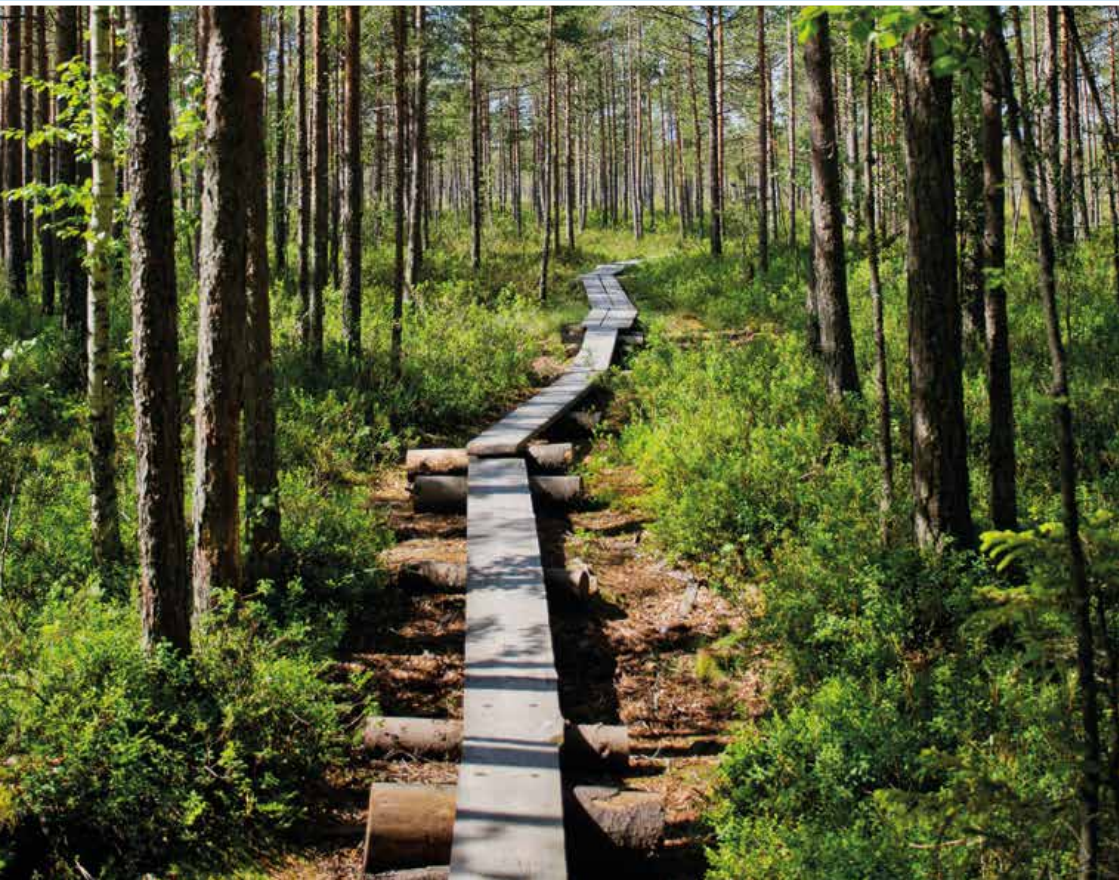
Hollola Lahti Nastola

LAHTI REGION 2015
ENVIRONMENTAL REVIEW



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FOREWORD

This Lahti Region Environmental Review for 2015 is the last joint environmental review of the three municipalities. At the beginning of 2016, Lahti and Nastola were merged into one, and Hollola and Hämeenkoski were also amalgamated. The preparations for the mergers marked the entire year 2015. Changes were also made in the environmental organization, and Lahti Region Environmental Services was dissolved as a unit.

Apart from the traditional environmental indicators, this environmental review also lists future goals and challenges. The positive things that we should mention include the continuing high level of waste recovery, improvements in energy efficiency and the reduction of carbon dioxide emissions. In addition, we can be proud of the fact that Lahti was internationally recognized for environmental excellence in 2015. On the negative side, a new record was set in 2015 in the number of days with poor air quality. Furthermore, for the first time since 1979, the number of listed buildings did not increase. We hope that these are passing phenomena rather than symptoms of deplorable new trends.

We, the mayors, encourage the new municipalities, their departments and employees as well as the businesses and citizens in this region to share the responsibility for our environment and to make environmentally sound decisions. Air, climate, groundwater, lakes, forests and animals do not respect municipal borders. Hazardous chemicals are transported on the roads and tracks across our municipalities. We all share this planet, but as it is difficult to achieve a planet-wide impact, we should focus on that which is possible: on the safety and quality of our local environment and on the protection of our climate using the means available to us. In environmental matters, cooperation has been and will always be vitally important.

Päivi Rahkonen
Mayor of Hollola

Jyrki Myllyvirta
Mayor of Lahti

Pauli Syyrakki
Mayor of Nastola

Municipalities' joint environmental policy

A joint environmental policy unanimously approved by the Councils of Hollola, Lahti and Nastola, has been in force since 2012. The main objectives of the environmental policy have been as follows:

- **To plan for climate change-induced risks and changes, to improve energy and material efficiency, and to reduce greenhouse gas emissions.**
- **To protect the quality of life in residential environments.**
- **To protect and promote biodiversity and the cultural environment.**
- **To safeguard the quality and quantity of groundwater.**
- **To actively improve the water quality in waterways and safeguard both their recreational and natural value.**
- **To allocate resources for the distribution of up-to-date environmental information and to increase the opportunities for residents and businesses to act for the good of their environment.**

In order to achieve these environmental objectives, the following principles should be upheld:

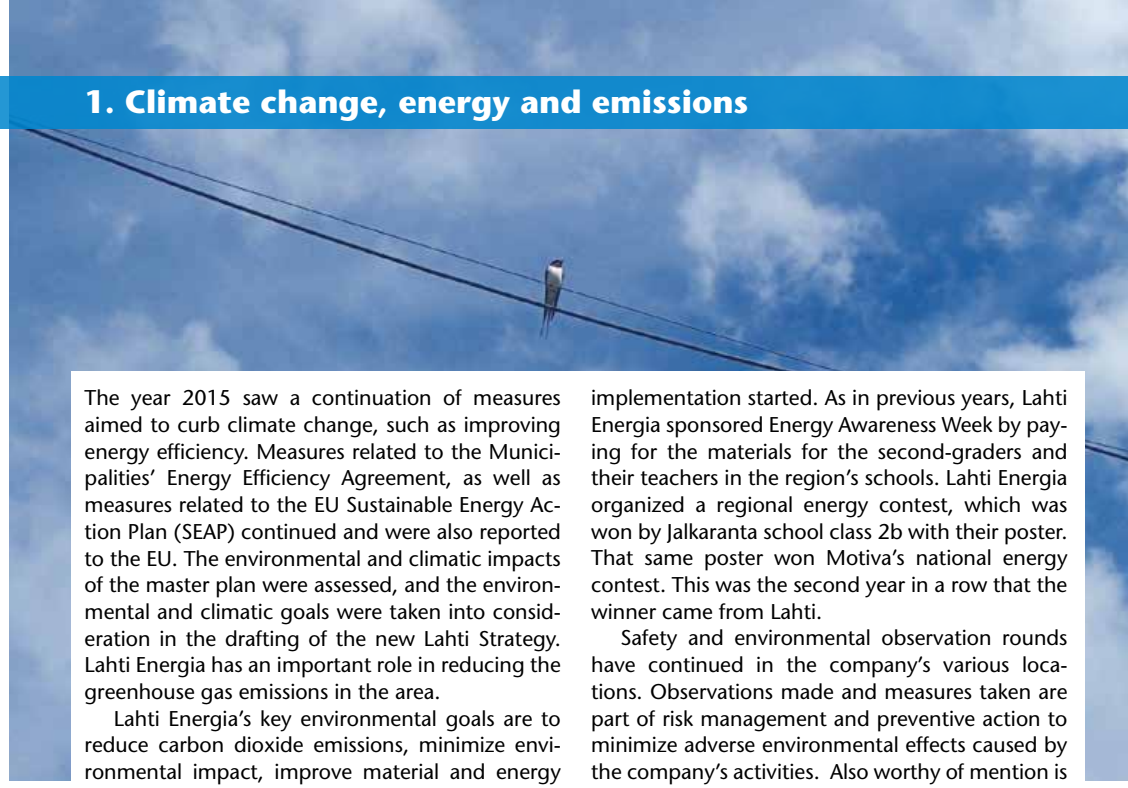
- **The municipalities of Hollola, Lahti and Nastola work in partnership with residents, businesses, organizations and other stakeholders for the good of their common environment.**
- **Business activities are taken into account in decision-making and operations with increased cooperation between city/municipal entities and group companies on environmental issues.**
- **Awareness of the value of nature and natural resources is increased and prejudices regarding environmental protection are reduced.**
- **In the Lahti Region Environmental Services the possibilities to enhance ecological sustainable development are reinforced**
- **The municipal leaders are responsible for the implementation of the joint environmental policy within their own organizations, as well through their roles in the management of group companies.**

An additional goal is for all employees and staff representatives to be aware of their own responsibility concerning environmental matters:

- **Implementation of the environmental policy will be integrated into the functions of the various municipal units.**
- **Environmental impacts of decisions are monitored in all levels of decision-making**

In order to achieve the objectives of the joint environmental policy, the Lahti Region Environmental Services shall establish and maintain a common environmental management system. This system will support political commitments and allow for the monitoring of policy implementation by taking measures for accountability and tracking of resources in sufficient detail. An annual implementation report on this management system will be presented to the decision-makers. In the future, environmental issues will be reported under the auspices of the development programme, which includes environmental issues.

1. Climate change, energy and emissions



The year 2015 saw a continuation of measures aimed to curb climate change, such as improving energy efficiency. Measures related to the Municipalities' Energy Efficiency Agreement, as well as measures related to the EU Sustainable Energy Action Plan (SEAP) continued and were also reported to the EU. The environmental and climatic impacts of the master plan were assessed, and the environmental and climatic goals were taken into consideration in the drafting of the new Lahti Strategy. Lahti Energia has an important role in reducing the greenhouse gas emissions in the area.

Lahti Energia's key environmental goals are to reduce carbon dioxide emissions, minimize environmental impact, improve material and energy efficiency and increase environmental awareness. Lahti Energia reduces carbon dioxide emissions by increasing the use of renewable energy and reducing the use of coal. This is made possible by investments in new technology. Polttimo's process heating plant, for instance, was granted an environmental permit in December 2015. The environmental permit for the Kymijärvi III power plant was delayed due to a change in plant design that called for updated noise modelling. Lahti Energia also invests in wind power by increasing the number of its wind power shares; the wind turbines are not located in Päijät-Häme but in windier areas.

On the basis of the results of energy audits carried out at Lahti Energia in 2015, the Group's energy efficiency plan has been updated and the implementation started. As in previous years, Lahti Energia sponsored Energy Awareness Week by paying for the materials for the second-graders and their teachers in the region's schools. Lahti Energia organized a regional energy contest, which was won by Jalkaranta school class 2b with their poster. That same poster won Motiva's national energy contest. This was the second year in a row that the winner came from Lahti.

Safety and environmental observation rounds have continued in the company's various locations. Observations made and measures taken are part of risk management and preventive action to minimize adverse environmental effects caused by the company's activities. Also worthy of mention is the environmental permit granted to the Kymijärvi I power plant: the environmental permit process took more than 13 years—the application for the permit was originally submitted on 4 December 2002. On the last day of 2015, the permit was finally granted for the remaining operational years of the power plant.

In 2015, renewables made up 36.37% of the total power sales of Lahti Energia. In the Hollola-Lahti-Nastola area, 42.65% of the district heat was produced using renewable energy sources. Furthermore, municipality-owned buildings in Hollola, for instance, have switched to wood chips for heating, and Lahden Talot in Lahti uses geothermal hybrid systems. The improved energy efficiency can be seen in the following indicators.

Key figures	Base year 2000	2011	2012	2013	2014
Electricity consumption (kWh per resident per year)					
Lahti	*2000: 8,620*	*8,358*	*9,051*	*8,712*	***8,780***
Hollola	*2007: 8,178*	*7,947*	*7,976*	*7,777*	***7,446***
Nastola	*2007: 13,127*	*12,115*	*11,673*	*11,943*	***11,551***

Key figures	Base year 2001	2011	2012	2013	2014	2015
Specific electricity consumption in municipal premises (kWh per cubic metre)						
Lahti	*18.2*	*17.2*	*17.9*	*18.2*	*16.9*	***15.7***
Hollola		*21.0*	*20.4*	*23.0*	*24.15*	***23.60***
Nastola		*22.6*	*22.4*	*17.6*	*17.88*	***26.59***
Heat consumption in municipal premises (kWh per cubic metre)						
Lahti	*52.1*	*44.5*	*43.4*	*41.1*	*40.7*	***39.1***
Hollola		*33.3*	*31.2*	*34.5*	*31.22*	***31.47***
Nastola		*44.5*	*48.2*	*42.9*	*41.32*	***42.63***

The relative change in vehicle traffic has been declining for two years; it may be partly due to the Matkakeskus building site, which has influenced traffic volumes on Highway 12, but it may also be that vehicle traffic has moved away from the city centre after Aleksanterinkatu was turned into a slow, one-way street. There is no evidence in the form of traffic counting data that cycling has increased. On the contrary, the traffic arrangements at the Matkakeskus building site have reduced the number of cyclists at the two counting points. Car dependency, that is, the number of registered passenger cars per thousand residents is constantly increasing.

Relative change index for vehicle traffic	2001	2011	2012	2013	2014	2015
Lahti (10 locations where traffic volumes are monitored)	*100*	*109.7*	*108.3*	*109.0*	*106.2*	***105.7***
Car dependency (cars per 1,000 residents)						
Lahti	*387*	*487*	*492*	*502*	*507*	***512***
Hollola	*392*	*574*	*588*	*606*	*615*	***631***
Nastola	*422*	*585*	*599*	*614*	*621*	***642***

Carbon dioxide emissions from power plants and industries have continued to decline.

Carbon dioxide emissions from power plants and industries, Lahti (tonnes)	1997	2011	2012	2013	2014	2015
Lahti	*691,300*	*811,533*	*610,300*	*692,900*	*566,232*	***495,220***

Almost all of the waste received by Päijät-Häme Waste Management Ltd. is utilized either as reusable material or for energy production. Separately collected burnable waste is utilized as fuel for Lahti Energia's Kymijärvi II power plant and other power plants. Mixed waste is transported to Kotka for energy production. Biodegradable waste is treated in the digestion and composting plant of Labio Ltd. Separately collected glass, metal and cardboard was utilized to replace virgin raw materials. From the beginning of 2016, Finnish Packaging Recycling RINKI Ltd. handles the regional collection of packaging waste.

At Labio Ltd., the sludge from wastewater treatment plants of Lahti Aqua and six other municipalities is mixed with biodegradable waste collected. In the digestion plant, the resulting biogas, or methane, is collected. The plant is the first digestion plant in Finland to use dry digestion technology. Waste can be digested without added water so, unlike conventional digestion technology, the process will not produce concentrated wastewater, which would require a separate treatment process. The biogas reactors are heated by waste heat from composting plant exhaust air so that all the biogas can be utilized. The biogas plant produces up to 50 GWh (i.e., 9 million cubic metres) of raw biogas per year. The raw biogas is transmitted to Gasum's biogas processing plant, where it is purified and fed into the natural gas network to be sold as transport fuel and recycled gas. After digestion, the material proceeds to compost. All in all, the process only takes about one-and-a-half months. All the composted material produced by Labio is re-used either in farming or to make growing media.

In 2015, 92 per cent of the municipal waste received by Päijät-Häme Waste Management Ltd. was reused. Of that amount, 33 per cent was reused as materials and 67 per cent was used for energy production. The amount of municipal waste dumped in landfills in 2015 was 35 kg per capita. The capacity of the incineration plants was less than expected, so the amount of waste that ended up in landfills was a little higher than planned.

Key figures	Base year 2001	2011	2012	2013	2014	2015
Amount of mixed (landfill) waste produced by municipal departments (tonnes)	*1,304*	*1,069*	*1,076*	*1,160*	*929*	***806***
Amount of municipal waste to be disposed of by landfilling (PHJ area) (kg per capita)	*234 (in1999)*	*48*	*40*	*21*	*20*	***35***
The degree of reuse of municipal waste received by PHJ (incl. energy use) (%)	*51*	*87.9*	*90.6*	*95.0*	*95*	***92***
The degree of recycling of municipal waste received by PHJ (reuse as materials) (%)					*35*	***33***

The wastewater produced by the 120,000 residents of the Lahti and Hollola region is treated at Lahti Aqua's Kariniemi and Ali-Juhakkala sewage treatment plants. In 2015, a total of 11.6 million cubic metres of wastewater was treated. The plants are bio-chemical wastewater treatment plants where solid waste and sand are removed mechanically, organic matter and nitrogen are removed biologically and phosphorus is removed chemically. The phosphorus and organic matter load on water after the cleaning process showed a decrease of approximately 30% from the previous year. In the first quarter of 2015, the Ali-Juhakkala treatment plant did not meet the environmental permit conditions for the levels of ammoniacal nitrogen, but the other permit conditions were met. The levels were too high as a result of cold meltwaters.

The requirements of Lahti Aqua's environmental permit were tightened in 2014. The largest hygienization plant in Finland for treated wastewater was opened in Lahti in May 2015. The hygienization plant processes treated wastewater from the Kariniemi and Ali-Juhakkala wastewater treatment plants before the water is released into the Porvoonjoki River. The hygienization is carried out with UV light. In the third and fourth quarters of the year, the faecal bacteria removal rate was almost 100%.

The biogas produced in the sludge process at Lahti Aqua's wastewater treatment plants is utilized as heating energy. Of the total 12,468 MWh of energy produced, 59.3% was used for heating the wastewater treatment plants and the rest was sold to be used in Lahti Energia's district heating network. The energy thus produced for the district heating network was equivalent to the annual heating energy consumption of 350 houses. All in all, the biogas reuse rate is 100%. After digestion and recovery of gas, the dry sludge is delivered to Labio, where the sludge is composted.

Lahti Aqua made major investments in 2015: the largest of these were the renovations of the Laune water abstraction site and Mustankallio water tower, as well as the wastewater hygienization plant. In a customer satisfaction survey, Lahti Aqua's quality of services and operations were given the best possible rating from both Lahti and Hollola based customers.

Key figures	Base year 1997	2011	2012	2013	2014	2015
Emissions into the Porvoonjoki River from wastewater treatment plants in Lahti and Hollola (tonnes) and purification efficiency (%)						
Phosphorus	*5.8*	*2.8 (97.6 %)*	*3.3 (97.2 %)*	*3.3 (97.2 %)*	*2.6 (97.7 %)*	***1.8 (98.3 %)***
Nitrogen (NH_4)	*28.8*	*26 (95.9 %)*	*29.3 (96.1 %)*	*31.4 (96.1 %)*	*14.4 (98.1 %)*	***16 (98 %)***
BHK_7	*140*	*59 (98.6 %)*	*89.5 (98.4 %)*	*74.5 (98.5 %)*	*73.0 (98.4 %)*	***52 (98.9 %)***

Key figures	2011	2012	2013	2014	2015
Nastola, wastewater nutrient loading (tonnes) and purification efficiency (%)					
Phosphorus	*0.2 (98.9 %)*	*0.2 (98.9 %)*	*0.2 (98.9 %)*	*0.19 (98.6 %)*	***0.16 (98.7 %)***
Nitrogen (NH_4)	*0.3 (99.7 %)*	*0.5 (99.4 %)*	*0.1 (99.9 %)*	*0.2 (99.7 %)*	***0.58 (99.2 %)***
BHK_7	*3.3 (99.4 %)*	*4.4 (99.2 %)*	*3.1 (99.5 %)*	*2.8 (99.5 %)*	***2.0 (99.6 %)***

The Nastola wastewater treatment plant processed about 1 million cubic metres of wastewater. The new, more stringent environmental permit requirements for the Nastola wastewater treatment plant became effective in the fall of 2015, and the plant met the new permit conditions for the entire year. The new permit requires that the treated wastewater is hygienized. A new hygienization plant will be built for the Nastola wastewater treatment plant during 2016. Sludge from the Nastola wastewater treatment plant is delivered to Labio for composting.

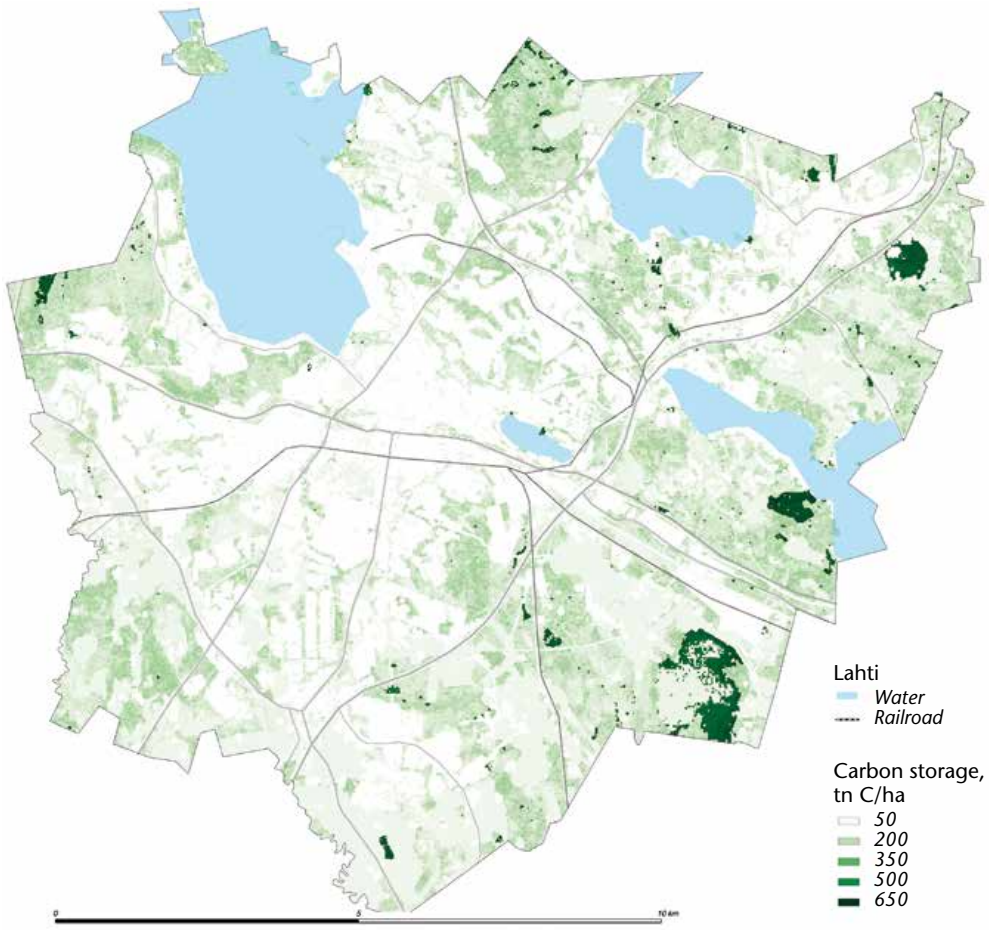
In the Smart Retro project during the spring of 2015, the City of Lahti and businesses operating in the city experimented with a variety of services that promote sustainable development. The experiment involved, among other things, the purchase of groceries online and a peer-to-peer delivery service of goods.

In 2015, Lahti was among the 16 best cities in the international Earth Hour City Challenge. According to the jury, the energy and climate activities of Lahti are more extensive than those of most cities of comparable size, and the activities are varied and concrete.

Future challenges related to climate change, energy and emissions:

- *More extreme weather phenomena related to climate change, and the risks associated with it.*
- *Hollola prepares for power failures and serious disruptions in the energy supply by providing backup systems for electricity, heating and water in new and recently built schools.*
- *Stopping the increase in electricity consumption.*
- *Increased use of renewable energy: if successful, the Kymijärvi III bioenergy plant will significantly improve the renewable energy rate of district heating.*
- *Increasing the utilization of waste as material.*
- *Sewage network repair backlog.*
- *Cutting dependency on cars.*

Carbon sinks in Lahti (2014)



2. Health, safety and quality of life in residential environments

The municipalities' joint environmental policy is designed to promote the health, safety and quality of life of residential environments. Green areas, parks and woods have been proven to have both health and recreational benefits to residents. Noise, on the other hand, has negative health effects, even at levels at which people do not perceive it as disturbing. In the resident survey of 2015, most of the comments made were about noise, particularly traffic noise.

The master plan requirements in the Land Use and Building Act require that the master plan shall ensure, among other things, that there are sufficient areas suitable for recreation. If the green areas are easily accessible, people are more inclined to perceive that there are enough of them. Small or fragmented green areas are no substitute for a larger continuous area because the edge effects, such as littering, extend about 50 metres into the area. The extensive green wedges in Lahti enable many free nature services, function as a carbon sink and slow down the greenhouse effect. No changes have occurred in the green area indicators.

Key figures	2011	2012	2013	2014	2015
Percentage of parks and green areas within the city planning areas (%)					
Lahti	*29*	*30*	*30*	*29.9*	***29.9***
Hollola	*25*	*25*	*25*	*25*	***25***
Nastola				*19*	***19.4***
Percentage of building lots in noisy areas in relation to all 2015 planned single-family house lots (%)	*10.5*	*4.1*	*0*	*-*	***0***
Percentage of apartments in noisy areas in relation to all 2015 planned apartment square metres (%)	*17.4*	*-*	*24.9*	*-*	***34.9***

The public transport system in the Lahti region was overhauled in 2014, so 2015 is the first full year of follow-up. The figures are not comparable to previous years' figures of public transport use. 6,721,619 trips were made in the Lahti region's public transport system, that is 33.4 trips per resident per year. This figure does not include the passenger volumes related to the existing transitional operating agreements, nor the passenger volumes related to market-based traffic, nor does it indicate the number of trips in the entire Päijät-Häme region. In 2015, Lahti Regional Transport (LSL) operated no routes to Hämeenkoski, but the population of Hämeenkoski is included in the calculations.

The year 2015 saw a record number of days with poor air quality: there were 35 such days in the Lahti region. The number should not exceed 30, according to EU recommendations. Every spring, the air contains a lot of dust, which is lifted into the air by wind and vehicles. The dust levels remain high until the sand is removed from the streets. If the amount of snowfall is low in winter, the dust levels may be high even in winter, which is a recent phenomenon.

Key figures	Base year 1997	2011	2012	2013	2014	2015
Number of days with poor air quality (EU: < 30)	*2002: 14*	*33*	*28*	*32*	*26*	***35***
NO_x emissions from transportation (LIISA 2012 model) (kg/resident)						
Lahti	*12*	*5.0*	*4.7*	*4.6*	*4.4*	***5.1***
Hollola	*25*	*10.6*	*10.0*	*9.8*	*9.6*	***8.6***
Nastola	*30*	*12.7*	*12.0*	*11.7*	*11.5*	***10.4***
CO_2 emissions from transportation (LIISA 2012 model) (kg/resident)						
Lahti	*1,458*	*1,450.7*	*1,421.7*	*1,455.0*	*1,448.8*	***1393.6***
Hollola	*2,816*	*2,786.0*	*2,744.7*	*2,828.6*	*2,838.3*	***2,527.7***
Nastola	*3,109*	*3,216.1*	*3,163.2*	*3,267.8*	*3,284.5*	***2,981.7***

One of the goals of Lahti's strategy is to implement an excellent public transport system complemented by an extensive network of pedestrian and cycling paths. So-called quality cycling corridors have also been prominently included in the discussions about the master plan in 2015. The improvements are not yet visible in the number of combined pedestrian and cycling paths. Other improvements are also possible, such as improvements of signage and widening of pathways.

The proportion of the population living along pedestrian and public transport routes is monitored in the Lahti master plan follow-up. The figure indicates the proportion of the population that has good access to services, either because of the proximity of the city centre or thanks to the efficient public transport system (maximum frequency: every 30 minutes). According to preliminary data for 2015, 82.8% of the residents of Lahti lived in the pedestrian/public transport zone.

Future challenges related to health, safety and quality of life in living environments:

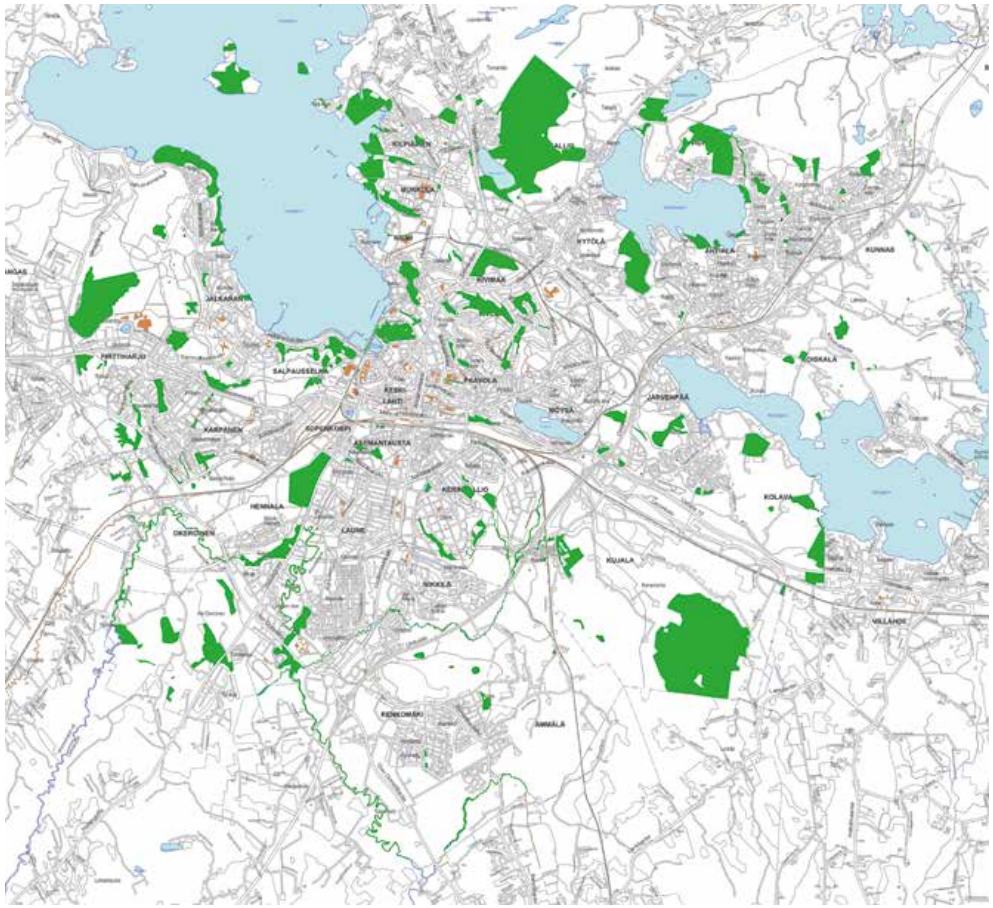
- *The new Lahti region has a greater variety of housing opportunities from the city centre to rural villages. The challenge is to control the population growth so that the different environments retain their unique characteristics: the city remains a city and the countryside remains countryside.*
- *Identification of different zones: from densely-built centres to dynamic villages.*
- *Reduction of noise and its harmful effects.*
- *In the future, days with poor air quality will also be recorded in winter, due to the warming climate and the resulting mild winters.*

Key figures	Base year	2011	2012	2013	2014	2015
Combined pedestrian and cycling paths (km)						
Lahti	*2001: 344*	*395*	*397*	*392*	*401*	***403.3***
Hollola	*2008: 49*	*59*	*59*	*66*	*70.8*	***70.8***
Nastola	*2006: 55*	*47*	*48*	*48*	*50.2*	***57***

3. Biodiversity and cultural heritage

In 2015, Lahti applied the forest management and use principles approved the previous year. The felling of old spruce trees changes the landscape, but from the diversity and sustainability point of view, the diversification of tree species is wise in the long run. The protected areas are the same as last year. In land-use planning, green corridors were allocated in the master plan, and the Salpausselkä ice age formation as a landscape area was taken into the master plan as well. In more detailed planning, attention was paid to ecosystem services and, in particular, ecological treatment of the surface runoff.

Biodiversity sites in Lahti



Key figures	2011	2012	2013	2014	2015
Areas protected under the Environmental Protection Act (ha)					
Lahti (in 1995:256)	*380*	*380*	*507*	*513*	***513***
Hollola	*751*	*751*	*1,237*	*1,284*	***1,284***
Nastola	*67*	*297*	*297*	*297*	***297***
Habitat sites protected under the Environmental Protection Act (ha)					
Lahti	*23.5*	*23.5*	*23.6*	*23.6*	***23.6***
Hollola	*16.5*	*16.5*	*19.2*	*19.2*	***19.2***
Nastola	*9.1*	*9.1*	*12.2*	*12.2*	***12.2***
Areas protected under the Environmental Protection Act, percentage of the municipal land area (%)					
Lahti (1995: 1,9)	*2.46*	*2.46*	*3.28*	*3.32*	***3.47***
Hollola	*1.41*	*1.41*	*2.33*	*2.41*	***2.41***
Nastola	*0.18*	*0.82*	*0.82*	*0.82*	***0.82***
Areas protected under regulations, percentage of the municipal land area (%)					
Lahti	*2.61*	*2.61*	*3.43*	*3.47*	***3.47***
Hollola	*1.44*	*1.44*	*2.36*	*2.45*	***2.45***
Nastola	*0.21*	*0.84*	*0.85*	*0.85*	***0.85***

In addition to the protected areas, municipalities have allocated so-called LUMO areas, or areas of natural diversity. In Lahti, the number of LUMO areas increased and there are now about 1,100 hectares of these areas. The LUMO diversity areas partially overlap the protected areas. The environmental programme of Lahti specifies a target of 4% for protected areas by 2020. The environmental programme was updated before the municipal merger, and it will affect the future development programme of the new Lahti

Future challenges related to the biodiversity and cultural heritage:

- *New protection targets (% of area) in the new municipality.*
- *Establishment of new protected areas, such as Kintterö 2017.*
- *Development and improvement of existing protected areas.*
- *Surveying of the LUMO diversity areas in the old Nastola.*
- *Protection of cultural heritage and maintainence of the unique characteristics of villages.*

Key figures	Base year	2011	2012	2013	2014	2015
Valuable areas protected by city planning regulations, Lahti (number of lots)	*1983: 60*	*1,008*	*1,011*	*1,027*	*1,023*	***1,027***
Number of protected buildings, Lahti	*1979: 3*	*281*	*288*	*295*	*302*	***300***
Traditional landscapes (ha)						
Lahti	*1995: 26.6*	*26.6*	*26.6*	*26.6*	*26.6*	***26.6***
Hollola	*2007: 54.9*	*54.9*	*54.9*	*54.9*	*54.9*	***54.9***
Nastola	*2007: 9.9*	*9.9*	*9.9*	*9.9*	*9.9*	***9.9***

The number of protected buildings took a downward turn for the first time during the follow-up of this indicator.

4. Quality and availability of groundwater

There are seven groundwater abstraction sites in Lahti and five in Hollola. The renovation of the Laune groundwater abstraction site was completed in 2015 and the site was put into trial use. The site was equipped with activated carbon filters that remove even the smallest pesticide residue from the water. In addition, new chemical treatment equipment and UV systems were installed to disinfect the water before it enters the network. A water abstraction site was built at the Laune springs in 1910 and was in use until 2001, when it was closed for waterworks use after pesticide concentrations had exceeded the limit set for household water.

The quality of water is monitored in the groundwater areas, water abstraction sites and the water supply network. In 2015, the amount of water pumped for consumption in Lahti and Hollola was 8.22 million cubic metres. Water intake in the region is based solely on groundwater. All water samples taken met the quality requirements and recommendations set for household water.

Unmetered consumption rate is the indicator that represents the functioning and leakiness of the water supply network. In Lahti, the proportion of unmetered consumption relative to the amount pumped was 5.9%, which is an excellent result compared to the national average, which is about 20%. In Hollola, the unmetered consumption rate was 10.5%, which is well below the national average. The lower the unmetered consumption rate, the smaller the amount of water, energy and chemicals wasted.

In recent years, the Nastola municipality and water utility have been developing the water management system in sparsely populated areas with a focus on source water protection. In two major trunk line building projects, a total of more than 30 km of water supply trunk lines were built in Nastola with construction costs of approximately 4 million euros. The projects were carried out in cooperation with neighboring municipalities and towns as government-subsidized water supply projects. In 2015, 3 km of distribution networks were built in sparsely populated areas with connections to the trunk lines built previously. Nastola water utility received a government subsidy for the construction of the distribution network.

Nastola has six water abstraction sites. A total of 950,371 cubic metres of water was pumped from them in 2015. The water intake is based solely on groundwater and all water samples taken met the quality requirements and recommendations set for household water.

Key figures	2011	2012	2013	2014	2015
Groundwater conductivity (µS/cm), depicts the total amount of salts dissolved in the water. Limit value 2,500 µS/cm.					
Lahti, Jalkaranta	*192*	*175*	*184*	*186*	***184***
Hollola, Ruoppa	*110*	*83*	*106*	*104*	***106***
Nastola, Mälkönen water abstraction site	*220*	*220*	*200*	*200*	***210***
Atrazine levels in groundwater (µg/L). Limit value for any particular pesticide in household water is 0.1 µg/L.					
Lahti (HP137, trackside)	*1.6*	*2.2*	*2.3*	*1.2*	***1.8***
Nastola, Uusikylä (observation point G1)		*2.9*	*1.3*	*1.0*	***0.8***
Percentage of groundwater capacity unavailable due to contamination (%)	*in 2000 0*	*in 2007 15*	*in 2008 28*	*25.5*	***25.5***
Water consumption (L/resident)					
Lahti, specific consumption	*197*	*189*	*184*	*183*	***179***
Hollola, specific consumption	*114*	*113*	*113*	*110*	***102***
Nastola, specific consumption	*212*	*192*	*211*	*211*	***216***
Lahti, household consumption	*127*	*125*	*124*	*122*	***121***

No major changes have occurred in water consumption in recent years. Specific consumption includes water used by households and industries as well as leakage.

Future challenges related to the quality and availability of groundwater:

- *Ecological treatment of surface runoff.*
- *Obtaining research data on the effects of climate change on groundwater and preparing for them.*
- *Decontamination of polluted groundwater areas.*
- *Raising awareness of how everyone can protect the groundwater and report hazards.*
- *Limiting the transport of dangerous chemicals in important groundwater areas and groundwater protection.*
- *Renkomäki gravel abstraction site and groundwater protection.*

5. Water quality and recreational and natural values of lakes and rivers

A significant main watershed runs through the territories of Hollola, Lahti and Nastola: lakes and ponds north of the First Salpausselkä Ridge belong to the Kymi River system, while the surface waters on the south side end up in the Porvoo River. On the terminal moraine of Salpausselkä there are small kettle ponds, such as Likolampi, Mytäjäinen, Häränsilmä, Kintterönlampi, Sietikka and Valkealampi in Lahti. The kettle ponds receive their water directly from the groundwater table or from precipitation. They were formed when giant blocks of ice buried in the soil during the ice age melted, leaving behind large potholes.

In addition to Lake Vesijärvi, there are several smaller lakes in the region. These have high recreational value, as they are located close to residential areas, many of them right in the middle of the city. However, the recreational value of most of the small lakes has been under threat in recent decades due to increased eutrophication. In addition, the state of Lake Vesijärvi is still no better than satisfactory.

The lakes are affected by many things around them, e.g., housing, economic activity, forests and farmland. Nutrients that cause eutrophication also enter the lakes from the atmosphere: rain water nutrient levels may occasionally be much higher than those of lake water.

Lahti is a densely populated and industrialized city and has a lot of activity that puts a strain on the waters. The eutrophication, which has been going on for a long time, has, in certain places, resulted in the depletion of oxygen and severe internal loading. The recreational use in summer is particularly affected by intermittent mass occurrences of planktonic algae, or algal blooms, some of which have been caused by toxic blue-green algae. Lakes in the Lahti region are managed jointly by the municipalities and the Vesijärvi Foundation. In addition to the management of the lakes, measures are also needed in the catchment areas so that the external loading caused by farming and surface runoff will be reduced.

Most of the lakes in the Lahti region are included in the national quality classification scheme. In compliance with the Water Framework Directive, the objective is to have the lakes in good or excellent condition by 2021 and, regarding Lake Kymijärvi, by 2027. At the moment, Lake Kymijärvi's quality is rated "passable". The lakes Iso-Kukkanen, Kärkjärvi, Alasenjärvi, Oksjärvi and Arkionmaanjärvi are rated "good".

In 2015, the Environmental Services carried out several measures for improving the quality of surface water. A comprehensive report prepared by Lahti Region Environmental Services on the results of the ditch load monitoring study 2008–2015 was completed. It was found that the external load on Lake Vesijärvi had decreased, but further decrease is required for the lake to reach "good" condition. To reduce the load, the Purailanviepä water conservation wetland was reconditioned. Lahti Region Environmental Services' long term monitoring programme had revealed that it was in need of improvement. A two-hectare water conservation wetland was created on Sammalsillansuo bog south of Lake Sylvöjärvi. The purpose of the wetland is to

Future challenges related to the recreational and natural values of lakes:

- *Reducing the external load into Lake Vesijärvi.*
- *Achieving the targets of the Water Framework Directive for all lakes.*

reduce the nutrient load into the lake and to improve the ecological state of the lake, which is now in satisfactory condition. The finishing work on the wetland will be carried out later once vegetation has grown in the excavation areas.

In addition, the Environmental Services organized an improvement project for the Hammonjoki River and was involved in the reconditioning of the Virojoki River. Both rivers flow into Lake Vesijärvi. The aim is to improve the trout breeding areas in the lake.

The contribution of surface runoff to the load on Vesijärvi's Enonselkä was studied and the report was published in 2015. Surface runoff from the city is a major contributor to the loading of Enonselkä now that other loading has been reduced.

A year-round measurement station was installed in the Lankiluoto Deep on Lake Vesijärvi in 2015. The station comprises a buoy and an underwater sensor. The station measures the quality of the water every hour along the entire height of the water column and the results are available online.

Key figures	Base year	2011	2012	2013	2014	2015
Lake water chlorophyll a, measured in August (µg/L)						
Vesijärvi, Lankiluoto in Enonselkä basin	*1995: 10*	*14.0*	*13.0*	*16.0*	*8.7*	***10***
Hollola, Lake Arkionmaanjärvi		*4.4*	*6.7*	*5.7*	*4.6*	***3.2***
Nastola, Lake Salajärvi		*10.0*	*15.0*	*14.0*	*9.5*	***8.1***
Lake water transparency measured in August (m)						
Vesijärvi, Enonselkä basin	*2001: 1,9*	*2.3*	*1.8*	*1.8*	*1.7*	***2***
Lake Alasenjärvi		*3.5*	*3.2*	*2.0*	*3.0*	-
Hollola, Lake Arkionmaanjärvi		*2.4*	*2.0*	*1.8*	*2.0*	-
Nastola, Lake Salajärvi		*3.0*	*2.0*	*2.0*	*1.8*	-
Lake Vesijärvi management fishing catch (tonnes/year)	*2001: 86*	*206*	*218*	*159*	*140*	***113***
Kymijärvi power plant's heating load into Lake Vesijärvi (TJ)	*1995: 722*	*1,246*	*817*	*1,293*	*877.4*	***600***
Percentage of lakes in good or excellent condition (% of total surface area)					*11*	***11***

As in previous years, the residents in the Lahti region in 2015 had the opportunity to ask for advice about environmental issues and get an environmental counsellor to lecture about waste management or energy saving, for instance. The Environmental Services' environmental counsellor was also available on weekdays in the Lahti INFO at the Trio shopping centre. Events and showcase exhibitions were organized at the shopping centre and people were invited to discuss environmental issues. The environmental counselling car "Kaisla" was often spotted at markets and fairs. The Environmental Counselling Team was also active in the social networks.

The Environmental Counselling had 11,275 customer contacts during the year at various events and occasions, such as markets and fairs, *talkoot*, the Eco-Village during the Environmental Week, and various counselling events organized for adult groups. Advice was also given by telephone and email.

Teachers and education professionals working with children and young people were offered training that supports environmental education. Children and young people were encountered in classes, school and kindergarten theme days and various events for children and families. In its bid to provide environmental education, the Environmental Counselling reached 3,197 children and young people.

Residents can borrow a wide range of environmental education equipment and material such as tools for teaching mathematics outdoors, bug science kits, aquatic ecosystem exploration kits, binoculars and nets from the Environmental Counselling. Residents can also borrow a thermal camera from the Environmental Counselling in order to find out whether there are energy leaks in their houses. As in previous years, the thermal cameras have been very popular. The Environmental Counselling also lends out a special box bike called "Pyöriäinen" to provide an ecological way of transporting goods. The environmental counsellor, riding on the "Pyöriäinen", also visited various events in Lahti.

In 2015, Päijät-Häme Waste Management Ltd. once again participated in the national Tuikku Hunt, organized for collecting empty aluminium tealight cups. In the Päijät-Häme region, 78 classes and 1,464 pupils took part in the Tuikku Hunt and collected a total of 811,465 empty tealight cups.

Key figures	Base year	2011	2012	2013	2014	2015
Number of environmental advice-related resident events	*2001: 53*	*114*	*180*	*178*	*179*	***102***
Number of environmental advice-related events for children					*136*	***117***
Number of children reached by the Environmental Counselling Team	*2001: 2,750*	*2,119*	*3,941*	*2,652*	*3,602*	***3,197***
Number of events for residents related to land use planning	*2000: 49*	*17*	*10*	*15*	*20*	***21***
Satisfaction percentage in resident questionnaires, Technical Services (%)	*2001: 70*	*67*	*65*	*69*	*71*	***71***

Future challenges related to environmental counselling and opportunities for participation:

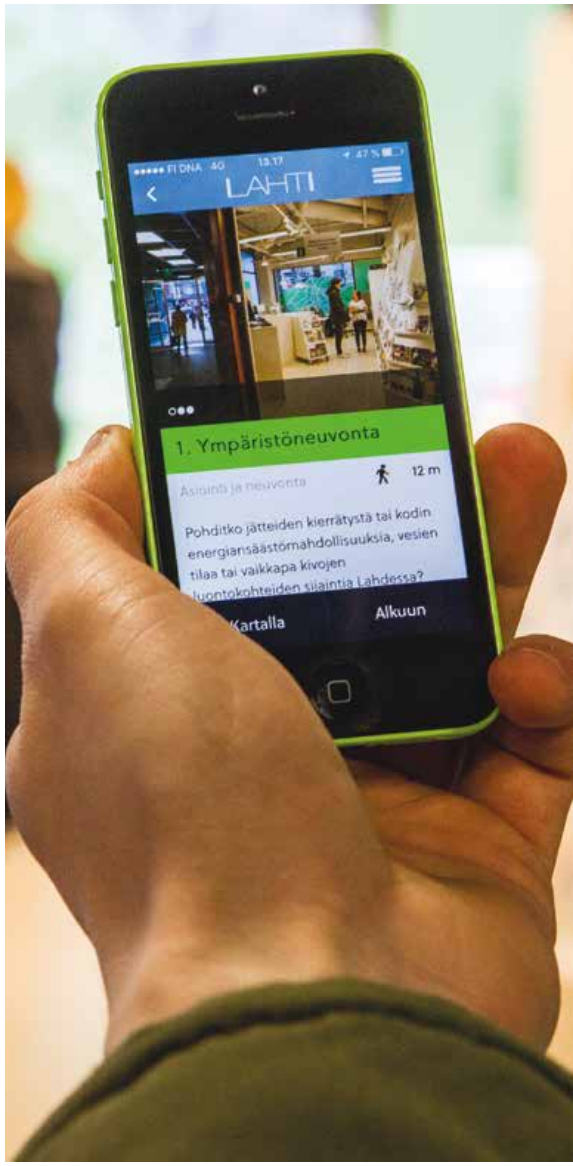
- *Raising environmental awareness and working for the climate.*
- *Education and training for the staff, and new electronic means of participation.*
- *Opening up public information.*
- *Encouraging residents' participation in environmental activities in their neighbourhoods.*

7. Municipalities and municipal enterprises promote environmental responsibility throughout the region

In all its tendering activities, Lahti Procurement Services always takes into account the relevant environmental considerations. Environmental awareness is reflected in all operations, but practices may vary between the different branches and for independent procurements carried out by the municipal units and enterprises. Lahti Real Estate Services is a good example: the environmental aspect is always included in all its procurement criteria. The Green Office programme continued in 11 municipal offices, and the units receive procurement-related guidance through the GO programme as well.

The Lahti region has become a major hub for environmental know-how and business. The Cleantech Venture Day, one of Europe's largest and most important venture capital investment events in clean technologies, was organized in Lahti in 2015. The most recent data on the sales and numbers of employees of cleantech businesses are from 2014 and, in that year, the trend was subsiding.

In 2015, the Environmental Ecology section of the University of Helsinki in Lahti had 13 ongoing research projects, in addition to which a number of post-graduate students were awarded dissertation grants by foundations. External research funding amounts to more than one million euros. Many research projects involve business partners, of which there are more than 90. The university research projects study, for example, the use of algae in food, as feed and as energy, and the development of commercial applications for eco-toxicological methods in cooperation with SMEs in the environmental field. In addition, studies on surface runoff continued. In 2015 the University of Helsinki launched a new bachelor programme in environmental sciences to be studied in the faculties of Biological and Environmental Sciences and Agriculture and Forestry. In 2015 twenty-two bachelor's degrees were awarded, and a record number of master's degrees, also 22. The number of doctoral and licentiate students was 19.



Key figures	2011	2012	2013	2014	2015
Environmental aspects accounted for in invitations to tender (Lahti Procurement Services) (%)	*26*	*24*	*38*	*98.5*	***98.3***

In 2015, the Lappeenranta University of Technology (LUT) strengthened its presence in Lahti by launching a process to grant a sustainability research professorship. LUT Environmental Engineering, alongside Helsinki University's Environmental Ecology, organized a project-based learning course in which students solved actual sustainability challenges in the Lahti region. LUT's projects in Lahti in 2015 dealt with, e.g., the development of sustainable food economics. In addition, preparations were made for projects for residential renewable energy production, improving energy efficiency, utilizing horse manure and for developing the production potential of rural renewable energy. The Clean Acceptance project was about searching for and identifying user-centric low-carbon housing models and further developing existing models for users. The long-term goal is to promote a sustainable urban structure, use of renewable energy and sustainable consumption habits.

In 2015, Salpaus Further Education participated in a wide range of projects and events organized by the Lahti Region Environmental Services, including events related to the reconditioning of Lake Vesijärvi, the mapping of the nature conservation areas in Lahti, the development of the Lapakisto nature conservation area in Nastola in addition to the Green Office programme and Environment Week. Environmental field technicians planned and organized a World Water Day and the Fair Trade and Sustainable Christmas showcase exhibitions in the Trio shopping centre. Students were learning at work at Trio's environmental counselling point, as well as in the various nature, water and environmental consultancy teams of Lahti Region Environmental Services.

LUMA activities

The Päijät-Häme LUMA Centre, part of the national LUMA network, which strenghtens math and science teaching in schools, organized visits to the environmental ecology laboratory of the University of Helsinki, researcher visits to schools and science course planning with teachers. The LUMA Centre has also promoted the networking of teachers in the region, improved mathematics and science skills and has organized club instructor training. The regional qualifier in the national "Tämä toimii!" contest for 4th to 6th graders was held in Lahti in March 2015. The Mukkula team won and the Villähde school team was the runner-up.

Future challenges regarding the promotion of environmental responsibility in the region:

- *Updating the city's procurement programme, and how the new Lahti strategy will affect it.*
- *Reform of procurement legislation and accounting for guidelines set by the Ministry of Employment and the Economy.*
- *Raising corporate environmental awareness and working for the climate.*
- *Increasing dynamism in the city while maintaining or improving the state of the environment.*
- *Improving business opportunities for the cleantech sector in Lahti, prominent references and building international relations.*
- *Municipal cooperation without a common organization of environmental protection.*
- *Ensuring funding for municipalities' environmental activities.*
- *Preserving high-level university education and research in Lahti and improving cooperation with the city organization.*

Key figures	Base year	2012	2013	2014	*2015*
Total net sales of cleantech businesses (EUR billion)	*2002: 0.38*	*1.38*	*1.39*	*1.11*	
People employed by cleantech businesses	*2002: 1,526*	*5,153*	*4,761*	*4,428*	
Annual intake of students in environmental degree programmes (LAMK, universities and Salpaus)	*1997: 47*	*138*	*131*	*141*	***133***

8. Summary of Environmental Balance Sheet 2015 (€1,000)

Environmental Category	City of Lahti			Lahti City Group			Operational area of Lahti Environmental Services		
	Return	Expend-itures	Invest-ments	Return	Expend-itures	Invest-ments	Return	Expend-itures	Invest-ments
1. Air and climate protection		*1.0*			*4,292.0*	*1,534.0*		*4,461.0*	*1,534.0*
2. Water protection and wastewater treatment		*281.2*		*12,402.1*	*8,369.4*	*3,586.7*	*14,144.1*	*9,115.4*	*4,504.7*
3. Waste management and litter prevention		*346.1*		*15,026.0*	*17,131.6*	*5,039.0*	*15,040.7*	*17,317.6*	*5,039.0*
4. Soil and groundwater protection					*36.0*	*11.5*		*36.0*	*11.5*
5. Noise and vibration prevention		*1.5*	*2.0*		*7.0*	*2.0*		*9.0*	*30.0*
6. Nature and landscape conservation/protection	*25.0*	*30.0*		*25.0*	*30.0*		*25.0*	*38.2*	
7. Administrative functions associated with environmental protection	*915.4*	*2,385.3*		*915.4*	*2,385.3*		*915.4*	*2,385.3*	
8. Promotion of environmental protection		*1,781.5*			*1,812.8*	*60.0*		*1,812.8*	*60.0*
9. Environmentally based taxes and payments		*1,454.1*			*2,479.9*			*2,717.3*	
Total	*940.4*	*6,280.8*	*2.0*	*28,368.6*	*36,544.2*	*10,233.2*	*30,125.3*	*37,892.8*	*11,179.2*
Interest costs					*294.9*			*294.9*	
Environmental provisions					*-6.0*			*-6.0*	
Change in environmental provisions					*-6.0*			*-6.0*	
Contingent environmental debt (estimated cost)									

NB! The categories in the environmental balance sheet are not identical to the sections in this review.

Additional information

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