8. Water consumption	Current details of the original and/or most recent action plan, including any relevant disadvantages or constraints resulting from historical and/or geographical factors which may have influenced this indicator area negatively. Denmark and Copenhagen are unique in being able to extract high-quality water for citizens and enterprises directly from the subsoil, which just requires very simple water treatment. Copenhagen is proud to be able to supply its citizens with water which does not contain chlorine, and that Copenhageners do not have to buy bottled water. In addition to being able to supply an exceptional quality of drinking water, Copenhagen is proud that citizens are well on the way to reducing their water consumption to 100l/capita/day; the result of great efforts from the City, water utilities and citizens. By means of politically adopted water supply plans, the City of Copenhagen sets out guidelines for the supply of drinking water which are adopted when there is a need for new plans, and not according to an established interval for revisions. The following sections describe the results so far, obtained through previously adopted water supply plans and an introductory description of the water supply of the City of Copenhagen. All water is delivered by one supply company, Copenhagen Energy which is owned by the City of Copenhagen. As there is sharp focus on limiting the quantity of drinking water transported from the suburban municipalities to Copenhagen, several goals have been adopted, focusing on limiting water catchment for drinking-water purposes. This is an advantage for the groundwater resource, energy consumption, and the volume of wastewater needing treatment. In order to limit carbon emissions from the operation of pumps, etc., Copenhagen Energy has set up wind turbines and photovoltaics in a single well field. From 2013, Copenhagen Energy will erect a further 100 wind turbines at other source sites.

Figure 1. The complex catchment and supply structure of the City of Copenhagen.

Water consumption per capita (in l/capita/year for households and business);

In 2006, to reduce water consumption, the City of Copenhagen adopted a goal for water consumption according to which household water consumption was to be reduced to 110 litres per capita per day before 2010. For businesses the target was

34 litres per capita per day. In 2010 household consumption was 108 litres per capita per day and for enterprises consumption was 29 litres per capita per day.

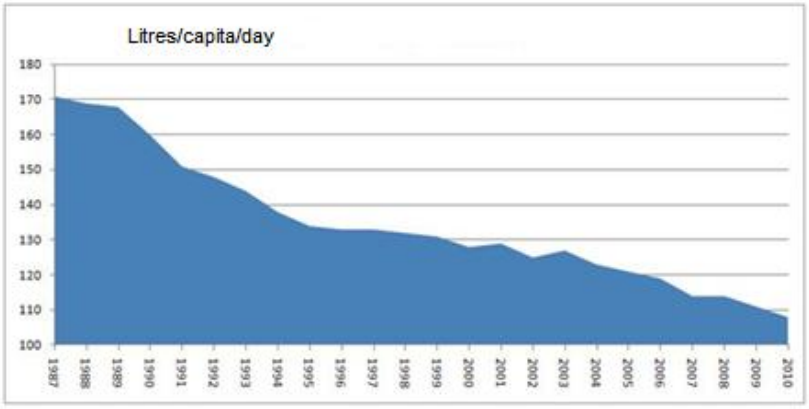

Figure 2. Development in water consumption in Copenhagen households.

In addition to support for the establishment of water-saving toilets and individual water meters, the City of Copenhagen carried out a two-year campaign to motivate citizens to reduce household consumption. The campaign involved information on how to save water, given on websites, facebook, fun runs, competitions and events in the city.

A plan was adopted to provide financial support for the establishment of installations to replace drinking water extracted outside the City with water extracted within the City, from roofs, or, for example, wastewater purified through a UV filter. Such measures help to protect the groundwater resource where drinking water is extracted and to minimise energy consumption when transporting water into the city. Most of the water cannot be used as drinking water, but may be used as process water in companies and thus replace water that can be used as drinking water.

Under Danish legislation, all properties connected to common waterworks must have water meters installed at property level. Properties with several flats are, however, only required to install one water meter at property level. As individual settlement at flat level has a positive effect on water consumption, the City of Copenhagen has agreed that water supply companies must allocate a pool of DKK 2 mill. annually to support establishment of individual water meters and water-saving toilets. Housing associations have obtained savings up to 20% of water consumption when establishing individual water meters.

Proportion of urban water supply subject to water metering;

Drinking water not measured is made up of water that is lost in the distribution system because of leaks, water used for fire extinguishing, cleaning of wires after wiring work and any measurement errors by the water meters. In 2010 unmeasured consumption accounted for 7.7% of the City's total consumption.

Water losses in pipelines;

As losses in the distribution grid may be prevented through renovation and leak detection there is great focus on this. Since 1929, the water supply companies have registered information on pipe failure, with information about dates, location of and

reason for failure.

	Service pipes	Supply lines
2007	118	94
2008	107	84
2009	120	111
2010	140	147

Table 1. Failures ascertained on the city distribution grid in recent years in the City of Copenhagen.

The water supply companies have used registration of failures to prioritise the areas and types of pipes that need renovation so as to prevent future failures. To ensure financially effective renovation of the pipes, renovation of pipes is also prioritised in areas where excavation has already commenced.

In connection with all new renovation work of well fields, model calculations, geophysical logs and water-quality surveys have been carried out to obtain the most sustainable catchment in terms of water quality and in relation to nature.

Copenhagen Energy has carried out mapping of flora and fauna in all well fields, and care-taking plans have been prepared for these which consider nature preservation.

In several well fields, action plans have been drawn up by the municipalities were the water is extracted. The action plans aim at protecting groundwater resources through e.g. voluntary cultivation agreements with farmers and changes in the type of extraction. Also forests have been planted in vast catchment areas. In January 2010, the planted area was 557 hectares while the total project area for afforestation was 3840 hectares.

The City of Copenhagen has also been working to protect soil and groundwater within the City borders for several decades. The work is being carried out to be able to use the groundwater resources under the City in the long term, but also to protect the overall water cycle against contamination.

The work includes politically adopted strategies to ensure that municipal care for areas is done without the use of pesticides and by minimising the use of salting. The City also carries out annual pesticide campaigns to convince citizens to reduce their private use of pesticides.

In addition, the City has put in considerable effort to remediate existing soil and groundwater contamination in the city and to prevent new contamination. This is done through remediation projects, restrictions on how to use contaminated soil and building waste in connection with building and construction work, as well as environmental inspection and approvals of the enterprises in the city. There is also focus on reusing as much of the remediated soil and the clean building waste as possible, in order to limit carbon emissions for transport of excavated material. This intensive environmental protection work protects the health of citizens, as well as the ground circuit and water cycle so that the city will be even cleaner in future.

Compliance with the EU Water Framework Directive and related Directives.

The EU Water Framework Directive is aimed at municipal action plans based on public sector water plans. The water plans have not yet been adopted and therefore

	neither have municipal action plans been adopted.
	Details of those targets achieved or not, to date (within the last 5 – 10 years). Provide a review of how both situations occurred and lessons learned. Proactive leakage management; Leakage detection in the distribution grid in Copenhagen is carried out with a frequency of a four-year period where the distribution grid is systematically checked in a limited area using electronic listening gear. Experience has shown that registration of leakages has made it possible to prioritise renovation work and prevent new leakages. Experience so far shows that it is possible to meet the goals of complete inspection of the distribution grid over a four-year period. Actually, the most recent leakage inspection period was cut down to three years. Network rehabilitation The aim of renovation of the distribution grid in the City of Copenhagen was previously to renovate it with at a renewal rate of 1%. This corresponds to renovating 9 kilometres of water pipes annually. However, experience shows that this goal cannot be met as there are great differences in the price of renovation of different parts of the distribution grid. Renovation for about DKK 34 mill. has been carried out in the four-year planning period. On average 6.8 kilometres of water pipes have been renovated for this amount. Experience from previous goals for renovation of the distribution grid has meant that the future goals will be to renovate the distribution grid so that losses in the distribution grid are kept as much under 10% as is technically and financially possible. Non-domestic metering As described in the above, all water delivered to households and non-households in the City of Copenhagen is metered. This is due to Danish legislation and support schemes for establishment of individual water meters in the City of Copenhagen. Experience from Copenhagen shows that legislation on compulsory metering of water consumption as well as subsidy schemes for individual water meters are an effective combination in efforts to bring down water consumption. By-law implementation in relation to efficient water usage Danish legislation provides only few possibilities for local government to introduce tighten national legislation in relation to saving water. However, section 52 of the Water Supply Act provides common water supply plants with the possibility of restricting water consumption when necessary in relation to the operation of the plant or to consider water supplies, e.g. hose pipe bans during dry spells. Copenhagen Energy imposes hose pipe bans in the summer months of June, July and August if they are needed. Moreover, wasting water by neglecting to close taps or other reckless behaviour is forbidden. Running water must not be used for cooling purposes, as propellant or other purposes not related to drinking water unless the water supply companies have given special approval. Main efforts to use the tariff system to improve water supply The drinking-water supply area is regulated by charges. The supply companies collect charges and fees on behalf of the municipal council and the government. The charges are approved by the City based on the “non-profit” principle. As the City has no possibility of regulating the price of water to motive people financially to save

	water, regulating charges cannot be used in this context. Awareness raising campaigns A Water and Energy Shop has been located in one of the City's closed down waterworks since 1997. The waterworks shop encompasses activities for use in teaching school children in the City of Copenhagen, to contribute to creating better awareness of water resources and the water cycles. A web-based teaching programme has been prepared, comprising teaching of water and drainage for pupils in basic school and upper secondary school. *Vestegnens Vandsamarbejde*, which in addition to the City of Copenhagen comprises 6 neighbour municipalities has in the past three years focused on groundwater protection campaigns: - Distribution of folders encouraging people not to use pesticides - TV spots - Facebook campaign - Articles in various magazines Furthermore, the City of Copenhagen carries out annual campaigns to reduce citizens' use of pesticides. It is difficult to measure the effect of these campaigns, but great results in water-savings have been achieved. Lessons learned: • Good cooperation between the water utilities and the City is important • Subsidies for individual water meters and water-saving toilets are effective in reducing water consumption • Campaigns are important in achieving greater consumer awareness about water savings.
	Plans to meet or revise key targets for the future and proposed approach to achieve these, including measures incorporating preparedness of water infrastructure to deal with future impacts of climate change. The City of Copenhagen is continuously revising the water supply plan regulating the City's supply of drinking water. This ensures that initiatives are taken for future efforts to e.g. reduce water consumption in the City. Subsidy schemes for water-saving toilets, individual water meters and reclaimed water are assessed to have a positive effect on the quantity of water that needs to be imported to Copenhagen, and therefore the coming water supply plan 2012 is expected to bring the schemes further towards achieving new goals. The new household consumption goals are a maximum of 100 litres per capita per day, and a maximum consumption for businesses of 301 litres per capita per day in 2017. There is a separate reclaimed water project working to ensure that water which cannot be used as drinking water is used instead for e.g. sewer cleaning, graffiti cleaning, watering and keeping roads clean. Furthermore, the 2012 water supply plan is expected to adopt an initiative where the distribution grid is continuously renewed to ensure that losses in grid are kept as far

	as technically and financially possible under 10% of total consumption. In connection with the recently completed budget agreement, the parties decided to allocate funds for the commencement of a water partnership with the City of Copenhagen, City & Port Development, Copenhagen Energy and a number of knowledge institutions as well as private enterprises for the purpose of developing and testing intelligent and future-proofed water solutions in the large urban development area, Nordhavn in Copenhagen. Solutions must focus on management of extreme rainfalls, management of road water and reduction of drinking water consumption and they must be implemented in future urban development areas. The City is considering introducing central softening so that citizens receive less hard water. This will affect the environment positively as citizens can then reduce soap and electricity consumption in their homes. Currently an elucidation project is being carried out with advantages and disadvantages on central softening and LCA (life-cycle assessment) of introducing central softening. The water supply in the City of Copenhagen is produced from groundwater extracted outside the City, and accordingly, protection of groundwater is outside the City where water and nature plans are expected to form the basis for municipal action plans before 2014. The water and nature plans implement the EU Water Framework Directive, which was adopted in 2000 to ensure that Denmark achieves a “good quality” aquatic environment before 2015. In addition, the municipalities affected and Copenhagen Energy prepare ongoing action plans in the catchment areas to ensure the supply of drinking water to the City in future. Climate change is expected to lead to increased groundwater levels and changed precipitation patterns with more heavy downpours. This may lead to contamination of drinking water due to leaky drinking water pipes. Copenhagen Energy is responsible for carrying out activities that prevent increased risk of drinking water contamination due to increased precipitation or groundwater levels. This is by renovating extraction plants, waterworks, overhead reservoirs and the distribution grid. To safeguard citizens as best as possible against contamination of drinking water from rainwater or increased groundwater levels, Copenhagen Energy has introduced the quality assurance system DDS - Documented Drinking Water Safety, which ensures water quality by promoting behaviour that reduces the risk of errors in areas in the water supply. If, despite this, the drinking water becomes contaminated, Copenhagen Energy will ensure that the water is checked several times daily before it is supplied to people in the city. Waterworks as well as the overhead reservoirs from where the water is distributed to the city are checked daily. In addition, several places in the distribution grid are checked. This intensive monitoring has meant that the use of water has only been restricted in a limited part of the city once in the past 12 years.