8. **Water management**

8A. **Present Situation**

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 area, including the situation of your river basin (e.g. if you are regularly experiencing droughts, scarcity and/or floods and expected future trends). Where available, information/data should be provided from previous years (5–10) to show trends. Detail the present situation regarding water demand of different sectors and describe plans currently in place to reduce water consumption.

Make reference to:

1. Total water consumption (in cubic meters/year and litres/capita/year) including a breakdown for different sectors (households, industry, energy, agriculture, small business, tourism, public sector);
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);
5. Water loss in pipelines, leakage management and network rehabilitation;
6. Storm water management;
7. How the links between water and energy consumption (water-energy nexus) (e.g. through pumping, treatment, heating) is taken into account;
8. Water recycling initiatives (grey water);
9. Compliance with the EU Water Framework Directive and other EU/national/regional legislation applicable at the city level.

*(max. 600 words)*

The water management in Ljubljana is the responsibility of the public company Vodovod-Kanalizacija (VO-KA).
Figure 1: Central water supply of the City of Ljubljana
Table 1: Water consumption by categories (2012)

<table>
<thead>
<tr>
<th>Category</th>
<th>Annual water consumption by categories (m³/year)</th>
<th>Water consumption per capita (l/year)</th>
<th>Daily consumption per capita (l/day)</th>
<th>Share of consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>14,147,772.55</td>
<td>44,880.08</td>
<td>122.96</td>
<td>67.47%</td>
</tr>
<tr>
<td>Companies, banks</td>
<td>2,092,981.15</td>
<td>6639.43</td>
<td>18.19</td>
<td>9.98%</td>
</tr>
<tr>
<td>Other industry</td>
<td>734,465.38</td>
<td>2329.90</td>
<td>6.38</td>
<td>3.50%</td>
</tr>
<tr>
<td>Hostels/boarding houses (workers, students)</td>
<td>571,282.22</td>
<td>1812.24</td>
<td>4.97</td>
<td>2.72%</td>
</tr>
<tr>
<td>Municipalities, state institutions</td>
<td>559,510.69</td>
<td>1774.90</td>
<td>4.86</td>
<td>2.67%</td>
</tr>
<tr>
<td>Hospitals, healthcare institutions</td>
<td>515,562.99</td>
<td>1635.49</td>
<td>4.48</td>
<td>2.46%</td>
</tr>
<tr>
<td>Schools</td>
<td>462,843.83</td>
<td>1468.25</td>
<td>4.02</td>
<td>2.21%</td>
</tr>
<tr>
<td>Catering establishments</td>
<td>268,507.89</td>
<td>851.77</td>
<td>2.33</td>
<td>1.28%</td>
</tr>
<tr>
<td>Utilities</td>
<td>240,562.84</td>
<td>763.12</td>
<td>2.09</td>
<td>1.15%</td>
</tr>
<tr>
<td>Food service industry</td>
<td>217,693.35</td>
<td>690.57</td>
<td>1.89</td>
<td>1.04%</td>
</tr>
<tr>
<td>Bathing facilities and sports complexes</td>
<td>199,300.80</td>
<td>632.23</td>
<td>1.73</td>
<td>0.95%</td>
</tr>
<tr>
<td>Hotels</td>
<td>189,250.89</td>
<td>600.35</td>
<td>1.64</td>
<td>0.90%</td>
</tr>
<tr>
<td>Small businesses</td>
<td>176,487.08</td>
<td>559.86</td>
<td>1.53</td>
<td>0.84%</td>
</tr>
<tr>
<td>Nursery schools</td>
<td>157,881.13</td>
<td>500.84</td>
<td>1.37</td>
<td>0.75%</td>
</tr>
<tr>
<td>Consumption by JP VO-KA</td>
<td>154,171.00</td>
<td>489.07</td>
<td>1.34</td>
<td>0.74%</td>
</tr>
<tr>
<td>Metals and metalworking industry</td>
<td>67,861.00</td>
<td>215.27</td>
<td>0.59</td>
<td>0.32%</td>
</tr>
<tr>
<td>Cultural institutions</td>
<td>56,973.91</td>
<td>180.73</td>
<td>0.50</td>
<td>0.27%</td>
</tr>
<tr>
<td>Other</td>
<td>154,626.60</td>
<td>490.51</td>
<td>1.34</td>
<td>0.74%</td>
</tr>
<tr>
<td>Total</td>
<td>20,967,735.30</td>
<td>66,514.62</td>
<td>182.23</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Ljubljana lies above its own underground water sources

Water supply system distributes untreated natural water which proves that the city's development has been and is closely tied up to sustainable measures for the protection of water sources.

The main source of drinking water for Ljubljana's central water supply system is the Ljubljansko Polje aquifer, which is part of the VD 1001 Sava Basin and Ljubljana Marshes water body and lies within the Danube watershed.

The water resource lies beneath agricultural (43%) and urban (41%) surfaces. In both parts there are monitoring sites to monitor the quantity and quality of groundwater.

Monitoring stations

A network of more than 60 monitoring stations has been established. Monitoring of situations arising as a consequence of man-made or natural events is continuous and enables timely adaptation to emergency situations.

The use of groundwater for potable water supply is sustainable, with pumped quantities falling and dynamic reserves only partly exploited.

The pump systems use a great deal of electricity. In order to optimise the consumption of electricity the wells are periodically revitalised.
After cleaning the sinkage is minimal (Figure 2).

**Monitoring groundwater level at the VD Kleče-3 well**

![Graph showing groundwater level over time](image)

**Figure 2: Monitoring the level of groundwater in the VD Kleče-3 well after revitalisation**

The groundwater in the Ljubljansko Polje aquifer is suitable for obtaining heat through the use of heat pumps. The wells for water/water heat pumps exploit the constant temperature of the groundwater of around 11°C.

**Condition of the water supply network**

Between 1994 and 2004, through regular and systematic inspection of the water supply network, analysis and renovation, we succeeded in reducing loss of water from the system by a remarkable 57% compared to the base year (1994).
Great progress in the reduction of water losses has been achieved through improvements in expertise, the use of modern technologies for finding and analysing water losses and through renovation and expansion of the network.

Figure 3: Fall in the share of unsupplied water compared to 1994
In the last five years we’ve renovated approximately 14km of the system annually and modernised technology (flow and pressure meters, water loss detectors, GIS technology, mathematical models…). Due to excellent natural conditions in Ljubljana we don’t expect water shortages, since even in drought periods consumption is sustainable and doesn’t have short or long-term impact on the environment.

**Following and upgrading the requirements of EU legislation**

The European Water Directive is a fundamental document. Water sources in Ljubljana are traditionally protected by water protection zones (the first was established already in 1955).

**The compliance of drinking water in Ljubljana at an extremely high level**

At the annual level the share of microbiologically non-compliant samples is approximately 1.5%, while non-compliance of physical-chemical parameters doesn’t represent a relevant problem. In Ljubljana the number of days in which customers are supplied with non-compliant drinking water equals zero. Ljubljana citizens are used to drinking tap water, at home and in restaurants.

**Management of rainwater run-off**

In most areas rainwater from roofs and hard surfaces is led into central sewerage system. This system is constructed primarily as a combined system (approximately 80%).

In order to mitigate the waste water load during heavy downpours, 66 discharges are built into the sewerage system, most of them on the main collectors. From 2008 to 2013 three retention pools were built with a total capacity of 30,500m³ and one retention channel.

One of the most important measures for reducing rainwater run-off is the strictly required drainage of rainwater (from roofs and hard surfaces) in procedure of issuing construction documentation and connection permits, where possible.

In order to monitor water quantities at crucial points of the sewerage system there are currently 30 measuring devices for monitoring waste water levels.

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**Figure 4: Annual length of new water pipelines**

In the last five years we’ve renovated approximately 14km of the system annually and modernised technology (flow and pressure meters, water loss detectors, GIS technology, mathematical models…).
8B. Past Performance

Describe the measures implemented over the last five to ten years for improving water management. Comment on which measures have been most effective.

Make reference to:

1. Technical, economic and institutional measures adopted and their effectiveness in achieving reduction of total water consumption;
2. Byelaw implementation in relation to efficiency in water usage, tariff and metering systems;
3. Awareness raising campaigns.

(max. 1200 words)

Measures to reduce water consumption

In order to increase savings of drinking water, the City Council adopted the Ordinance on the Urban Master Plan of the City of Ljubljana in 2010, which provides that:

- a building with a gross floor area of more than 1,500 m² must have a system for the collection, storage and use of rainwater from the roof, for the reuse of this water in the building or its grounds. For example, Slovenia’s largest stadium Stožice has rainwater cisterns which are used to water the grass;
- users of processing water must use closed systems that recycle the water consumed. In sports complex Stožice we installed a system of waterless urinals, which we’re introducing in all sports facilities, renovations and constructions;
- water losses in the water supply network shall be reduced by 15-20%.

Another way in which we encourage citizens to use water rationally is with a tariff system for drinking water consumption (since 2009). The cost of water consumption depends on the average daily consumption of water in the building. In Ljubljana water consumption is measured with meters at all consumption points.

Normalised water consumption for an individual building is determined on the basis of the following criteria:

- in buildings where water consumption is measured by water meter, normalised consumption is determined on the basis of the capacity of the water meter,
- in buildings where water consumption in individual residences is unmeasured, normalised consumption is determined on the basis of the number of inhabitants and normalised consumption of drinking water (150 l/person/day).

Annual water consumption that exceeds normalised consumption for the building is considered excessive consumption of drinking water and is charged at a price that is 50% higher than the price for normalised consumption of water.

One of the effective measures to encourage saving is the water use fee, defined by a government decree. Because of the higher cost per unit of water consumed, the water use fee encourages users to save drinking water. As a consequence, the quantity of billed water consumption in Ljubljana has been falling since 1988. The drop in consumption has been especially pronounced over the past three years.
Achieving and upgrading national legislation requirements
Regulations promulgated in 2012 strongly impact management of water supply system operators:

The Decree on drinking water supply (OG RS No 88/12) is an umbrella document which defines the types of tasks which are performed within the framework of compulsory municipal commercial drinking water companies, equipment standards for companies, methods and conditions for the supply of drinking water and the obligations of municipalities and public operators. The requirements on equipment standards and conditions for the supply of drinking water are taken into account when drafting expert guidelines for project documentation for the construction of public water supply systems and residential connections. Drinking water conditions are also consistently taken into account when issuing spatial planning, guidelines and construction documentation.

The Decree on the Methodology for Forming Prices of Municipal Environmental Protection Services Under a Public Service Obligation (OGRS 87/12) strongly affected the method of charging for the services of drinking water supply as well as drainage and treatment of waste water. The Decree has introduced new requirements for acquiring data and creating databases, particularly in drainage and treatment of run-off waste water, which to date have not been urgently needed from the perspective of charging for services. The establishing of databases and adjustment of charging practices is a long-term process. The project Cadastre of surfaces contributing to rainwater run-off in Ljubljana was carried out in 2007, and now serves as the basis for the establishment of official records. In September we conducted a “questionnaire survey” that will help us to improve the records and to form and implement a new method of charging in accordance with the Decree.

Active dialogue with citizens
We’re aware of the importance of active communication with citizens. We do more than simply follow the legislative provisions that oblige us to provide information. Since 2006 the Public holding company Ljubljana has been monitoring user satisfaction with our services through regular surveys and a panel. Public company VO-KA is included in these surveys and users rate their satisfaction on a scale of 1 (dissatisfied) to 5 (very satisfied).
Raising public awareness
We systematically inform citizens about the importance of drinking water and how important it is to manage it responsibly and preserve water sources. We’ve redesigned our website and have a free information hot-line. We provide advice in the Ljubljana magazine (sent free of charge to all households), presentations, radio and television programmes, leaflets/brochures in printed and electronic form, draw attention to current environmental topics and offer instructions. Innovations and new services are also presented on city buses, where they reach a wide audience.

We devote particular attention to children, since we’re aware that they represent our most susceptible target audience. We’ve designed a mascot called “Cevko”, in the form of a water pipe with his own website (www.cevko.si). We hold Cevko’s workshops in nursery and elementary schools, and Cevko is also a regular guest at children’s events, environmental gatherings and other events. In June 2013 we organized a contest for children and handed prizes for the best artwork on the water theme.

We actively participate in various events and trade fairs which are not intended solely for children. We took part in an event prepared by the Ministry of Agriculture and the Environment called “Water Connects”, and presented our vision and mission at the Eco conference in April that takes place every year as part of the international trade fair Nature and Health.

Figure 6: We will continue raising awareness among children and young people with our mascot Cevko.

We’re also proud of our new online service (www.primavoda.si) which presents facts about water in an innovative manner. The website is interactive, educational and user-friendly. The materials are also specially adapted for educational purposes in collaboration with schools and educational experts.

In the coming year, Ljubljana will celebrate the 2.000th anniversary of Emona, a Roman city which stood on the site of the present Ljubljana city centre. In homage to the achievements of the Romans and to water as an important element of the urban environment of that time, we’ve developed an application called ‘Roman Emona’ which in an interactive manner presents the water supply and sewerage installations in Emona and various other information.
For the last 12 years we’ve been organising annual clean-up campaign “For a More Beautiful Ljubljana”, which takes place between World Water Day (March, 22) and World Earth Day (April, 22). We emphasise the importance of water and at the same time we clean the Ljubljanica River and its banks and has become a popular tourist event.

Figure 7: The history of public drinking water supply and sewerage in Ljubljana goes back to the Roman Empire (www.primavoda.si/rimskaemona).

18 public drinking fountains operate in Ljubljana from April to October, which are connected to the public water supply system and are maintained and monitored on a regular basis. Information on the fountains and on the conformity of the drinking water in the fountains is available on our website, and as application for smart phones, which shows the route to the nearest fountain.

Figure 8: Rubbish from the Ljubljanica placed on view to raise citizens' awareness.
8C. 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 emphases on key water saving and reuse targets for the future and the proposed approach to achieve these, including measures incorporating water infrastructure to deal with future impacts of climate change.

(max. 800 words)

Maintaining outstanding high quality water supply in the future

In Ljubljana we’re very aware of the importance of conserving unspoiled natural water sources and saving water that is why we constantly raise awareness among our citizens.

In the last decade climate change has been reflected in extreme weather, exceptional rainfall events and long periods of drought. The European CC-WaterS project (Climate Change and Impacts on Water Supply, 2009-2012, budget: €4.3 million) has included modelling of the most likely scenarios that we can expect in the future. The results of the project show the impacts that climate change will have on the supply of drinking water. It also evaluates proposed measures for the management of drinking water supply. In Ljubljana it is clear that, despite climate change, water shortages are not to be expected in the future. Groundwater recharge at the Ljubljansko Polje area is three times greater than water consumption. No significant increase in water consumption is expected. But even if the quantity of groundwater will not be a problem in the future, it will nevertheless be necessary to implement measures to maintain its quality. The study evaluates the preparation of drinking water as the last possible measure, since it involves high costs.

For all these reasons a climate change adaptation strategy is not a first priority; however it’s necessary to vigorously pursue measures to ensure that the quality of groundwater is maintained. These measures include the protection of water protection zones, compensation to farmers for loss of income in the strictest water protection zones, repairs and completion of the sewerage system, reduction of water losses, new water plants, groundwater enrichment, etc.
The key focus of our efforts is the preservation of natural water sources:

**Short-term objectives (up to 5 years)**
- further improvement of water supply system monitoring,
- installation of more energy-efficient water pumping facilities,
- optimisation of the water supply system in cases of changed operating conditions,
- informing citizens about the use of modern environmentally friendly solutions in the field of water supply and waste water/rainwater drainage,
- upgrading the monitoring of drinking water abundance and compliance (in reservoirs and in the water supply network),
- further improvement of controls in water protection zones,
- revision of security plans
- replacement of old wastepipes 20km/year.

**Long-term objectives (over 5 years)**
- intensified reconstruction of the water supply network on the basis of the actually identified state of water supply pipelines, considering technical criteria and expert guidelines for the planning and implementation of repairs,
- informing citizens on the importance of long-term conservation of natural water sources and water saving,
- maintaining the role of water protection zones and the abundance and quality of water sources,
- adaptation of drinking water supply systems to climate change,
- improving the security of drinking water supply by discovering, researching and protecting new and additional water sources by planning the existing and new water supply systems.

We prepared long-term objectives for drinking water supply up to 2050. Reducing drinking water consumption will be the result of measures such as comprehensive reconstruction of the water supply network, which will contribute to reducing losses to 5% of pumped water by 2050. We’ll achieve this effect with the introduction of the modern flow and pressure regulation technologies with the introduction of new elements to our operating model (division of water supply network into zones, efficient metering system and remote reading system), showing users the (financial) consequences of irresponsible use of water.

We’ll continue with active communication with citizens and public awareness campaigns. We’ll strive to provide an even higher quality of life for our citizens, for which the City of Ljubljana already received:

- **Earth-Friendly Municipality 2012 in 2013** award (by Planet Earth Society for responsible efforts in the area of protection of natural resources and providing public information about the environment),
- **European Prize for Urban Public Space 2012** for the project “Refurbishment of the Banks and Bridges of the Ljublanica River”. (The project was selected as the winner out of 347 projects from 36 European countries),
- **Greenest Urban Municipality in Slovenia 2011 title**. Water was part of Ljubljana's candidature. This award is an important incentive and motivates the exchange of good practices and innovative green solutions for the future development of cities and the country as a whole. (Organisers: Fit Media - under the banner “Green Slovenia”, the Ministry of the Environment and Spatial Planning..).

Since 2011 the City of Ljubljana and GFS Institute are organizing Ljubljana Forum, a regionally responsible sustainable development initiative. This year’s topic was “Managing Water and Transport in the Danube Region”. Its aim was to present global challenges of managing water transport in the Danube Region.
8D. References

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

(max. 400 words)

The information cited above can be documented by internal material from public company VODOVOD-KANALIZACIJA (VO-KA) and information available on the following websites:

- Drinking water supply programme for 2013, VODOVOD-KANALIZACIJA d.o.o., October 2012.
- Programme of permanent measuring stations in the water supply system – revision phase I, Project No 1556/1 V, VODOVOD-KANALIZACIJA d.o.o., June 2009.
- Vision of Ljubljana 2025, including 93 main projects (in English): http://www.ljubljana.si/en/municipality/vision-ljubljana/
- Public company VODOVOD-KANALIZACIJA website (in English): http://www.vo-ka/en/
- Public Holding Company Ljubljana website (in English): http://www.jhl.si/en
- Project INCOME website (in English): http://www.life-income.si/?lang=2
- Project CC-WaterS website (in English): www.ccwaters.eu


