9. Water

9A. Present Situation

Please complete the following table providing the most recent data that is available:

Table 1: Benchmarking Data - Water

Indicator		Unit	Year of Data
Domestic usage (drinking water) - litres per capita per day	114.1	Litres/capita/day	2018
Total usage (drinking water) - litres per capita per day	195.6	Litres/capita/day	2018
Water loss in pipelines	32.5	%	2018
Percentage (%) of total annual generated waste water load, connected to waste water collecting system + urban waste water treatment plants (UWWTPs)	100	%	2018
No. of WWTP	4	Number	2018
Total design capacity (Population Equivalent - PE)	357,700	PE	2018
Total load received by UWWTP (PE)	134,564	PE	2018
Connection rate	99.35	%	2018
Treatment level which is applied in each UWWTP: secondary or more stringent; in this case, type of treatment: nitrogen and/or phosphorus removal, disinfection etc.	97.3% tertiary (N-P-disinfection) 2.7% secondary	Treatment level	2018
Waste water reuse (describe type of reuse)	0.14	%	2018
Water pricing (overall and split into water supply and waste water services, incl. taxes and service charges)	1.87	€/m^3 (overall)	2019
	1.37	€/m^3 (water supply)	2019
	0.93	€/m^3 (waste water supply)	2019

Describe the present situation in relation to water management, including any relevant disadvantages or constraints resulting from historical, geographical and/or socio-economic factors which may have influenced this indicator.

Describe the current general features of waste water treatment according to national requirements and the

requirements of the Urban Waste Water Treatment Directive (UWWTD, 91/271/EEC), and the situation regarding drinking water quality and the requirements concerning the Drinking Water Directive 98/83/EC .

Please provide information of the EU Water Framework Directive 2000/60/EC and its daughter directives regarding implementation.

In detail, please make reference to:

1. Total water drinking water consumption (in cubic meters/year and litres/capita/year) including a breakdown for different sectors (e.g. households, industry, energy, agriculture, small business, tourism, public sector); describe plans currently in place to reduce water consumption and to improve water status
2. Proportion of urban water supply subject to water metering, both for domestic and non-domestic metering;
3. Source of water (surface water, groundwater) - make reference to aquifers and river basin management;
4. Quality of drinking water (e.g. how many days of non-compliance with the Drinking Water Directive?) - make reference to connection to large/small supplies;
5. Water loss in pipelines, leakage management and network rehabilitation; please provide information on leakage management and network rehabilitation;
6. Storm water management (including number of storm water overflows) and use of natural water retention measures (www.nwrm.eu) and/or sustainable urban drainage systems (SUDS);
7. How the links between water and energy consumption (water-energy nexus) if available provide data on yearly energy consumption (kWh/m^3 of distributed water); describe measures in place to reduce/optimise the energy consumption for waste water plants or water supply services;
8. Compliance with the EU Water Framework Directive and other EU/national/regional legislation applicable at the city level indicating status of water bodies relevant for the urban area within the city limits and relevance of measures enshrined in the applicable river basin management plans; this shall include the status of the relevant river basin (e.g. water bodies in good/bad status; if information on droughts, scarcity; expected future trends);
9. Compliance with the EU Water Framework Directive and link to the relevant Flood Risk Management plans;
10. Use of 'non-conventional resources' and water recycling initiatives (rain water use and grey water or waste water reuse);
11. The scale of river restoration projects planned e.g. for resurfacing (lost) rivers, naturalising previous channeled rivers;
12. Projects to reconnect citizens with waterbodies e.g. creation of wetland parks, improving water quality to allow for swimming.

Include data and a short explanation for the following specific indicators. Provide explanation in the case of missing information.

1. Proportion (%) of total generated waste water load, not connected to waste water collecting systems and explanation of the type of waste water treatment applied to this fraction (reference to individual or other appropriate systems, i.e. IAS);

2. If the city is located in an EU Member State include data on waste water treatment obligations according to the UWWTD (based on city's size and nature of the area of discharge);
3. Waste water collecting systems: main type of collecting system (combined/separated) and annual proportion (%) of COD-loads discharged via storm water overflows;
4. UWWTPs: organic design capacity (PE), most advanced treatment level, annual incoming and discharged loads (load or concentration) of BOD_5, COD, Ntot and Ptot and treated waste water amounts (m^3/annum) of all UWWTPs serving the city. If the city is located in an EU Member State, indicate whether the UWWTP complies with the treatment requirements under the UWWTD;
5. Annual amounts of generated sewage sludge (tonnes/year) and description of treatment/disposal pathways (% of total amount);
6. Further information (e.g. on treated waste water reuse, economic sustainability, use of integrated constructed wetlands or other GI/nature-based solutions) is highly appreciated.

Please note:

In case the city is served by a private, or public/private services company, or your regional/national authorities are responsible for the water services, please provide the information requested and describe the additional city activities.

(max. 800 words and 5 graphics, images or tables)

For many years the Municipality and the Water Service Company have implemented a series of measures and initiatives aimed at sustainable water resource management.

In 2018 the total water consumption per capita amounted to 195.6 l/inhab/d and the one relative to domestic use only to 114.1 l/inhab/d. Both values are considerably lower than those recorded in the Italian main cities, respectively equal to 236 and 161 l/inhab/g.

Households (58,3 %) and business (22,2 %) are the two sectors that consume the greatest quantities of drinkable water.

Sectors	Consumption
Households	8.182.261
Business	3.114.306
Industry	1.505.253
Other	1.016.334
Public	170.907
Agriculture	41.282
TOTAL	**14.030.343**

***Table 1** - 2018 drinking water consumption (cubic meters) in different sectors*

The amount of energy used to comply with the entire water service declined from a value of 2.03 kWh/m3 in

2015 to 1.79 kWh/m3 in 2018. Over the past four years energy consumption required for dispensing drinking water alone has remained substantially unchanged (0.49 kWh/m^3).

All the water supply comes from a deep aquifer and is subject to qualitative and quantitative measurement. No cases of interruption of the water distribution service have ever been recorded over the past 10 years, and quality parameters were always in compliance with the limits set by law.

In 2018 leakages accounted for 32.5% of the water fed into the network. Despite the overall value is still too high, over the last five years a reduction in water loss quantity was recorded, as a result of the initiatives undertaken by the Municipality, in collaboration with the water service company.

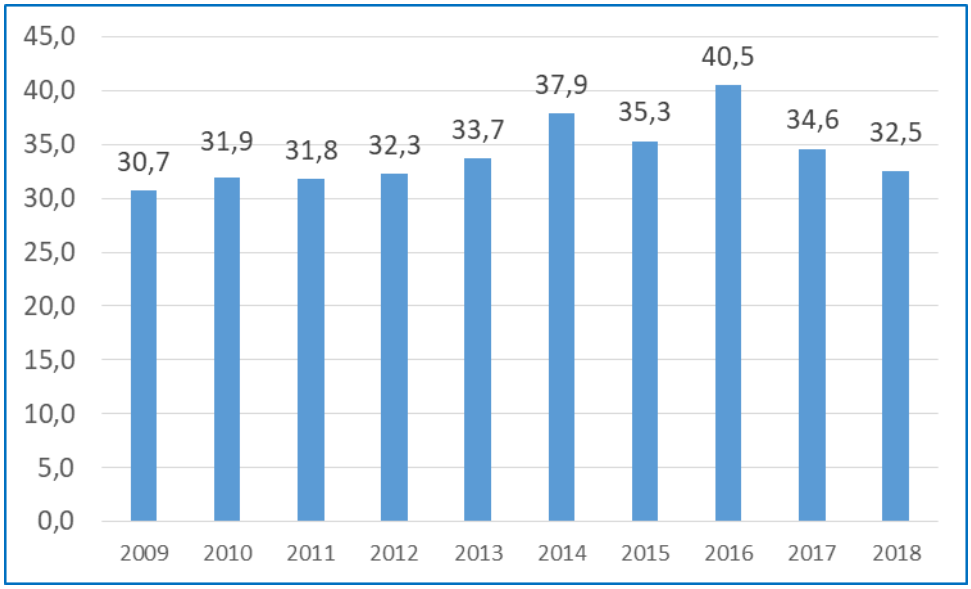

Figure 1- *Leakages from water distribution networks (%)*

The waste water collecting system in the urban center is combined while in the new districts is mainly separated, as a result of technical and administrative requirements imposed on new settlements since 1990. As required by Regional regulations the combined network features storm water overflows that discharge excess water due to rainfall, when it exceeds 5 times the rated design sewage flow. The plant is sized in such a way to ensure the protection of water quality of the receiving water bodies also during heavy rainfall.

To date, the sewerage system can be described as follows:

- Mixed sewage pipelines = 330 km.
- Wastewater sewage pipelines = 280 km.
- Rainwater sewage pipelines = 210 km.
- 88 storm water overflows.
- 70 pumping stations.

In addition 5 rainwater balancing tanks are designed to limit the intake of rainwater into the receiving water bodies.

The entire population of Parma benefits from a proper wastewater treatment system. The large majority of the population (98.1%) is connected to the sewage treatment plant, while the remaining portion is provided with appropriate treatment systems.

The city has four main sewage treatment plants:

- West Parma, 168,000 PE. Tertiary treatment (N, P and disinfection);
- East Parma, 180,000 PE. Tertiary treatment (N, P and disinfection);
- Corcagnano, 7,500 PE. Secondary treatment;
- Baganzola, 2,200 PE. Secondary treatment.

The overall capacity is therefore 357,700 PE as against an always significantly smaller total load received, which in 2018 was equal to 134,564 PE.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total capacity	357700	357700	357700	357700	357700	357700	357700	357700	357700	357700
Load	165657	125002	121506	153174	106930	123374	117232	152904	146862	134564

***Table 2** - overall capacity and waste water load received inhab/e*

The two main waste water treatment plants - West Parma and East Parma, receiving 97.3% of the municipal waste water load – are equipped with a tertiary treatment system, while the remaining 2.7% only with secondary treatment. 54% of water treated by the West Parma plant – accounting for 0.14% of the entire volume discharged from Parma plants - is recovered and reused in the plant process operation itself.

All plants feature an extremely effective purifying capacity; the main parameters show a good pollutant reduction percentage and output values are below the regulatory limits.

	BOD5 (mg/l)		COD (mg/l)		N tot (mg/l)		P tot (mg/l)	
	Input	Output	Input	Output	Input	Output	Input	Output
Baganzola	94.7	6.9	190	24.4	36.1	na	4	2
Corcagnano	135.4	4.1	270	16.3	59.9	11.4	4.9	0.9
East Parma	84.3	3.7	176.5	15.9	27.7	7.8	3.4	0.6
West Parma	155	4.23	340	16.8	47.7	8.4	7	0.7

***Table 3** - treatment effectiveness in waste water plant*

In 2018, a total amount of 18,829.3 tons of sewage sludge was produced, which was then used as follows: 62.7% reused in agriculture, 22.4% disposed of by incineration, 10.7% dumped into landfills and 4.2% other form of reuse.

5 monitoring stations for Water Body quality are located within the municipal area, of which three were effectively monitored in the 2014-2016 period (latest data available). The two stations on the Parma River scored a sufficient Ecological "State", whereas the one on the Baganza stream scored a "poor" value.

9B. Past Performance

Describe the measures implemented over the last five to ten years for improving water management, including waste water management. Describe the baseline (situation) ten years ago and comment on which measures have been most effective and what progress has been achieved.

With specific reference to waste water and drinking water, please note that if the city is located in an EU Member State, special reference should be given to non-compliance situation, exceedances and relevant infringement cases. Particular reference may be given to capacity building, measures for maintenance, management and restoration of waste water collecting systems and UWWTPs, as well as for water supply systems.

Make reference to:

1. Technical, nature-based, economic and institutional measures adopted and their effectiveness in achieving reduction of total water consumption or improvement of water status;
2. Bye-law implementation in relation to efficiency in water usage, tariff and metering systems and water quality;
3. Citizen engagement and public awareness initiatives;
4. Actual and projected improvements (in %) of water status/potential compared to 2009, when the first river basin management plans were to be in place.

Describe actions and activities carried out by the city (or service provider) over the last ten years to improve the situation (e.g. information of citizens, public activities such as flyer or public information desk).

(max. 1,200 words and five graphics, images or tables)

The water consumption values recorded in Parma, as already mentioned, are positive, both with reference to the latest available annual data and with reference to the performance recorded over the last 10 years. A few effective actions contributed to reach these results, such as the widespread installation of metering units by individual users - which has improved measurement accuracy, thus mobilizing citizens to reduce their water consumption - and a broad distribution of flow rate reducers (which have been installed by more than 80% of the population), an especially useful measure in raising awareness of a responsible use of the water resource.

Comune di Parma
Assessorato Mobilità e Ambiente

Risparmiare l'acqua si può...
Consigli utili per il risparmio idrico nelle nostre case

In cucina	Si risparmia così:
	Controlla sempre se il rubinetto presenta delle perdite: goccia dopo goccia si sprecano circa 50 litri d'acqua al giorno, quasi 4.000 litri all'anno. Controlliamo anche il WC che perde perché si possono consumare fino a 100 litri di acqua al giorno.
	Applicare un frangigetto al rubinetto di casa consente di risparmiare, per una famiglia di 3 persone, fino a 6.000 litri all'anno. L'operazione è semplice e costa poco, consiste in una retina che arricchisce il getto d'aria riducendo la quantità d'acqua usata.
	Non è necessario lavare la frutta e la verdura sotto l'acqua corrente, è sufficiente lasciarla a bagno con un pizzico di bicarbonato, per ogni famiglia si possono risparmiare circa 4.500 litri di acqua all'anno. La stessa acqua si può poi utilizzare per innaffiare le piante di casa e del giardino

In bagno	Si risparmia così:
	E' sempre consigliabile utilizzare lavatrici e lavastoviglie solo quando sono a pieno carico. In questo modo si possono risparmiare dagli 8.000 agli 11.000 litri d'acqua all'anno. Occhio anche alle temperature: una lavatrice consuma meno della metà dell'acqua con lavaggio a 30° rispetto ai lavaggi a 90°! In questo modo oltre all'acqua si risparmia anche energia elettrica!
	Ogni volta che tiriamo lo sciacquone del water consumiamo 15-20 litri d'acqua! Esistono in commercio delle vaschette con scarichi differenziati che permettono di risparmiarne fino al 50%! E' stato calcolato che una famiglia di 4 persone può arrivare a risparmiare fino 26.000 litri di acqua all'anno.
	Fare la doccia invece del bagno è una buona abitudine che consente di risparmiare acqua: si consumano 150 litri per un bagno e 30 litri per la doccia. Non dimentichiamoci, però, di chiudere il rubinetto mentre ci si insapona.
	Mentre ci si lava i denti o ci si rade la barba è inutile lasciare scorrere l'acqua: in questo modo ogni persona può risparmiare fino 2.500 litri di acqua all'anno.

In cortile e in giardino	Si risparmia così:
	Lavare l'auto con un secchio e non con la canna consente di risparmiare 130 litri ogni lavaggio, quasi il 75% di un lavaggio con la canna
	Il momento migliore per innaffiare le piante e il giardino è alla sera, infatti al pomeriggio la terra è ancora calda e il sole fa evaporare l'acqua con grandi sprechi e danno per le piante stesse! Anche innaffiare con un innaffiatoio e non con la canna consente di risparmiare grandi quantità di acqua.

ANNO 2006

Figure 2 *- Water saving awareness campaign*

For this purpose some environmental education projects were also dedicated to schools, organized by the Environmental Education Department of the City of Parma, in liaison with along with CIREA, the Environmental Education Center of the University, and several NGOs. Among the various projects, "*Casa Ecologica"* (Eco-friendly House) and *Eticopoli* (3), are worth mentioning, which involved about 1,000 students.

The positive effect of these initiatives stems clearly from the data recorded over the last 10 years, which shows a 27.1% reduction in total water consumption and 34.2 % in domestic consumption.

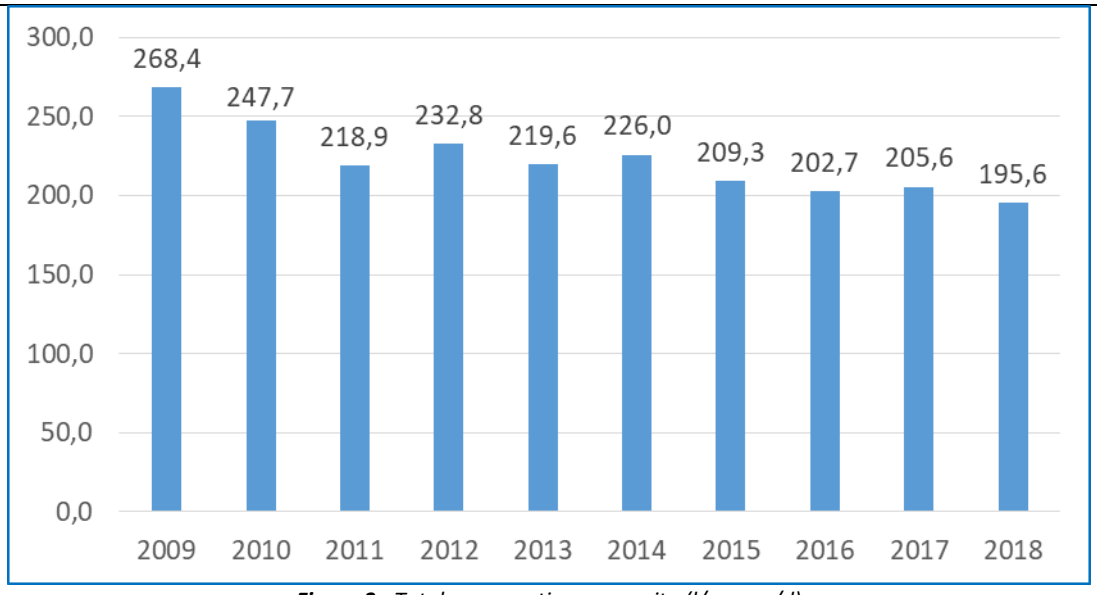

Figure 3 *- Total consumption per capita (l/person/d)*

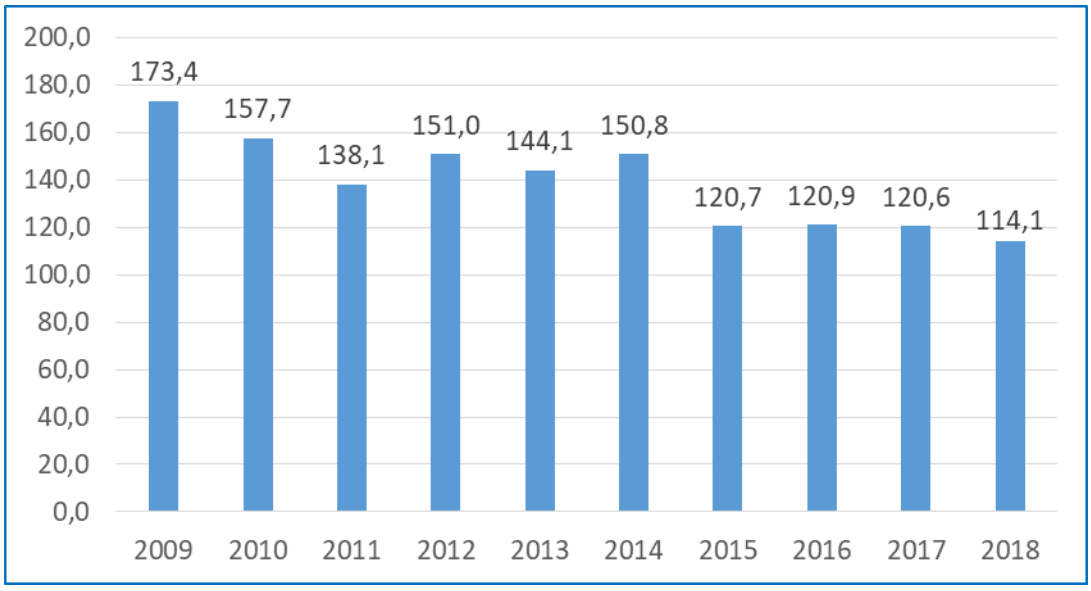

Figure 4 *- total water domestic consumption per capita*

Other awareness campaigns have been aimed at reducing the consumption of bottled water, encouraging the use of public water.

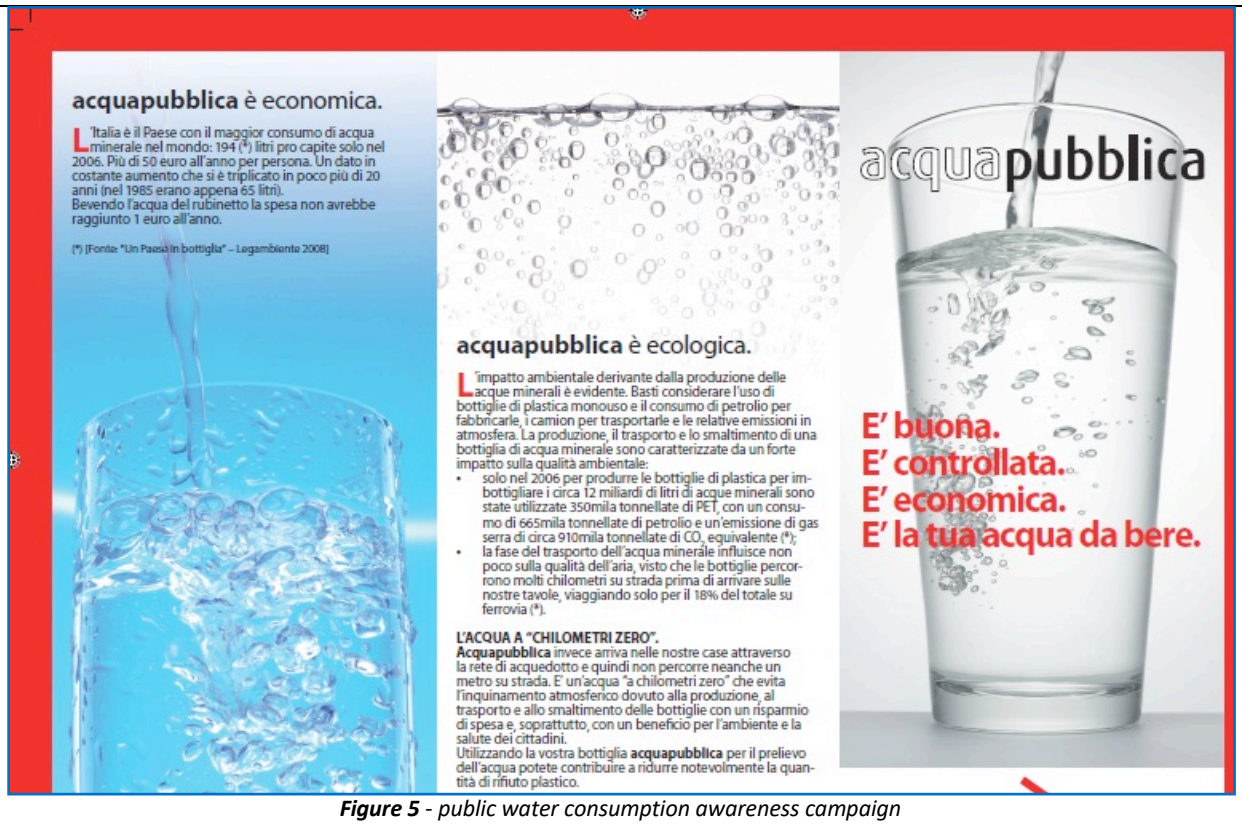

Figure 5 *- public water consumption awareness campaign*

In recent years, the Municipal authority, along with the Water Service Company, focused mainly on the implementation of measures designed to improve the sewerage management and to reduce the pollution load affecting surface water bodies. The *Water Area Plan* – i.e. the overall programming tool – was drafted and then followed by the *Operational Plan*, which implemented a series of effective projects, aimed at extending the sewerage system to the peripheral areas of the city, which were previously not catered for. One of the largest investments made over the past 10 years concerned a nearly 10 million Euro investment, which has allowed to connect about 11.500/inhab/eq. to the sewerage system.

At the same time, a considerable effort was made to improve the connection of a few historical buildings built between 1950s and 1980s to the sewerage system, which in many cases discharged waste water directly into surface water bodies. This project made it possible to reduce the pollution load of the canals and other small water bodies and comprehensively improve the quality of water flowing through the city.

Further extraordinary maintenance works have improved the service quality such as, for example, the installation of remote control systems on an increasing number of plants. This has resulted into a drastic reduction of malfunctioning system recovery time, with a consequent reduction of sewage spills in surface water bodies.

Additionally, most mixed rain water and waste water pumping stations were retrofitted thanks to the revamping of electromechanical parts, which has improved the pumping system reliability.

Modernization work was carried out on all the water storm overflows, adjusting the amplitude to comply with

the dilution ratio required by law. This has made it possible to significantly reduce and in many cases eliminate spill episodes in receiving water bodies, preserving the water quality.

A few measures that are worth mentioning include a scheduled monitoring and cleaning plan of pumping stations, of rain run-offs, overflows, in addition to a dedicated cleaning plan and simultaneous video inspection of the sewerage network. This maintenance strategy is supported by a software architecture called AM WFM, which traces every maintenance operation that is performed and serves as guidance for any further extraordinary maintenance plans based on feedback from the field. These predictive maintenance techniques (or Machine Learning) are characterized by systems that are able to learn and detect any changes in situations detected in the field and to suggest check frequency variations, thus making it possible to significantly increase maintenance efficiency.

9C. Future Plans

Describe the short and long term objectives for water management and the proposed approach for their achievement, including how they are influenced by the expected impacts from climate change and other long-term trends. Emphasise to what extent plans are supported by commitments, budget allocations, and monitoring and performance evaluation schemes.

Place particular emphasis on water quality goals and on key water saving and reuse targets for the future and the proposed approach to achieve these, including technical and nature-based measures incorporating water infrastructure to deal with future impacts of climate change.

Describe the future short and long term objectives for waste water treatment and management and the proposed approach, and specify the measures for their achievement. Emphasise to what extent plans are supported by commitments, budget allocations, and monitoring and performance evaluation schemes. Emphasise to what extent plans are triggered by the demands of EU and national regulations.

Please describe future action/plans taken regarding water (re-opening of water-courses, housing development with specific regard to water issues). Reference to legal action may be give (e.g. obligation for green roofing, subsidies for disconnection to sewer, unsealing measures); describe intentions and best practice measures and indicate its planning status (intention or detailed planning).

Refer to:

1. Improvement/maintenance/management of collecting systems;
2. Improvement of connection to collecting systems and to the UWWTPs (inter alia, additional percentage of PE forecasted to be connected);
3. Improvement of design capacity, treatment level and treatment performance of UWWTPs and indicate if these go beyond the requirements in the Directive;
4. Improvements of further environmental and economic aspects of waste water treatment (e.g. removal of emerging substance, micropollutants, pharmaceuticals, micro-plastic particles and pollution prevention measures; and measures on water reuse;
5. Measures to improve public information and participation;
6. Other improvements.

(max. 800 words and five graphics, images or tables)

In 2018 water leakages accounted for 32.5% of the water fed into the distribution network. Although this data shows a progressive deterioration in all Italian cities and the value of Parma is lower than the average recorded in other chief towns - accounting for 39.1% (2) - it still is a high value. The Municipality is engaged in the implementation of appropriate enforcement actions through an improvement in the monitoring of the water networks and the **definition of an intervention program to halve the network losses by 2030**.

The Municipality has also decided to increased investments to improve the water distribution, sewerage and treatment infrastructure management, also through other forms of funding other than fees. In particular, monitoring activities will be carried out and further extended to check the sewerage connection to the old town buildings, to avoid any discharge of untreated waste water into surface water bodies.

The Water Service Company, in addition to continuing with the implementation of special distribution network and pumping equipment maintenance plans, will adopt more innovative water leakage monitoring tools, such as satellite tracking systems, to monitors the millimetric displacements of identified fixed points, thus detecting, through the use of sophisticated algorithms, whether any possible movement is attributable to a loss on the sewerage network. The satellite scanning frequencies and the comparison with the time series data of the same fixed point will ensure intervention times for the repair of potential breakdown of the sewer pipes by far shorter than the current standard. The reduced repair time will consequently improve the quality of surface and underground water.

We will also adopt NO DIG repair techniques, instead of proceeding - as done so far - directly with the replacement of the pipe across the excavation. Thanks to these new techniques the repair and maintenance time will be shorter compared to traditional ones, with the obvious advantage of reducing the spillage time in the groundwater or surface water body. Obviously this brings other benefits because it will ensure lower impacts on traffic, will not affect the well-being of residents, by reducing the production of dust due to excavations and embankments, will reduce greenhouse gas emissions, which would instead derive from the use of traditional pipe replacement equipment. Whenever the cost-benefit ratio shows that it is more advantageous to replace pipes, the system operator shall opt for higher quality replacement pipes than those previously installed, providing at least the same performance and proving to be more environmentally friendly.

In addition, we will purchase new electric pumps for both the aqueduct and the sewage lifting systems, which shall ensure an energy saving and at the same time a greater system reliability and flexibility.

We will increase efficient use and saving of water in urban areas, by means of communication and information campaigns addressed to citizens, the distribution of further water flow reduction devices, the completion of the installation of smart metering units that will allow users to track and modify their consumption habits.

The Municipality wants to deeply extend the reuse of treated water, as well as rainwater, using sustainable urban drainage systems (SUDS), methods and techniques for rain water treatment and management. The construction of water storage basins has already been planned within the *Municipal Structural Plan* (4) and other interventions, as well as the timing of implementation and the necessary resources, will be identified in the context of the *Climate Change Strategy and Action Plan*, which will be completed by December 2020. In

this context the municipality also identified the objective of recovering 10% of the water leaving the treatment plants by 2035.

Finally, Parma wants to improve the relationship of citizens with the city's water bodies, it wants people to rediscover the value and beauty of rivers. This is also why the *Parma River Urban Park* by 2025 will be established. This protected area will be set up with various aims, in particular to improve the ecological status of the Parma river and offer new green leisure areas to citizens.

Figure 6 *– The Parma River*

9D. References

List supporting documentation, adding links where possible. Further detail may be requested during the pre-selection phase. Documentation should not be forwarded at this stage.

(max. 400 words)

1. **Water Service Company (IRETI)**

   https://www.irenacqua.it/
2. **Italian National Institute of Statistics - ISTAT: Ambiente Urbano, 2016**
3. **Data provided by the Regional Agency for Prevention, Environment and Energy of Emilia-Romagna (Arpae)**

   https://www.arpae.it/dettaglio_generale.asp?id=2711
4. **Eticopoli project**

   http://www.cirea.unipr.it/eticopoli/
5. **Municipal Structural Plan - PSC 2030 (MSP)**

   http://www.comune.parma.it/pianificazioneterritoriale/PSC---Piano-Strutturale-Comunale.aspx
   http://www.comune.parma.it/pianificazioneterritoriale/variante/c0bc7c20-a1e8-4df2-96b4-b4bf535819c1.aspx

Word Count Check

Please complete the below word count check for Indicator 9: Water, Sections 9A, 9B and 9C.

As per the Guidance Note (Annex 2 of the Rules of Contest), the word count includes text in graphics/tables and the body of text. The word count excludes text in the original application form, captions and text in Table 1: Benchmarking Data - Water.

Section	Number of words in graphics/tables	Number of words in body of text	Total number of words in graphics/tables and body of text	Max. words
9A	**6**	**654**	**660**	800
9B	**0**	**620**	**620**	1,200
9C	**0**	**715**	**715**	800