9. Water

Refer to Section 2.9 of the Guidance Note

9A. Present Situation

Indicator		Unit	Year of Data
Domestic usage (drinking water) - litres per capita per day	97.01	litres/capita/day	2016
Total usage (drinking water) - litres per capita per day	149.79	litres/capita/day	2015
Water loss in pipelines, leakage management and network rehabilitation	12.75	%	2016
Percentage (%) of total annual generated waste water load, connected to waste water collecting system + urban waste water treatment plants (UWWTPs)	88.49	%	2016
No. of WWTP*	5	Number	2016
Total design capacity (Population Equivalent - PE)	649 113	PE	2016
Total load received by UWWTP (PE)	288 680	PE	2016
Connection rate	100% (sewers 95.33% + septic tanks)	%	2016
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.	Explained below in description of UWWTP	Treatment level	
Waste water re-use (describe type of re-use)	Not used	%	

Ostrava's water management is exceptional in a number of ways: the city has sufficient long-term sources of drinking water (including groundwater of outstanding quality), low water consumption per capita, a higher-than-average waste water treatment capacity (facilitating the future development of the city), and the most modern water treatment technologies.

Image 1: Company OVAK motto: "We live water – We live Ostrava"

Drinking water

Ostrava's public water supply network is run by the Ostrava Water and Sewerage Company (OVAK), which is part-owned by the City (the Mayor is the Chairman of the Board of Directors). The network consists of 1 046 km of water mains, 31 852 connecting pipelines (420.4 km), 32 324 network-integrated water meters, 47 pumping stations, 15 water tanks (total volume 40 540 m^3) and a water treatment plan at Nova Ves.

65% of the drinking water in Ostrava is treated **surface water** from dammed reservoirs in the wider region, supplied via the regional water main network. The remaining 35% of supplies are groundwater. The main sources are the reservoirs at Sance, Moravka and Kruzberk. Water from these reservoirs is treated before being supplied to consumers. Ostrava's drinking water meets all legislative quality and hygiene standards.

Year	2013	2014	2015	2016
Domestic use	10 886	10 643	10 822	10 649
Other	5 226	5 220	5 263	5 044
Total drinking water supplied	**16 112**	**15 863**	**16 085**	**15 693**

Table 1: Drinking water supplies (thousands m^3)

Groundwater sources

Out of the 300 700 inhabitants connected to the public water supply system (2016), over two-fifths are supplied with groundwater. The annual production of drinking water from groundwater sources

fluctuates between 5.9 and 7.5 million m^3. The location of groundwater sources minimizes distances to end users and ensures that essential drinking water can be supplied quickly in emergency situations. Groundwater is extracted in a sustainable manner in order to ensure that this renewable resource remains available on a long-term basis.

Preventive maintenance of the water supply network also helps to ensure that drinking water sources are used efficiently. A new method of preventive maintenance – ice pigging – has now been introduced.

Data on energy consumption of distributed water is not available.

Waste water

Key technical data on sewerage and waste water treatment

Ostrava's sewer network is 1 057 km in length (including house drains). It removes waste water from domestic and industrial premises. The majority of the public sewer system is a combined system (both waste water and surface runoff), though separate sewerage systems have been installed in some recently built areas. The city's sewer network consists of several subsystems supplying waste water treatment plants or carrying waste water direct to a recipient body of water.

Ostrava is expanding its sewer network to serve a number of outlying districts (municipalities), connecting them to the central waste water treatment plant. Sewer maintenance uses modern technologies including pressure and combined trucks as well as camera systems.

Indicator	unit	2014	2015	2016
Waste water treatment plants - number	number	5	5	5
Waste water treatment plants - capacity	m^3/d^{-1}	186 536	186 536	186 536
Length of sewerage network	km	851	866	880
Waste water collected by public sewers (excl. surface runoff)	thousand m^3	15 993	15 751	15 422
Of which: waste water treated	thousand m^3	30 290	30 001	31 852
Treated waste water (incl. surface runoff)	thousand m^3	30 785	30 090	32 309
Sludge produced by waste water treatment plants	t dry weight/yr^1	8 445	8 242	9 346

Table 2: Selected information on waste water treatment in Ostrava (2014-2016)

Waste water treatment plants

Ostrava's waste water treatment plants (WWTPs) are run by the Ostrava Water and Sewerage Company (OVAK). All WWTP operations are fully compliant with the legislation stipulating quality requirements for treated water and sludge. There are also 35 waste water pumping stations and two retention reservoirs. In 2016, Ostrava's WWTPs treated a total 31.9 million m^3 of waste water. The Central WWTP in Ostrava-Privoz also treated over 533 000 m^3 of concentrated waste water from the coking and heating industries and produced 4 million m^3 of biogas, which was used to generate 5.2 MWh of electricity. A total 27 090 t of dewatered sludge was produced. The dried and hygienically cleaned sludge is used to produce substrate for the recultivation of landfill sites and areas suffering from mining-related ground subsidence.

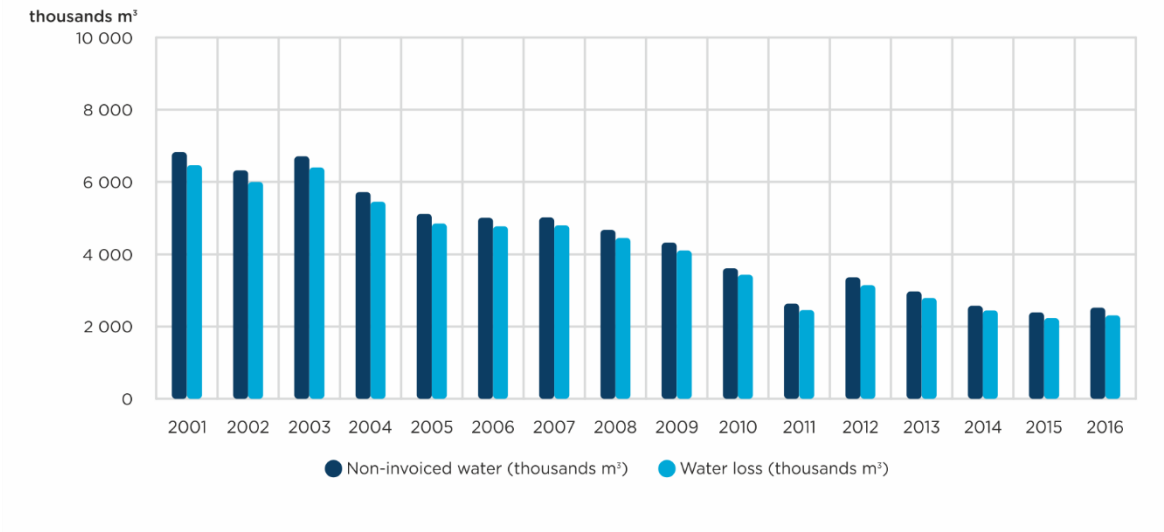
Image 2: Waste water treatment plant in Ostrava-Privoz

A key water management issue for Ostrava is flood protection (see section Past).

9B. Past Performance

Drinking water

Key priorities in the management of Ostrava's water supply network include minimizing water loss and achieving a gradual reduction in operating costs. In 2016 water loss accounted for 12.75% of the total volume; this was the second lowest level in the past 15 years.

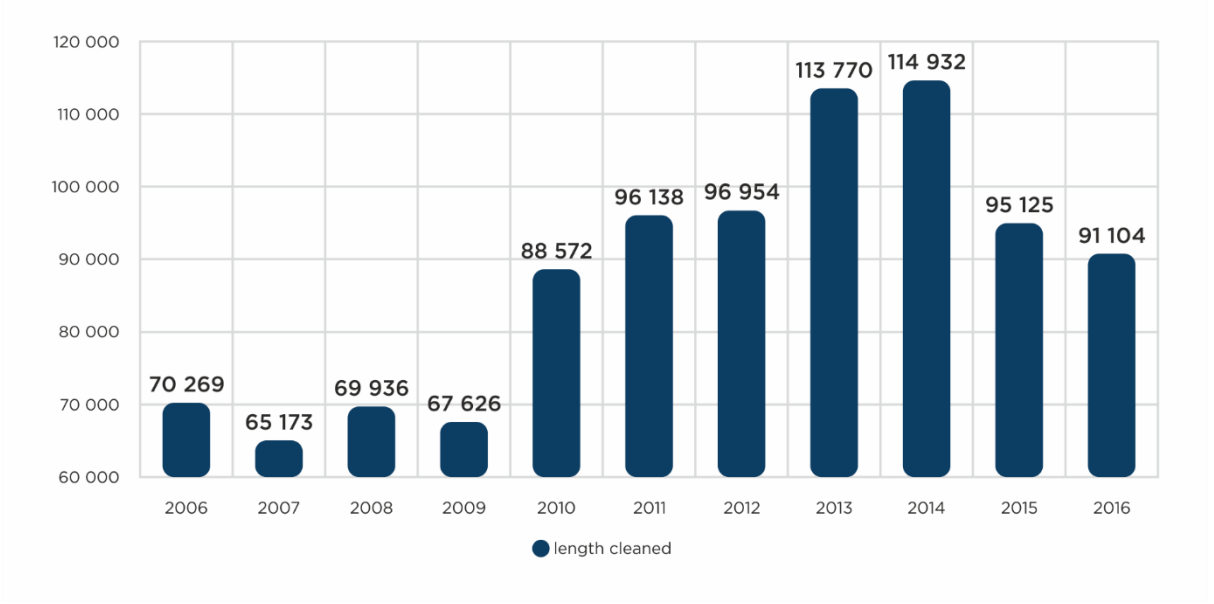


Graph 1: Non-invoiced water and water loss 2001-2016

Waste water

In recent years Ostrava has conducted intensive maintenance work on its waste water collecting and sewerage system (inspection, cleaning, technical monitoring). The total number of metres inspected and cleaned grew year-on-year until 2015, when there was a planned decrease as a result of the City's acquisition of a large network of existing waste water collection/sewerage infrastructure from previous owners. In 2016 over 91.1 km of the waste water collection network was cleaned, and 77.6

km of the sewer network was inspected using a camera system.



Graph 2: Length of sewer cleaned in 2006-2016 (metres)

Central Waste Water Treatment Plant

98.7% of waste water treatment in Ostrava takes place at the mechanical-biological Central Waste Water Treatment Plant (CWWTP) in Ostrava-Privoz, which receives waste water from the majority of the city and water treatment complies with UWWTD. The CWWTP was opened in 1996, and it gradually replaced most of the city's existing WWTPs, which were technically obsolete and no longer had the required capacity. The CWWTP uses mechanical/biological methods to treat domestic and industrial waste water applying the principle of low-loaded activation with nitrification and upfront denitrification. The anaerobically stabilized sludge is dewatered in centrifuges featuring an automated technological process management system and sanitized using lime. This complex process ensures that waste water treatment is conducted to the highest standards, and the high capacity of the CWWTP (638 850 PE) enables it to cope with the city's future development needs. The high capacity is also necessary because the CWWTP treats waste water not only from domestic sources (the majority of Ostrava's inhabitants), but also:

- from the food industry;
- from other industries (after prior pre-treatment);
- from coking plants in Ostrava (concentrated phenol-ammonia water).

All the other WWTPs use at least second-degree mechanical-biological treatment. One of the WWTPs (Michalkovice) uses long-term activation technology which is highly effective in removing organic impurities and nitrogen pollution.

In 2016, the Ostrava Water and Sewerage Company (OVAK) focused on achieving systematic reductions in energy consumption. The CWWTP in Ostrava-Přívoz operated cogeneration units to burn sludge gases, producing 5.2 MWh of green electricity for the mains network. A small hydroelectric power plant at the Muglinov WWTP produced 39 MWh of electricity. Energy savings were also achieved by modernizing pumping equipment. The company uses 17 CNG-powered vehicles.

A key priority for the company is to raise public **environmental awareness through education and promotion**, so it organizes a range of educational events as part of World Water Day and Earth Day. During 2016 the company organized 30 public tours of its facilities and infrastructure and created a unique new exhibition on the history of water management in Ostrava.

Image 3: Exhibition on the history of water management in Ostrava (Babylon museum)

As part of its **Smart Metering project** (for details see Future Plans), the company replaced 2000 meters with new smart meters enabling remote on-line monitoring of water consumption.

Flood protection

A key water management issue for Ostrava is flood protection. In 1997 the city was hit by massive floods; this led to numerous flood defence measures (see Figure 1). The City introduced preventive measures and prepared a set of measures to be implemented in a flood situation.

The preventive measures include legislative and administrative changes, flood plans (covering the entire drainage basin, municipalities, and sites/buildings in flood zones), and the construction/installation and maintenance of flood defence structures and equipment.

The measures to be implemented in a flood situation include the activation of a flood forecasting and public announcement system, ongoing monitoring of all meteorological and hydrological parameters, and forecasting-based methods enabling action to be taken when and where it becomes necessary.

The flood zones of Ostrava's watercourses (including the active area within the flood zone) are delineated by the responsible authorities. The City has drawn up a Flood Plan including measures to be implemented at the level of the individual municipal districts, and it also has a Flood Commission. Ostrava's flood defence system is co-funded by the state and the City budget.

In 2014 Ostrava created a Digital Flood Plan which incorporates the territories of outlying municipalities that are partially integrated into the City of Ostrava; the plan sets out measures to prevent or mitigate potential flood-related damage.

A natural form of flood defence is the Protected Landscape Area Poodri – an area situated along the banks of the Odra River before it enters the city, and partially within the city boundaries (see Chapter 5); this enables floodwater to disperse into extensive buffer areas consisting of riparian woodland and alluvial meadows.

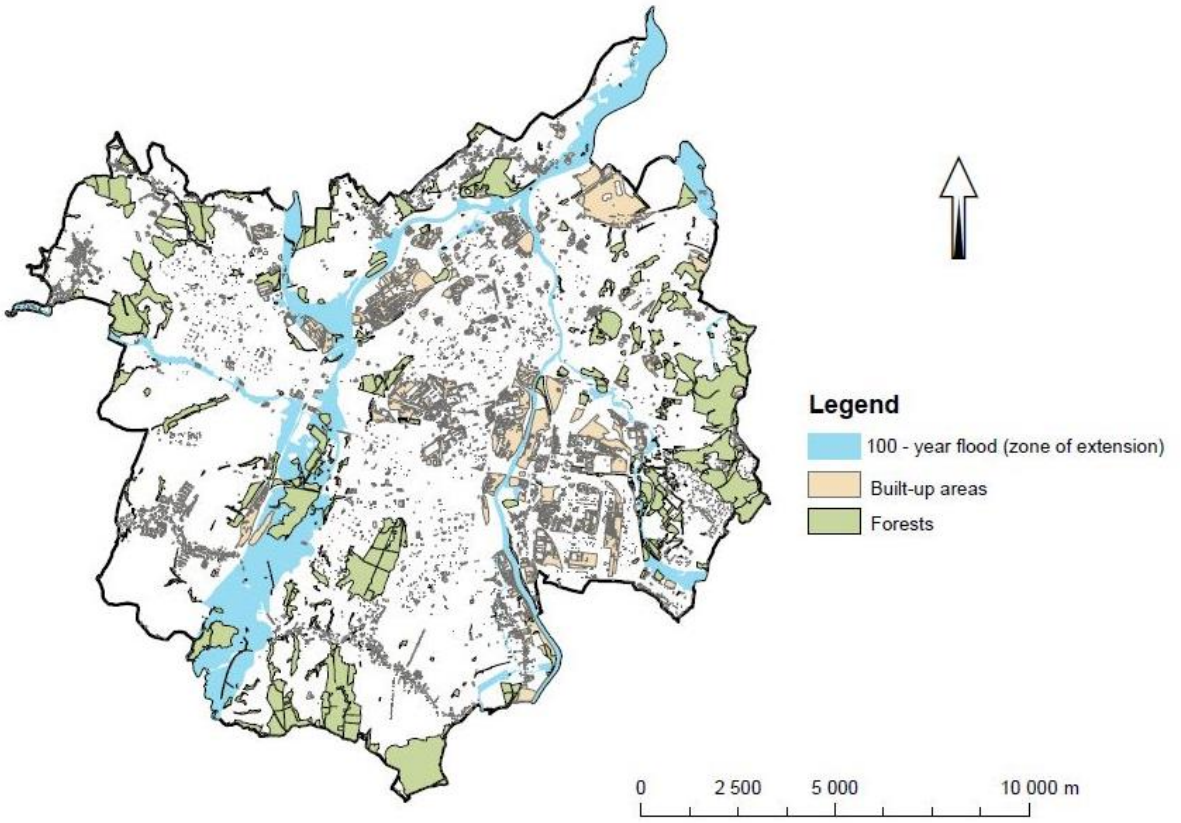


Figure 1: Flood zones in Ostrava

9C. Future Plans

The Ostrava Water and Sewerage Company (OVAK) pursues an environmental policy as a key part of its integrated management system for quality, environmental protection, and occupational health & safety.

Plans to fund the renovation and development of the water supply and sewerage networks

Following a successful pilot project (2015), the company will continue cleaning its water supply network using a sophisticated new method (**ice pigging**) at other suitable locations in the city.

This sophisticated method involves injecting a pressurized mixture of ice slurry and salt into the pipelines, which cleans the pipe far more effectively than standard water jet or air cleaning methods. Ice pigging is a revolutionary new development in water management infrastructure maintenance; though it is relatively expensive to test, it has the potential to significantly reduce water loss and

retain excellent quality standards. The main advantage of the ice/salt mix is its abrasive effect, which can remove up to a thousand times more dirt than previously used methods – regardless of the material that the pipe is made from. There is also a 50% reduction in water consumption compared with standard methods (water jet cleaning), as well as a 50% time saving. The risks of ice pigging are negligible; if any problems occur, the ice will soon melt.

Image 4: Ice-pigging equipment

The company also plans to expand its Smart Metering system which enables remote monitoring of water consumption. The number of customers using this system is set to grow to 8000 by 2019. In the longer term, smart meters may be installed at all metering points (32 000 in the city). Smart metering offers several practical benefits. It provides access to data on water consumption (current levels and history) via an internet portal; this alerts users to abnormal consumption levels, helping to detect leaks and minimize damage and costs. The system collects data via transmitters located on the meters, which are sent as an encrypted signal at radio frequency 169 MHz and then via GPRS to the server where the data are processed. Users and the service provider have access to the data, and can select various display formats via the user interface. The system can alert users to abnormalities by sending an e-mail or SMS message.

Image 5: Smart metering of water consumption

The company will also continue to run **educational/promotional programmes** raising public awareness of water conservation, in line with the company's motto: "We live water – We live Ostrava".

An example of such a programme is the 'Free Water Zone' concept, which encourages people to drink tap water. The concept has two components: the Water Bar and the "Water Gate" (an inflatable gate which produces a fine spray of water mist for refreshment on hot day). Tap water is often not available at many events, but the unique Water Bar solves this problem with a direct linkup to the drinking water mains providing pure, fresh water at an ideal temperature (7-10 °C). The Water Bar has become very popular among organizers of cultural events or happenings, and its popularity continues to grow.

Image 6: OVAK´s Water Gate

The company will also develop its range of environmental education activities, encouraging people to use natural resources responsibly and sustainably (in line with the company's slogan "Professional with respect to nature"). This includes the production of educational materials (board games

presenting the water cycle and other aspects of water) and the organization of various events (the children's competition "Find the source" and other activities, mainly for World Water Day).

9D. References

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