EGCA 2018, Umeå, Sweden

8. Water management

8A Present situation

Indicator		Unit	Year of data
Domestic usage - Litres per capita per day	128	litres/capita/day	2014
Total Usage - Litres per capita per day	175	litres/capita/day	2014
Water loss in pipelines, leakage management and network rehabilitation	18	%	2014

The water in Umeå is supplied by the municipal utility company UMEVA, which is responsible for Umeå's water production, wastewater treatment and waste management. UMEVA is certified according to ISO 9001, ISO 14001 and OH-SAS 18001.

A total of ten waterworks supply Umeå municipality with drinking water. The biggest waterworks, Forslunda, which supplies about 90% of the municipality inhabitants, is located on a glacial boulder ridge (Vindelälvsåsen) (Fig. 8C1). Since 1913, groundwater has been pumped from this area. The amount and quality of water in the river basin is considered to be secured even in the future.

The groundwater is only treated through a sand filter (to reduce iron and manganese levels) and by adding calcium for pH-adjustment. As a future precaution measure, UV-lights have been installed during 2015.

The national interest of Saami reindeer husbandry has the right to use land for grazing. This can be an issue around water facilities where it can be necessary to put up fences for security reasons.

A1. 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).

Total water consumption remains at a relatively constant level (see also 8B1). The household's domestic consumption 2014 was 128 litres/capita/day.

		Sectorial breakdown, % of total cons.				
	Total consumption (m^3)	Households	Industry	Public sector	Households domestic cons./capita (litres/day)	Total cons./ capita (litres/day)
2005	7 703 136	73%	12%	15%	139	191
2006	7 782 307	72%	13%	15%	137	192
2007	7 661 953	72%	13%	15%	137	189
2008	7 610 065	73%	13%	14%	135	185
2009	7 583 186	73%	12%	15%	133	182
2010	7 507 324	73%	11%	15%	131	179
2011	7 630 585	72%	13%	15%	131	181
2012	7 590 103	72%	13%	15%	128	178
2013	7 650 400	72%	11%	16%	128	177
2014	7 636 575	73%	10%	17%	128	175

Figure 8A1: Water consumption in Umeå municipality, sectorial breakdown is based on available reporting.

A2. Proportion of urban water supply subject to water metering, both for domestic and non-domestic metering.

100% of the urban water is metered. Households report their consumption to UMEVA annually. Companies and property owners with large consumption have automatic meters.

A3. Source of water (surface water, groundwater) – make reference to aquifers and river basin management.

Groundwater from glacial boulder ridges is used. At Forslunda waterworks the ground water level in the aquifer is refilled with water from the Ume river. The infiltrated water becomes groundwater within 6–11 weeks. The proportion of infiltrated ground water in the tap water delivered is about 20–40%.

A4. Quality of drinking water (e.g. how many days of non-compliance with the Drinking Water Directive).

The drinking water in Umeå is of high quality and has always been in 100% compliance with the Drinking Water Directive (no recommendations for boiling water or addition of chlorine).

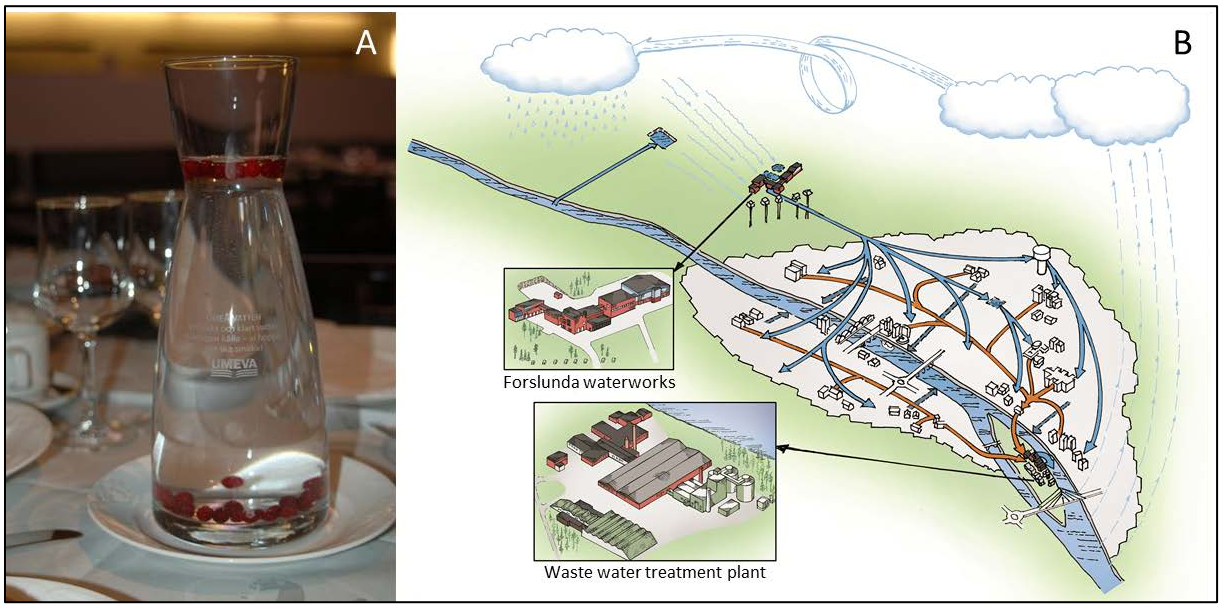

Figure 8A2: The good quality of Umeå's drinking water is included in the environmental objectives of the municipality. (A) Most restaurants in Umeå proudly serve the municipal drinking water, still or sparkling, in carafes. Some of them specially designed and with inscription showing the origin of the water. (B) The cycle of water in Umeå from Forslunda waterworks to the waste water treatment plant at Ön.

A5. Water loss in pipelines, leakage management and network rehabilitation; please provide data on total unaccounted water in percentage and whereas available, in specific losses (m^3/km/day) and info on leakage management and network rehabilitation.

In 2014 the length of the distribution net was 941 km with 0,071 leaks/km. As it is not possible to retrieve data on specific water losses through leakages, the percentage of unmetered volume is presented instead.

Leakage management includes a 10-year renewal plan from 2009 regarding where renewal of the distribution net should be prioritized depending on material status and impact of external factors, such as soil conditions. In 2014 renewal rate was 0.2%. Expansion of the net since 2005 is 53 km. (see also 8B1/8C)

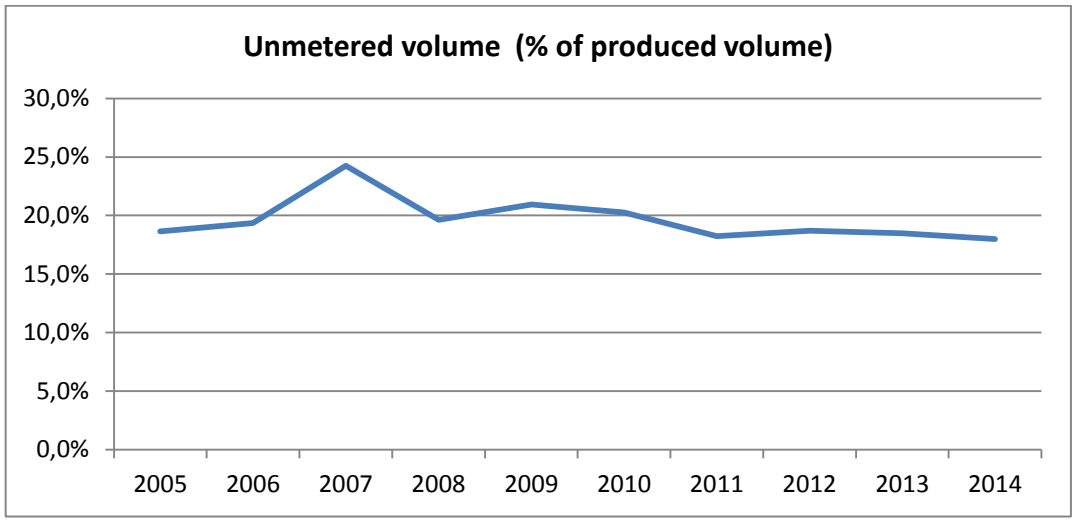

Figure 8A3: Proportion of unmetered volume. The unmetered volume includes, for example, water used to flush sewage pipes for maintenance.

A6. Storm water management and use of natural water retention measures.

Due to recurrent consequences of spring flood, storm water management is always one part in the urban planning process. Umeå's separate storm-water system limits extraneous water in waste water pipes, thus allowing efficient wastewater treatment. Storm water is lead to closest water body, which improves chances to cope with predicted precipitation increase caused by climate change.

A storm water strategy is not yet adopted, but the city works continuously to develop strategies for storm water management based on the Water Framework Directive, the Environmental Code (1998:808), the Act on Public Water Services (2006:412), the Plan and Building Act, national environmental objectives and municipal policy documents.

The water tariff is designed to promote property owners to take care of the storm water locally. Incitement is a reduced fee.

Natural based storm water treatment systems (open systems and delays) are designed according to the recipient's sensitivity and activities in the drainage area (roads, industrial, residential, etc.). Examples are UWWTP and Väven culture centre with green roofs and retention ponds at UWWTP and in residential areas.

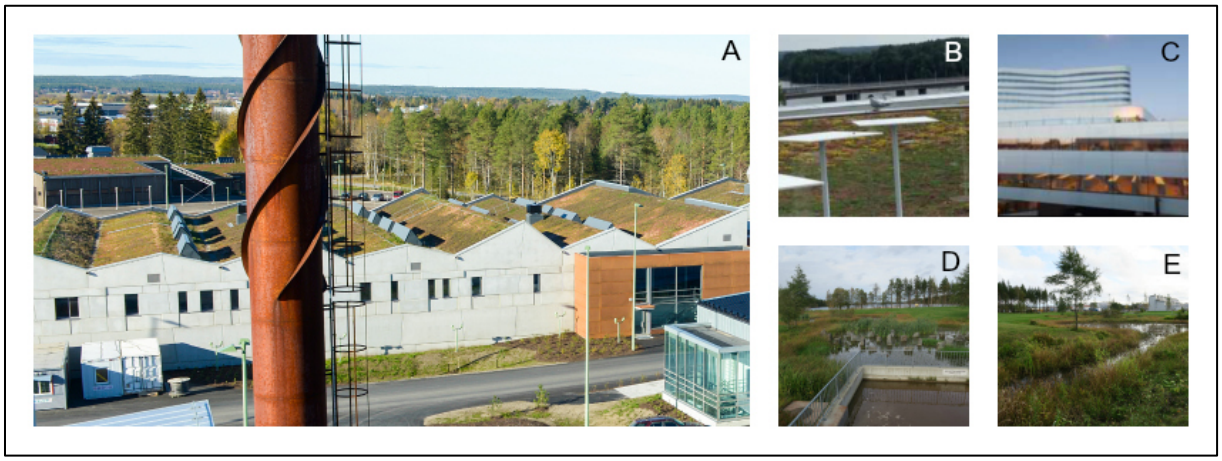

Figure 8A4: Local storm water retention with green roofs (A) on an industrial property (new UWWTP) and (B) and (C) at the new culture centre; (D) and (E) Open storm water system for purifying water from a residential area.

A7. Compliance with the Floods Directive and link to the relevant Flood Risk Management Plans.

Umeå municipality has no areas at risk for flooding according to the Floods Directive.

A8. How the links between water and energy consumption (water-energy nexus) (e.g. through pumping, treatment, heating) is taken into account; if available provide data on yearly energy consumption (Kwh/m^3 of distributed water).

The water-energy nexus 2014 was 0,71 kWh/produced m^3 (includes operating waterworks, distribution net and reservoirs). Nordic weather conditions with temperatures down to -30°C require all facilities to be located indoors and a lot of energy for heating. UMEVA continuously monitors the facilities in order to prioritize where to implement actions to reduce energy consumption. For example, heat exchange is used from output drinking water.

A9. Use of "non conventional resources" and water recycling initiatives (rain water use and grey water or wastewater reuse).

The environmental office enforces the industry, e.g. car washes, to increase the reuse of grey water treated on site. One successful example in Umeå is the Green Zone industrial area, where recirculating grey water from a car wash reduced the need of fresh water intake from 300 L to 30 L per car wash.

A10. 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.

Groundwater status: good.
Ecological status: moderate; main problem: barriers for fish migration.
Chemical status: not good; main problem: high mercury levels (from industry).
(See also 8B4)

A11. The scale of River restoration projects planned – e.g. for resurfacing (lost) rivers, naturalising previous channelised rivers.

Tributaries of the Vindel and Ume river will be restored by removing artificial barriers to improve fish migration (proposed EU life project). For example, culverts at road crossings are migration barriers to fish in 30% of the cases. Special focus will be on small coastal streams.

A12. Projects to reconnect citizens with waterbodies – eg creation of wetland parks, cleaning up water quality such that swimming is possible.

Water is an important aspect in Umeå's urban environment. Recent constructions have focused on reintegrating the Ume river into everyday life. Recreational possibilities include swimming, kayaking, fishing, and cycling, and it is easy to combine outdoor activities with visiting cultural-historical sites (e.g. Baggböle mansion, Arboretum Norr).

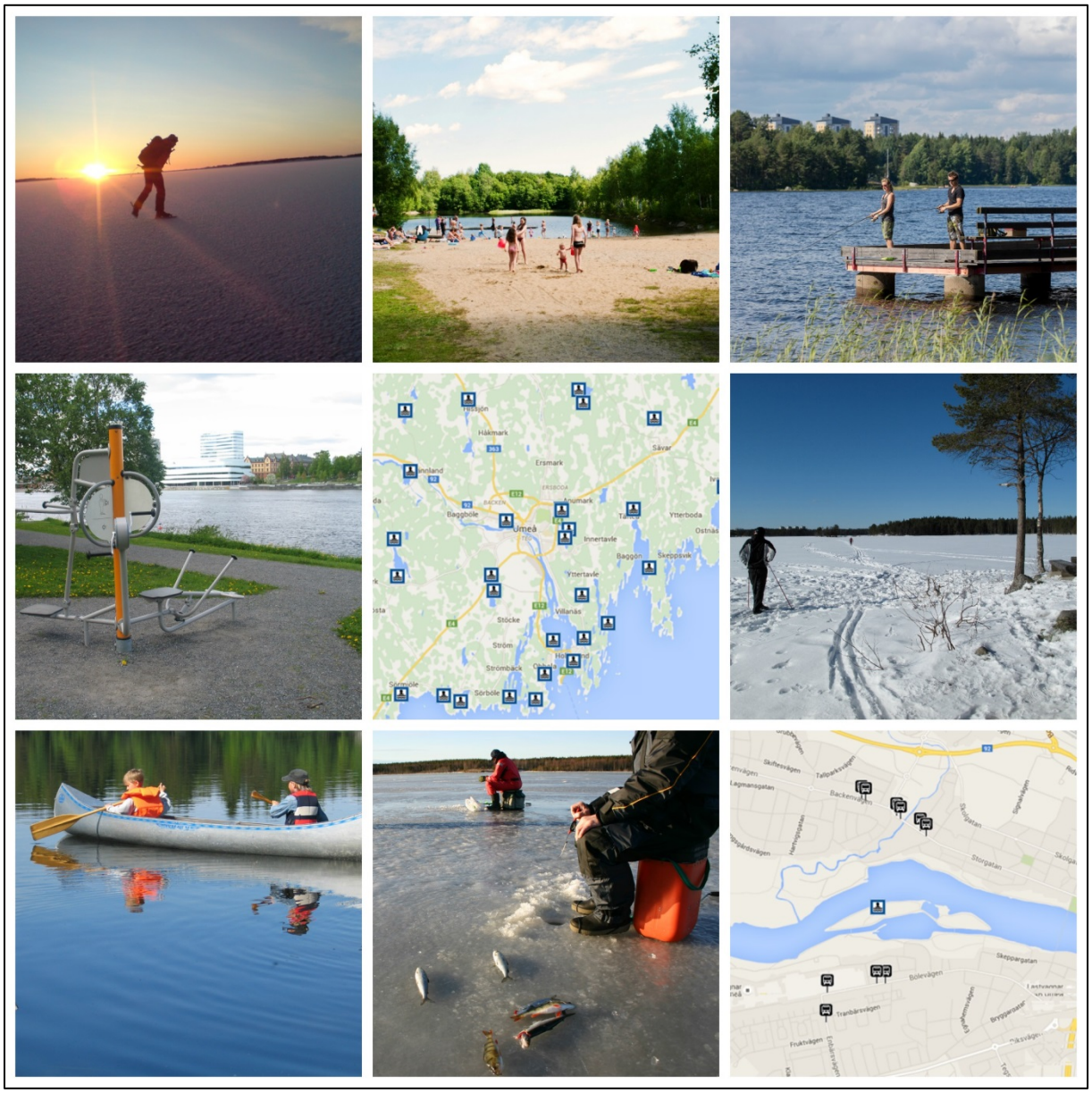

Figure 8A5: Recreational activities linked to water: Ice skating on the Baltic Sea; Swimming in the Ume river; Fishing at lake Nydala; Fitness trail at the Ume river; Map over swimming areas and beaches maintained by the municipality; Cross-country skiing at lake Nydala; Kayaking; Ice fishing at lake Nydala; Interactive map showing public transport options.

8B Past performance

B1. Technical, nature-based, economic and institutional measures adopted and their effectiveness in achieving reduction of total water consumption or improvement of water status.

Umeå's total water consumption has been constant for the last 30 years, despite a population growth of 42%, i.e. the water consumption per capita has decreased by more than 40%. The amount of water produced has not changed essentially since 1980. Reduced water consumption means reduced need for purifying of water, which leads to less water that has to be treated with chemicals. It is important to UMEVA to inform all customers about this, starting with fourth graders in all primary schools that receive specially tailored lessons each year.

The municipal housing company Bostaden, the biggest actor on Umeå's rental housing market (45%), has an objective to reduce energy consumption with 20 % by 2016 (compared to 2008). By installing the "Echolog" in new apartments, the consumption of hot water decreased from 0,7 m^3/m^2 to 0,56 m^3/m^2 per year compared to apartments without the Echolog. The corresponding decrease for cold water was from 1,5 m^3/m^2 to 1,2 m^3/m^2.

In a pilot study conducted by Bostaden and Umeå university (2012-2014),the installation of energy-saving, "intelligent", low water-consuming equipment resulted in a 30% decrease of hot water consumption (15% for cold water), i.e. a reduction of about 10 Mio KWh/year. Based on these results, Bostaden plans to successively substitute the equipment in all apartments.

Figure 8B1: (A) The terminal "Echolog" in all Bostaden's new apartments shows the consumption of electricity and hot and cold water in real time. The purpose is to help reduce consumption through increased awareness. (B)"Intelligent" equipment as used in the pilot study. (C) Energy performance graph from low to high performance (in the middle) according to which properties are classified. (Photo source: (A) Bostaden; (B) FM Mattson)

Energy performance of public buildings has to be made visible in the entrance. For private housing, energy performance must reach a certain quality; otherwise the property value can be reduced.

Maintenance of the 2200 km-long drinking-, wastewater- and storm water-distribution net includes replacement of old pipes with a cost of almost €3.3 million/year. This is necessary to reduce leakage and to secure water supply and sewage treatment sustainably in a long-term perspective. The urban changes connected to a growing city also lead to a substantial network expansion, and during this work old pipes are replaced whenever possible.

The ambition to reduce water losses is also pursued by encouraging property owners to develop both short- and long-term maintenance and renovation plans of the building's water system. Additionally, tenants are regularly informed about the notification requirement if there is a leakage.

Most effective measures:

- Monitoring and restoration of the distribution net to reduce leakage
- Renovation of the largest waterworks
- Energy efficiency measures at the waterworks
- Information campaigns

B2. Byelaw implementation in relation to efficiency in water usage, tariff and metering systems and water quality.

Tariffs

The drinking-water supply is regulated by charges suggested by the board of UMEVA and approved by the municipal council. No taxes are used to finance the operations and by law UMEVA is not allowed to make profit.

The tariff system is used as a way to affect water consumption, 50% of the tariff is fixed and 50 % is variable due to water use. UMEVA constantly promotes the environmental and economic advantages of saving water.

Metering

Households, business and industry are required by law to have a water meter. The metering system helps to specify the water tariffs (50% variable) and is also used to optimize production. The latter is important to avoid overproduction**.**

Water quality

In order to maintain Umeå's high water quality even in the future, UV-lights were installed as microbial barrier in all waterworks during 2015.

B3. Awareness raising campaigns.

Water Week

Each spring, UMEVA arranges Water week, with focus on water use in Umeå and the world. The aim is to raise the awareness of the importance of water and to acknowledge the fact that we have to take care of our water for future generations. The less water we use, the less water needs to be cleaned.

Water and sanitation in developing countries

UMEVA campaigns to raise awareness of the water and sanitation situation in developing countries. The message is that water is a common resource and that we all have a responsibility to support organizations like Water Aid. As a reminder of the situation in the world UMEVA installed a water pump in the city centre.

The special distance "Walk 6 km for water in the world!" at the Umeälvsloppet race 2015 was dedicated to the many people in the world that have to walk this distance each day to get their daily water.

A new drinking fountain symbolising democracy has been installed in Väven culture centre in October 2015, as a comment to water as a cause for conflicts and war.

Each year, World water day on March 22 is acknowledged.

Figure 8B2: (A) Umeälvsloppet: 6 km run for water in the world; (B) New drinking fountain "Reason to attack" in Umeå's culture centre (photo source: Umeå Tidning); (C) Water pump in Umeå's city centre. The pump model is the most widely used hand pump in the world and normally used to provide drinking water in countries where there is lack of water.

Education

In order to increase children's awareness, UMEVA offers fourth graders at all schools in the municipality two tailored lessons (60 min) about waste & recycling and water & sewerage. With gained knowledge of these subjects, the children can influence their families to act in a more environmentally responsible way.

Information leaflets and brochures

UMEVA works continuously to raise awareness of water- and waste water management issues. For example, in September 2014 UMEVA sent out an information brochure to all households in the municipality about what UMEVA is doing and how citizens can reduce water consumption and improve the waste water quality.

B4. Actual and projected improvements (in %) of water status/potential compared to 2009, when the 1st river basin management plans were to be in place.

The first cycle of river basin management (2009–2015) focussed on gathering knowledge of bodies of water, while the new cycle will focus on measure to improve water status (management plan to be adopted in December 2015).

The main challenge for Northern Sweden lies in the vast amount of water. Given the existing economic resources, appropriate monitoring is only possible in a fraction of rivers, lakes, and groundwater bodies, leading to a non-satisfying data base for status assessment.

Due to the modification of the criteria since 2009 it was not possible to make an appropriate comparison. The reduction of mercury benchmarks, for example, resulted in a classification as bad status for all water bodies in the municipality. Also, the data base for assessment has been extended to include sediment samples (revealing lead contamination that was not detected previously during water sampling) and biological samples, such as phytoplankton (leading to an improvement of the biological status).

8C Future plans

Challenges for Umeå in the future include all aspects of being a growing city. Water supply and wastewater treatment need to be secured, for example by protecting the current water source as well as localizing a suitable reserve water body, without neglecting water quality.

Climate change predictions for the boreal region of Sweden include increased annual precipitation and a higher proportion of precipitation falling as rain instead of snow during winter. Earlier snowmelt and thinner snow packs will result in earlier spring floods of lower amplitude. Consequences include an increased mean annual runoff (by up to 24%) with decreased spring flood peaks, increased frequency of high flow events during autumns, and higher winter flows.

Figure 8C:. Spring flood in the Ume river, upstreams from the Umeå city centre.

One of the highest prioritized environmental targets for the city of Umeå is maintaining the high quality of the water. Keys objectives are the protection of groundwater, adequate maintenance, and investments in the water supply system as well as in downstream processes, such as the new waste water treatment plant (commissioning of last parts in October 2015).

Water and waste water strategy

The City of Umeå is currently working on a strategy regarding the development of water and waste water in a growing city. Key objectives are (a) to benefit continuous sustainable growth (i.e. expansion areas should be planned in such a way that the ground and water bodies are not burdened with additional impurities), (b) to develop a tool to be able to predict future investments and costs, and (c) to facilitate cooperation and consensus between different city administrations regarding city planning and water/waste water issues.

Even though there is currently no risk of flooding, future increase of precipitation due to climate change demands for flood risk management. At present, Umeå's distribution net is built to cope with ten-year events. Therefore, a risk assessment project in cooperation with the local fire department uses modelling techniques to simulate extreme precipitation events to predict which areas in the city could be at risk of being flooded in the future.

Protection of water source

UMEVA works to optimize flow measurement on the networks to find losses and to improve protection of water sources. Currently, three separated water protection areas exist to protect the water resources from contamination. The City Council will make a formal consultation with referral agencies and affected landowners on a proposal to expand and connect these three separated zones to establish one large area. A particular condition for Northern Sweden consists in the use of the region for reindeer husbandry, meaning that the Saami parliament has the right to co-decide how reindeer feeding grounds are used. Even though the proposed boundaries of the new protection zones have not yet been adopted, efforts to reduce existing and future risks for drinking water quality in the area are undertaken. For example, a bitumen-producing plant and a (tree-) nursery have been disassembled and the soil decontaminated to avoid potential leakages of oil or pesticides, respectively.

Fig 8C2: The national interest of Saami reindeer husbandry has the right to use land for grazing. This can be an issue around water facilities where it can be necessary to put up fences for security reasons.

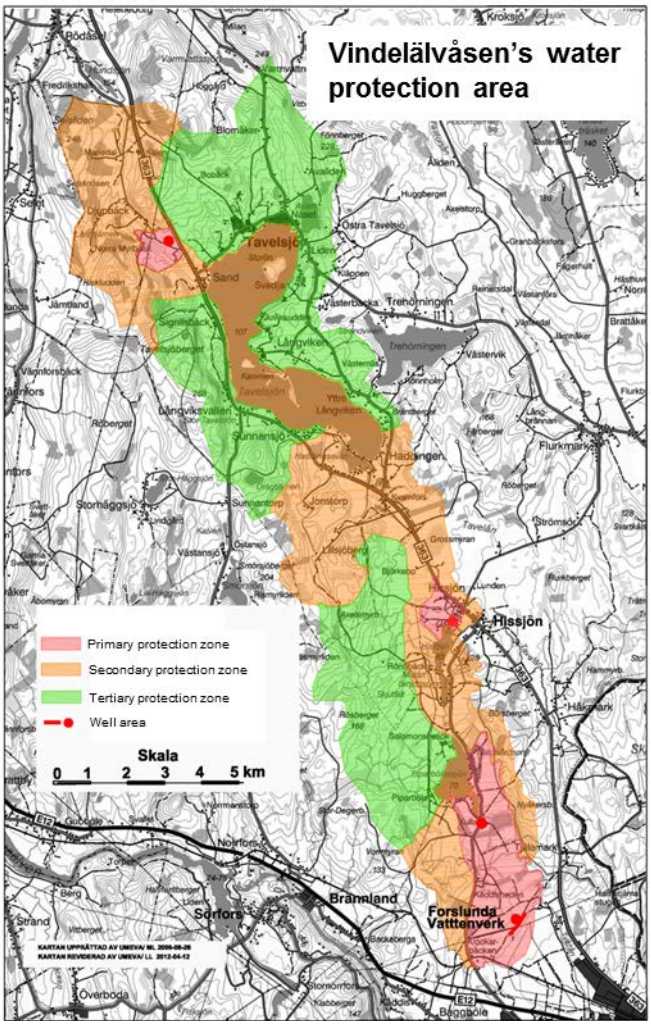

Figure 8C3: Map of proposed water protection area for Vindelälvsåsen; current extent corresponds to the primary protection zones.

Alternative water body

A back-up water body would only be needed in case of severe crisis (e.g. contamination).

A water body with enough capacity to provide Umeå with water has been tested, but the quality was not satisfactory. Other possible options are being investigated. Short-term supply can always be secured by the other waterworks in the municipality.

Reduce leakage

UMEVA is also working with preventive measures to reduce leakage by installing flow meters on the distribution net to be able to better monitor the net to discover leaks and to be better at prioritizing the needed actions which will decrease water loss in the distribution net.

Energy consumption

Figure 8C4: The biogas plant at Ön's waste water treatment plant, supplying the plant and UMEVA's offices with electricity and heating.

The main focus to reduce energy consumption is to optimize both water production and distribution, so that losses are minimized and unnecessary, unsolicited water volumes not pumped. Improvement of insulation in a number of facilities to reduce energy consumption for heating started in 2014. Furthermore, with the commissioning of a second gas engine in October 2015, both quantity and quality of self-generated biogas were increased, bringing UMEVA substantially closer to the goal of being self-sufficient for electricity and heating of industrial facilities and office spaces (at least 90% by 2016). The control systems will be optimized and, whenever possible, old pumps will be replaced with more energy efficient modern pumps.

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Information to property owners
Information to property owners about the importance of controlling the water consumption

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