). In recent years, a decrease in the quality of water collected at source has been observed. However, water for human consumption is subject to exhaustive control by operators and health authorities and is of good quality. 78% of supplies have implemented Water Health Plans and 10% have them in progress, in accordance with the future requirements of the European Drinking Water Directive, which will presumably come into force in 2023. Implementation reaches 95% in metropolitan areas.

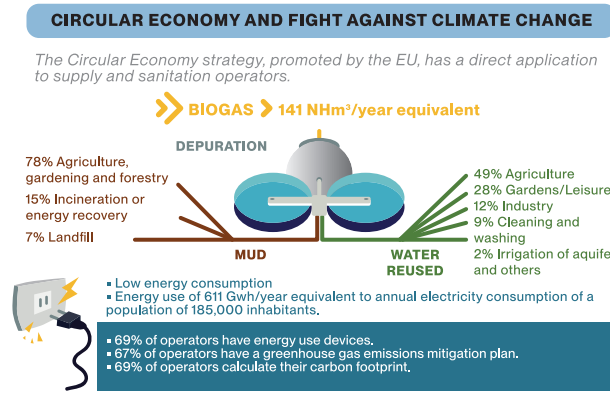


Diagram of the circular economy and energy savings. Destination of reused water and sludge (AEAS)

Methodology as an international reference model

✓ Open Methodology

Comparison of:
✓ Spain to other countries
✓ Periodical evolution

Official database:
✓ International
✓ Publicly accesible
✓ Referenced

(EUROSTAT, OECD, World Bank, UN, World Economic Forum, FAO, AQUASTAT, etc.). The **qualitative evaluation** refers exclusively to Spain and is based on the responses obtained from a survey questionnaire sent to a selected group of experts of the sector. The responses obtained have been processed anonymously and on a confidential basis. To facilitate the assessment, the analysis has been grouped into eight groups of common characteristics for all sectors, called "Criteria.

The evaluation studies the conditions of six public works sectors: Railways, Highways, Ports, Airports, Water Cycle and Urban and Metropolitan Public Transport. The methodology designed by the Asociación Caminos carries out an objective evaluation, which analyses quantitative indicators in different countries with similar economic and social environment. As well, it carries out a qualitative research, based on the opinions of a selected group of experts.

The **quantitative evaluation** is developed carrying out a comparative study with other countries (Spain, Germany, France, United Kingdom, Italy, Turkey; USA, Mexico, Brazil, Peru; Egypt, Israel, Saudi Arabia; Japan, China and India). This quantitative evaluation takes into consideration the most representative indicators of the sector, obtained from publicly access databases which are available in important multilateral organizations

CAPACITY	PERFORMANCE	FINANCING	ADAPTABILITY TO THE FUTURE AND SUSTAINIBILITY
OPERATION AND MAINTENANCE	SAFETY	RESILIENCE	ENGINEERING AND INNOVATION

• Evaluation of the Complete Water Cycle

Indicators:
Experts:

Rating		
Spain	6.9	D
Germany	7.1	C
France	8.1	B
United Kingdom	6.9	D
Italy	6.8	D
Turkey	5.5	E
USA	8.1	B
Mexico	5.0	E
Brazil	6.0	D
Peru	4.9	FX
Egypt	3.5	FX
Israel	6.9	D
Saudi Arabia	4.4	FX
Japan	8.1	B
China	5.6	E
India	4.4	FX

▪ Comparative analysis of Spanish Water Cycle in an international context

The best rated countries on a global level considering the agreed indicators are France, Japan and the USA (8.1). Spain, Germany, Italy, United Kingdom and Israel have obtained a similar rating (between 7.1 and 6.8). Spain obtains a good rating in Capacity (7.6), Performance (9.1), Operation and maintenance (8.6) and Safety (8.9).

The rates obtained in the experts evaluation is lower than the evaluation by indicators: it gives Spain the rating of sufficient, standing out in Capacity (6.4), Performance (6.8) and in Engineering and Innovation (6.1). Experts rate the financing as insufficient.

Evaluation of the Water Cycle with indicators (Max 10)		
CRITERIA		
CAPACITY	7.6	C
PERFORMANCE	9.1	A
FINANCING	6.0	D
ADAPTABILITY TO THE FUTURE AND SUSTAINIBILITY	6.6	D
OPERATION AND MAINTENANCE	8.6	B
SAFETY	8.9	B
RESILIENCE	6.9	D
ENGINEERING AND INNOVATION	5.3	E
Evaluation by Objective Indicators	**6.9**	**D**
Indicators considered: 57		

Evaluation of the Water Cycle sector by experts (Max 10)		
CRITERIA		
CAPACITY	6.4	D
PERFORMANCE	6.8	D
FINANCING	4.8	FX
ADAPTABILITY TO THE FUTURE AND SUSTAINIBILITY	5.9	E
OPERATION AND MAINTENANCE	5.7	E
SAFETY	5.5	E
RESILIENCE	5.8	E
ENGINEERING AND INNOVATION	6.1	D
Evaluation by experts	**5.7**	**E**
Answers received: 56		

Highlights of the study

- In Spain, water is a public domain, and the regulators are the different public administrations. Water management is very heterogeneous, involving different parties: the Administration (both state and regional), regulators, independent municipal entities and hundreds of private operating entities.
- The urban water sector represents 0.64% of the GDP, with a turnover of 7,650 million euros. Direct employment in the sector is 33,000 people, with highly qualified training. In 2022, the average price of domestic water was €1.97/ m3, one of the lowest in Europe, and represents an average of 0.9% of Spanish household spending.
- The domestic supply situation is good, but industrial and agricultural supply is very variable. In each region, alternative infrastructures and objectives must be developed, depending on their situation.
- The storage capacity of surface waters and the regulation of Mediterranean basins must be increased.

Final evaluation of the Water Cycle (Max 10)		
CRITERIA		
CAPACITY	7.0	C
PERFORMANCE	7.9	C
FINANCING	5.4	E
ADAPTABILITY TO THE FUTURE AND SUSTAINIBILITY	6.3	D
OPERATION AND MAINTENANCE	7.1	C
SAFETY	7.2	C
RESILIENCE	6.3	D
ENGINEERING AND INNOVATION	5.7	E
Final Weighted evaluation	**6.3**	**D**

- There is no hydraulic policy at the national level. In general, the concept of water as a public good is not respected; it is considered a territorial resource, which practically makes interconnections between basins impossible.
- Some experts believe that private management for low water supply should be maintained as it is more efficient than if there is a strict regulation. At a high level, management by basin organizations is efficient and capable of responding to challenges.
- There is a deficit of investment in water purification in the urban water cycle.
- Some experts believe that private investment must be increased and, to do so, the real cost of the water cycle must be reflected in the rates. Overexploitation of surface and groundwater has been detected, which prevents achieving the objectives of the EU Framework Directive.
- In the urban area, the creation of systems or associations which are large enough to guarantee technical, economic, and environmental viability must be promoted. In irrigation, the priority must be focused on improving and modernizing the systems, in order to reduce high water consumption.
- It is necessary to improve the Safety of water-related facilities, with the establishment of protocols and increase the surveillance.
- The weight and importance of engineering must be reinforced, the PERTE of digitalization must be developed significantly and the participation of the private sector in the entire R&D&I process must be increased.

Capacity

Indicators:
Experts:

Do the resources and capacity of the public works sector meet current demands?

% of the population with access to basic drinking water services

% of the population with access to basic sanitation services

Resources extracted from water for non-domestic use/irrigated area) (m3/ha)

% Irrigated area/total area

(100-Water stress index) *available water per capita (m3)

% Irrigated area/acreage of agricultural land

Water stress (Resources extracted from freshwater/(Renewable freshwater resources -Environmental flow) (%) (SDG: 6.4.2)

Rating		
Spain	7.6	C
Germany	6.9	D
France	7.6	C
United Kingdom	7.1	C
Italy	8.5	B
Turkey	6.8	D
USA	8.1	B
Mexico	6.5	D
Brazil	7.0	C
Peru	5.1	E
Egypt	6.2	D
Israel	6.7	D
Saudi Arabia	4.8	FX
Japan	8.5	B
China	4.4	FX
India	5.1	E

The first two indicators analyze the percentage of the population with access to basic health services, drinking water and sanitation. The third relates to the resources extracted from water for non-domestic use with the irrigated surface. The fourth indicates the percentage of irrigated area in relation to the total area, and the percentage of irrigated area in relation to the area of agricultural land.

The best rating for the Capacity Criterion is Japan (8.5), closely followed by Italy and the US. Spain and France have 7.6. Saudi Arabia and China have the worst ratings.

Evaluation by experts and comments

1.1. How do you assess the coverage of the territory of the drinking water supply network?	7.9	C
1.2. How do you assess the coverage of the territory of the drinking water supply network?	6.3	D
1.3.Taking into account the characteristics of the population in Spain and the strong seasonality of rainfall in many areas, how do you assess the capacity of the Water Cycle facilities in Spain to meet current demands?	6.1	D
1.4.Taking into account the characteristics of the population in Spain, the strong seasonality of rainfall in many areas, and the possible effects of phenomens associated with climate change in the near future, how do you assess the next 10 years?	5.4	E
Capacity Evaluation by experts	**6.4**	**D**

- The domestic supply situation is good, but industrial and agricultural supply is very variable. In each region, infrastructure must be developed, and appropriate objectives established depending on each situation.
- Excessive political control of water rates prevents income from covering the costs of infrastructure renewal and its conservation and maintenance.
- Although the capacity to meet supply demand is positive, significant environmental impacts frequently occur due to the overexploitation of rivers and aquifers.
- Spain is very diverse: there are areas where demand is satisfied without problems and others that have serious deficits.
- The storage capacity of surface waters and the regulation of Mediterranean basins must be increased.

Performance

Indicators:
Experts:

Are the current provision and physical conditions of the public works sector adequate to meet current users expectations?

Percentage of population using safely managed drinking water

Percentage of population using safely managed sanitation services

Efficiency in water use (USD/m3) / (GDP*10,000) (SDG: 6.4.1) UN

Percentage of wastewater collected in sewage systems

% of the population connected to a wastewater treatment plant -primary treatment- (OECD)

% of the population connected to a wastewater treatment plant -secondary treatment- (OECD)

% of the population connected to a wastewater treatment plant -tertiary treatment- (OECD)

Rating		
Spain	9.1	A
Germany	8.8	B
France	7.8	C
United Kingdom	9.2	A
Italy	7.0	C
Turkey	6.1	D
USA	10.0	A
Mexico	5.0	E
Brazil	4.3	FX
Peru	3.7	FX
Egypt	7.4	C
Israel	8.3	B
Saudi Arabia	7.9	C
Japan	7.1	C
China	6.9	D
India	5.2	E

The indicator "Percentage of the population that uses safely managed drinking water" shows the same trend as in the Capacity indicators. The indicator "Percentage of the population that uses safely managed sanitation services" has the same trend as the previous indicator, Although with lower values. The indicator "Efficiency in water use (USD/m3) / (GDP*10,000) (SDG: 6.4.1) "UN" refers to the price per m3 of water that users pay. The United Kingdom stands out, with the highest price (87 USD/m3). The lowest prices are in the USA and Peru (8 USD/m3). Spain, along with Italy and Turkey, has the lowest prices of the European countries analyzed. The overall assessment of the Performance Criterion is excellent in the USA, the United Kingdom and Spain, followed by the European countries, Israel and Japan.

Evaluation by experts and comments

2.1. How do you rate the quality of water for consumption in Spain?	8.1	B
2.2. In relation to other countries around us, how do you value the water quality control systems for supply?	7.8	C
2.3. How do you assess the existing regulatory capacity in Spain (dams, reservoirs, interconnection of basins, etc.)?	6.5	D
2.4. How do you value the existing interconnections between basins?	5.1	E
2.5. Overall, how do you rate the attention to the public and the management of incidents by operators in the water sector in Spain?	6.4	D
Performance Evaluation by experts	**6.8**	**D**

- There should be a national hydraulic policy. In general, the concept of water as a public good is not respected, It is considered a resource of the territory, which makes interconnections between the basins difficult.
- Empty Spain and the interior have great management difficulties in maintaining a good service.
- Some experts believe that private management for low supply water should be maintained, as it is more efficient if adequate regulation is available. At high level, management by basin organizations appears efficient and capable of responding to challenges.

• Financing

Indicators:
Experts:

Which amount of investment is allocated to financing the public works sector? Which amount is applied to the creation of infrastructure? And what about operation and maintenance?

(Total expenditure Water Cycle Sector / inhabitants) * Investment needs
(Total Water Cycle Sector Expenditure / Real GDP) * Investment needs*1000000
(Maintenance expenditure / Total expenditure) * Investment needs
Total expenditure Water Cycle Sector / inhabitants
Total expenditure Water Cycle Sector / real GDP
Operation and maintenance expense / Total expense
Investment needs

Rating		
Spain	6.0	D
Germany	6.3	D
France	7.2	C
United Kingdom	6.8	D
Italy	6.0	D
Turkey	5.4	E
USA	6.7	D
Mexico	4.8	FX
Brazil	6.0	D
Peru	1.1	F
Egypt	5.2	E
Israel	10.0	A
Saudi Arabia	6.1	D
Japan	7.5	C
China	5.1	E
India	4.5	FX

One of the most representative indicators is the investment in the complete water cycle in relation to the national GDP. A high percentage of GDP (greater than 0.8%) indicates that the complete water cycle is in the process of creation. In general terms, if this percentage falls below 0.6% it indicates that no new infrastructure is being created; altogether if this percentage drops from 0.2-0.3% is an indication that the investment does not adequately covers the conservation needs, maintenance and management of the infrastructure.

▪ Evaluation by experts and comments

3.1. Do you consider the current investment in water cycle facilities in Spain (reservoirs, desalination plants, other collection works, ETAPS, WWTPs, reuse facilities, etc.) is sufficient?	4.3	FX
3.2. How do you assess the robustness of the current sources of financing for works related to the Water Cycle?	4.7	FX
3.3. How do you think the investment in the Water Cycle works is being managed?	5.1	E
3.4. How do you consider the current participation of private investment in the project, construction and/or exploitation of the Water Cycle works in Spain?	5.1	E
Financing Evaluation by experts	**4.8**	**FX**

- It is necessary to complete the needed infrastructure to comply with the EU Water Framework Directive.
- There is a purification deficit in the urban water cycle, as well as a low cost recovery by users, which is more pronounced in the agricultural sector.
- Some experts believe that the real cost of the water cycle must be reflected in the rates to encourage private investment (which allows it to complement or replace public financing) and, to do so, the current charges and rates must be reviewed.

• Adaptability to the future and sustainability

Indicators:
Experts:

Is the capacity and performance of the public works sector prepared to meet future expectations and demands? Are the resources and investment considered adequate to cover the future needs of the sector? How are actions that provide environmental sustainability being applied? Are active measures applied to meet the objectives established to decarbonize public works and transportation?

Freshwater resources (long-term annual average) -Evapotranspiration- (m3/Habit.) (OECD)
Freshwater resources (long-term annual average) -Total renewable per capita (m3/ Habit.) -
Freshwater extraction (long-term annual average) (millions. m3) -Gross extraction per capita (m3/Habit.)- (OCDE)
Projection of change in annual runoff (ND-GAIN Water Index.)
Projection of the change in annual groundwater recharge. (ND-GAIN Water Index.)
Freshwater extraction rate. (ND-GAIN Water Index. Fresh water withdrawal rate)
Dependency ratio on water originating outside its borders. (ND-GAIN Water Index)
Prey capacity. (ND-GAIN Water Index. Dam capacity)
% Technologies related to water treatment and purification (OECD)
% Gross freshwater extraction per inhabitant / total renewable freshwater per inhabitant

Rating		
Spain	6.6	D
Germany	6.0	D
France	6.9	D
United Kingdom	5.8	E
Italy	6.8	D
Turkey	7.0	C
USA	6.4	D
Mexico	7.0	C
Brazil	7.6	C
Peru	5.9	E
Egypt	2.7	F
Israel	3.9	FX
Saudi Arabia	0.6	F
Japan	5.4	E
China	5.6	E
India	4.1	FX

In the indicator that measures evapotranspiration per inhabitant, Israel stands out with a ratio of 431 m3/ Habit. much lower than the rest of the countries, most likely because storage is done in warehouses or areas protected from solar incidence that prevent evapotranspiration. Spain is the country with the highest evapotranspiration of the European countries analyzed (4,805 m3/ Inhabitant).
Renewable freshwater resources per inhabitant (annual average long term) present similar results in all European countries (of the order of 2,400 m3/Habit.).
In the indicator that measures freshwater extraction per inhabitant, Spain stands out unfavorably (633 m3/Inhabitant); The US extracts twice as much as European countries.

▪ Evaluation by experts and comments

4.1. Do you consider that the hydrological planning instruments in force take into account adaptation to future user demands?	5.9	E
4.2. Do you consider that Hydrological Planning is coherent and do you have the financing and investment tools to put it into practice?	4.5	FX
4.3. How would you evaluate the adaptation of the Water Cycle works in Spain to environmental protection in terms of compliance with current legislation, including the Water Framework Directive?	6.1	D
4.4. How do you assess the actions that are being taken to reduce the environmental impact of the Water Cycle works in Spain?	6.6	D
4.5. How do you assess the environmental requirements in the Water Cycle works in Spain in relation to other types of infrastructure?	6.8	D
4.6. How do you assess the efficiency of irrigation facilities in terms of watersavings in Spain?	5.5	E
4.7. How do you assess the actions that are being taken to reduce CO2 consumption in the complete Water Cycle infrastructure?	6.1	D
4.8. How do you consider the adaptation of the infrastructure of the Complete Water Cycle to the effects of climate change?	5.8	E
Adaptability to the future Evaluation by experts	**5.9**	**E**

- The adaptation of hydrological planning to the environment It has an ideological bias, which does not always coincide with reality (particularly in irrigation). There is an important gap between the necessary investment in purification and that planned, which affects the achievement of the EU Framework Directive.
- Surface and groundwater are overexploited, Therefore, it is difficult to achieve the objectives of the Framework Directive.

• Operation and maintenance

Indicators:
Experts:

Are public works being operated and maintained in accordance with your needs? Is the necessary investment being made in order to ensure the adequate conservation and maintenance?

Expenses in operation and maintenance water sector / inhabitants
% Water sector operation and maintenance expenses / real GDP
Reliability in water supply. GCI Index (WEF)

Rating		
Spain	8.6	B
Germany	6.1	D
France	10.0	A
United Kingdom	5.9	E
Italy	6.3	D
Turkey	2.7	F
USA	8.2	B
Mexico	2.7	F
Brazil	5.1	E
Peru	7.2	C
Egypt	3.5	FX
Israel	9.7	A
Saudi Arabia	6.5	D
Japan	10.0	A
China	2.9	F
India	1.5	F

The most significant rate obtained in the Operation and Maintenance Criterion is the percentage of the investment in operation and maintenance on the equity value. In the absence of data, investment in operation and maintenance has been used in relation with GDP. The average value of the ratio "% Operation and maintenance expenses water sector / real GDP" is 0.62%, with a maximum of 1.3% and a minimum of 0.28%, which corresponds to India.
Spain has a percentage of 0.83%.

Another indicative ratio is the percentage of investment in operation and maintenance in relation to the population. The resulting average value is $168, although the maximum is $453 and the minimum is $5. Spain has $244.

▪ Evaluation by experts and comments

5.1. How do you value the investment made in conservation and maintenance of the Water Cycle facilities in Spain and in the purification stations?		5.2	E
5.2. Do you consider that the measures applied to the operation, conservation and maintenance of the Water Cycle facilities are adequate to meet the demand of users in the different areas?:	[Regulation works (dams and reservoirs)]	4.8	FX
5.3.	[Desalination stations]	6.3	D
5.4.	[High driving]	6.1	D
5.5.	[Water treatment stations]	6.3	D
5.6.	[Low networks]	5.4	E
5.7.	[purification stations]	5.3	E
5.8. How do you assess the conditions of conservation and maintenance of the Water Cycle works in Spain in the different areas?:	[Regulation works (dams and reservoirs)]	4.9	FX
5.9.	[Desalination stations]	6.7	D
5.10.	[High driving]	6.0	D
5.11.	[Water treatment stations]	6.3	D
5.12.	[Low networks]	5.1	E
5.13.	[purification stations]	5.2	E
Operation and maintenance Evaluation by experts		**5.7**	**E**

- Conservation requires investments that are not being made. The conservation situation is different between the agricultural and urban sectors and, in the latter, depending on the size of the population.
- In the urban area, the creation of systems or associations large enough to guarantee technical, economic and environmental viability must be promoted. In irrigation, the priority must be focused on improving and modernizing the systems, and to reduce high consumption.
- The surveillance and control of the public hydraulic domain by the Public Administrations is essential to guarantee an adequate operation and maintenance of the surface and underground supply systems.

• Safety

Indicators:
Experts:

Is the public works sector safe for users? Are effective measures implemented to ensure safe performance and operation?

Premature deaths, per million inhabitants (unsafe water source) (OECD)
Premature deaths, per million inhabitants (Unsafe Sanitation) (OECD)
Premature deaths, per million inhabitants (Without access to safe handwashing)

Rating		
Spain	8.9	B
Germany	8.7	B
France	8.7	B
United Kingdom	8.4	B
Italy	9.2	A
Turkey	6.1	D
USA	8.3	B
Mexico	1.4	F
Brazil	1.0	F
Peru	1.0	F
Egypt	1.1	F
Israel	8.7	B
Saudi Arabia	7.7	C
Japan	6.0	D
China	7.9	C
India	1.0	F

The indicator "Premature deaths, per million inhabitants (unsafe water source) (OECD)" presents an average of 33 fatalities, with important variations between countries: from a minimum of 2 that all European countries have, as well as USA and Israel, up to a maximum of 0.372 presented by India. Spain has 1.11, a figure which is among the best countries. The indicator: "Premature deaths, per million inhabitants (Unsafe Sanitation) (OECD)" presents values that are in line with the first indicator; The United Kingdom (0.12) and Spain (0.27) stand out; and the highest figure is India (213). A similar situation has the third indicator "Premature deaths, per million inhabitants (Without access to safe handwashing)
(OECD)". Overall, the best rated countries are European, the US and Israel, with slight differences between them.

▪ Evaluation by experts and comments

6.1. How do you assess the existing control measures in place to guarantee the water supply to the population in Spain?		6.9	D
6.2. How do you assess, from the point of view of health safety, the extent and quality of wastewater treatment?		6.0	D
6.3. Overall, how do you rate the security of the water Cycle facilities in Spain whenever they have to face physical attacks in different areas?: [Global]		5.7	E
6.4.	[Regulation works (dams and reservoirs)]	5.5	E
6.5.	[Desalination stations]	6.2	D
6.6.	[High driving]	6.1	D
6.7.	[Water treatment stations]	6.0	D
6.8.	[Low networks]	5.5	E
6.9.	[purification stations]	5.8	E
6.10. Overall, how do you assess the security of the Water Cycle facilities in Spain against logical attacks (cybersecurity) in different areas? [Global]		4.9	FX
6.11.	[Regulation works (dams and reservoirs)]	4.8	FX
6.12.	[Desalination stations]	5.1	E
6.13.	[High driving]	5.2	E
6.14.	[Water treatment stations]	4.9	FX
6.15	[Low networks]	4.8	FX
6.16.	[purification stations]	4.8	FX
6.17. Do you consider that measures are being taken to reduce the incidence of physical and/or logical attacks on Water Cycle facilities in Spain in the future?		4.8	FX
Safety Evaluation by experts		**5.5**	**E**

- It is necessary to improve the Safety of water-related facilities, with the establishment of protocols and increase the surveillance.

• Resilience

Indicators:
Experts:

When threats and adverse incidents occur, what is the capacity of public works to prevent, protect and minimize the consequences for users, the environment, the economy and national Safety? Are the public works prepared to recover its initial condition within a reasonable time when the threat or adverse incident has ceased? Are there alternatives to attend the service they provide?

Available water per capita (Renewable freshwater resources/Population) (m3/year)
(Renewable freshwater resources*(1-Water stress))/agricultural area (m3/ha)
% integrated water resources management (SDG: 6.5.1)
% Annual freshwater withdrawal for domestic use/Total freshwater withdrawal

Rating		
Spain	6.9	D
Germany	7.8	C
France	9.6	A
United Kingdom	7.7	C
Italy	8.4	B
Turkey	7.1	C
USA	9.4	A
Mexico	6.8	D
Brazil	8.9	B
Peru	8.9	B
Egypt	2.9	F
Israel	3.0	FX
Saudi Arabia	3.2	FX
Japan	10.0	A
China	6.9	E
India	8.1	B

Available water per capita indicates vulnerability, and capacity reaction to a water supply problem in situations of drought or scarcity. The evaluation of renewable resources of fresh water through agricultural land of the country, corrected for water stress, also provides information on the response capacity of agriculture to freshwater scarcity phenomena. The highest global rating for this indicator is obtained by Japan (10.0), France (9.6) and the USA (9.4), followed by European countries, including Spain (6.9). The worst countries are Egypt, Israel and Saudi Arabia.

▪ Evaluation by experts and comments

7.1. How do you assess the capacity of the Water Cycle facilities in Spain to recover to the initial condition of service when an adverse situations occur?	6.4	D
7.2. How do you assess the measures adopted by operators to prevent water supply cuts in the event of natural or induced incidents?	6.4	D
7.3. How would you evaluate the measures that are being adopted in the facilities of the Water Cycle to alleviate the effects of climate change (for example, greater frequency of extreme phenomena such as floods and droughts)?	5.0	E
7.4. How do you assess the interconnection of existing supply networks in terms of their ability to maintain supply in situations of destruction or serious damage to a part of the network?	5.4	E
7.5. How do you value the contingency plans that are applied in the complete water cycle to prevent infrastructure from natural or provoked incidents?	5.7	E
Resilience Evaluation by experts	**5.8**	**E**

- Contingency plans usually reflect anticipated situations. Climate changes are not correctly characterized (the models are not precise and the results are in the medium error range).
- The resilience of urban systems is, logically, greater than that of irrigation. At the same time, within urban areas, the systems Of larger populations generally have better conditions than smaller ones.
- It is advisable to review the forecasts frequently, incorporating the latest data to reanalyze the results. The cost/benefit of infrastructure that will be necessary within a given period must also be analyzed.

• Engineering and Innovation

Indicators::
Experts:

Are there adequate resources allocated to engineering in the design, construction, conservation, management and operation of the public works sector? Is the appropriate investment made in innovation? What new techniques, materials, technologies and operating methods are being implemented to improve public works? Is progress being made in digitalization, monitoring and sensorization during the complete cycle of public works? Is the information adequate for users?

Number of patents related to water treatment and purification/Million population (OECD)
Number of patents related to the reduction of water pollution/Million population (OCDE)
Number of patents. Seawater desalination/Million population (OECD)
% of GDP allocated to Gross Domestic Expenditure on R&D (OECD R&D)
Gross domestic expenditure on R&D ($)/Population (OECD R&D)
% of GDP allocated to spending on basic research (OECD R&D)
% of GDP of private financing allocated to R&D (OECD R&D)
% of GDP of public financing allocated to R&D (OECD R&D) Digitization. Participation in new technologies. GCI Score (WEF)
Digitization. Information and communication technology infrastructure index. (ND Index)
Digitization. % of people who use the internet
Engineering. Regulatory transparency. Services Trade Restriction Index (OECD)
Engineering. Barriers to competition. Services Trade Restriction Index (OECD)
Engineering. Restrictions on movement. Services Trade Restriction Index (OECD)
Engineering. Restrictions on the entry of engineers from abroad. Trade restriction index
Innovation index. ND Gain Index

Rating		
Spain	5.3	E
Germany	8.2	B
France	7.8	C
United Kingdom	6.8	D
Italy	5.1	E
Turkey	3.3	FX
USA	9.0	A
Mexico	3.5	FX
Brazil	4.3	FX
Peru	3.7	FX
Egypt	1.6	F
Israel	8.0	B
Saudi Arabia	3.9	FX
Japan	9.2	A
China	5.8	E
India	3.8	FX

In relation to innovation, three patent indicators have been determined OECD: number of patents related to treatment and purification, reducing water pollution and desalination. The global assessement of the Engineering and Innovation criterion grants top ratings to USA (9.0), Japan (9.2), followed by Germany (8.2), Israel (8.0). Spain obtains a rating of 5.3 below China (5.8).

▪ Evaluation by experts and comments

8.1. How do you value the use of new techniques, technologies and materials in construction and maintenance?	6.2	D
8.2. How do you assess the measures adopted in the public tender to favor innovation in the water sector?	4.4	FX
8.3. How do you assess the adaptation of the irrigation sector to new technologies?	5.9	E
8.4. How do you value the adaptation programs to new technologies in the case of wastewater treatment stations and in the field of water reuse?	5.6	E
8.5. How do you value the research, development and innovation that is being developed in the water cycle?	6.0	D
8.6. How do you value the current technology that is being applied in the complete cycle of the water?	6.2	D
8.7. How do you value innovations in digitalization of the management and operations of the complete water cycle?	6.1	D
8.8. How do you value the current technology that is being used in the water cycle?	7.5	C
8.9. How do you consider the progress in digitalization and monitoring of the behavior of water elements?	7.1	C
Engineering and Innovation evaluation by experts	**6.1**	**D**

- There are no real technological advances in the facilities due to the bidding processes, which prevent or hinder the proposal of new technologies.
- The weight of engineering must be reinforce, also the European digitalization funds must be developed considerably and the participation of the private sector in the entire R&D&I process must be increased.

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