VANTAA

State of the Environment in Vantaa

Summary August 2012

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Foreword

Vantaa is the fourth biggest city in Finland. Together with Helsinki and Espoo, it constitutes a metropolis of around one million citizens, a metropolis that is home to a fifth of Finns. Vantaa has been the most rapidly developing areas in Finland. Growth has been steady with an annual population increase of approx. 2,000. At the end of 2011, Vantaa had around 203,000 inhabitants.

Vantaa has grown into a big city at a time when preserving the natural environment in connection with urban structure has become increasingly important. Vantaa was among the first municipalities in Finland to account for the ecological network and its preservation in master plans. Nowadays Vantaa's green areas and diverse natural environment constitute the city's competitive advantages.

The City of Vantaa systematically monitors the realization of work on environmental protection and sustainable development. Traditional environmental protection has been successful, and the number of nature reserves in Vantaa, adjusted for acreage, is among the highest in the country. Management of environmental issues in all the city's planning and implementation processes is continuously developed. The City of Vantaa is aware of the significance of small inland water habitats, and stormwater management plays an important role in planning and building.

Vantaa aims to direct new building required by the growing city at already built areas. Condensing the urban structure helps preserve expansive unbuilt natural areas elsewhere. Traffic management is a bigger challenge than placing residential and workplace building. Vantaa is a big logistic hub, and the national main routes cross Vantaa, breaking valuable green-area connections.

In the course of years, our knowledge of the environment has greatly increased. Now that we are facing more and more severe environmental challenges, environmental data are in great demand. The city participates in numerous R&D projects to mitigate climate change and to adapt to it, as well as to preserve biodiversity. The experiences and knowledge gained from these projects act as a foundation for implementing the City of Vantaa's environmental policy.

Stefan Skog
Environmental Director

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Biodiversity in Vantaa

Nature in Vantaa has retained its biological diversity and is in a fairly good state of health right next to an expanding city. Even though wide roads have cut green-area connections and the share of forests has over time diminished, Vantaa has been quite successful in maintaining its green-area network. Large outdoor recreation areas, Petikko and Sipoonkorpi, situated in the fringes of the city, constitute a significant part of the regional green circle. In addition, the river and creek banks with their trees and bushes constitute an important green-area network in Vantaa. Some of the coastal zones belong to the city's protected nature reserves whose share—adjusted for Vantaa's acreage—is among the highest in the country.

Ecological networks help secure maintenance of biodiversity. Vantaa's ecological network consists of the following core nature areas: nature reserves, surrounding forests, and the green-area connections in between. The biggest outdoor recreation areas are situated in Petikko, which has a connection to Nuuksio National Park, and in Sotunki, from which the Sipoonkorpi National Park begins.

The diminished number and increased shattering of forests, uniformity of nature in the remaining forests, decrease in the amount of decomposed wood, and over-all decrease in old forests have made it increasingly difficult for a number of species to survive in Vantaa, too.

Compliant with its forestry plan, the City of Vantaa is committed to accounting for biodiversity in the approx. 4,000 hectares of forest areas owned by the city. The majority of Vantaa's remaining 5,000 hectares of forest areas are commercial forests.

Vantaa's meadows and pastures—an integral part of the city's cultural history—used to range uninterruptedly from one region to another. At present, they have shrunk into small patches. There are two regionally valuable traditional biotopes in Vantaa: Vesterkulla's former pastures and Voutila's rocky fields. Locally valuable sites include Kakolanmäki's rocky fields and Tapola's meadows. The combined acreage of Vantaa's traditional meadows amounts to almost four hectares. Furthermore, other open environments with their fields and wastelands have significance for other traditional biotope species.

The river and creek banks with their trees and bushes constitute an important green-area network in Vantaa. Urban creeks reanimate green areas and are centers of urban biodiversity.

Vantaa's 2011-2020 green area program gives the guidelines for planning and building in the vicinity of green areas. Building in such areas that are bordered by protected areas and how to implement the narrowest green areas are two special focuses. Renovation programs are designed for the most urgent small inland water habitats. Creeks are maintained as part of other green-area implementation.

Photo 1. In the course of a hundred+ years, forests in Vantaa have become scarcer and more shattered. The 2004 situation map shows Vantaa's present boundary.

Abundance of nature reserves

The combined acreage of nature reserves financed in August 2012 amounted to around 1,157 hectares, i.e., 4.8% of Vantaa's acreage. The biggest nature reserves are Sipoonkorpi in the east (537 ha) and Vestra in the west (270 ha).

Some of Vantaa's nature reserves are included in national programs such as the program to protect old woods, swamps and groves, and the Natura 2000 Network Initiative to protect the endangered thick-shelled river mussel in Europe.

Besides nature reserves, Vantaa's outdoor recreation areas and agriculture and forestry areas have their own especially important areas for biodiversity, designated in the master plan. There acreage totals around 620 hectares.

Photo: City of Vantaa

Photo 2. Bristly bellflower

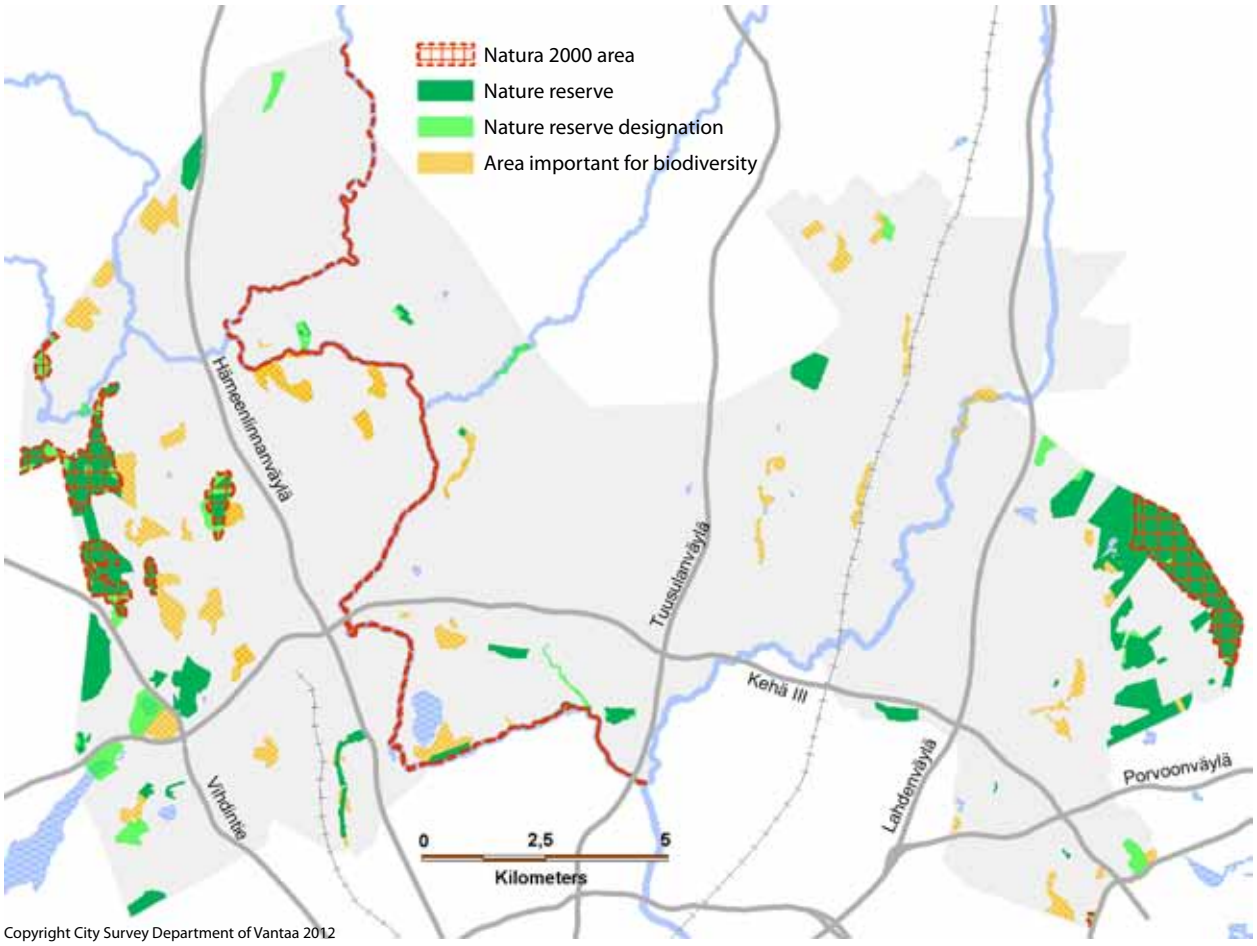

Photo 3. Nature reserves, nature reserve designations, Natura 2000 areas and areas important for biodiversity in Vantaa.

Endangered species in Vantaa

Vantaa is known to be home to more than 40 nationally endangered species. All endangered species in Finland are listed in the Nature Conservation Decree. The aim is to monitor the development of their prevalence and to compile species-specific conservation plans. An endangered species is at risk of disappearing from Finland as a whole. In case of such a risk, the situation of an endangered species is deemed endangered, very endangered, or extremely endangered. The species monitored are at risk of becoming extinct.

Endangered plant species in Vantaa are bristly bellflower, lady's bedstraw, early marsh orchid, and white adder's mouth. Meanwhile, endangered animals living in Vantaa consist of, among others, Siberian flying squirrel, nathusius' pipistrelle, the common buzzard, the northern wheatear, the ortolan, and the sand martin. Examples of endangered insects include scythris laminella, hylochares cruentatus, calamia tridens, and amphipyra tragopoginis. Finally, endangered species in our waters are salmon, grayling, trout, and thick-shelled river mussel.

The white-throated dipper and shore lark—two endangered bird species—winter in Vantaa but do not nest here. The white-backed woodpecker and quail (the latter of which was, for a while, an extinct nester in Finland) are occasional visitors to Vantaa. In addition to endangered species, a large number of species to be carefully monitored live in Vantaa.

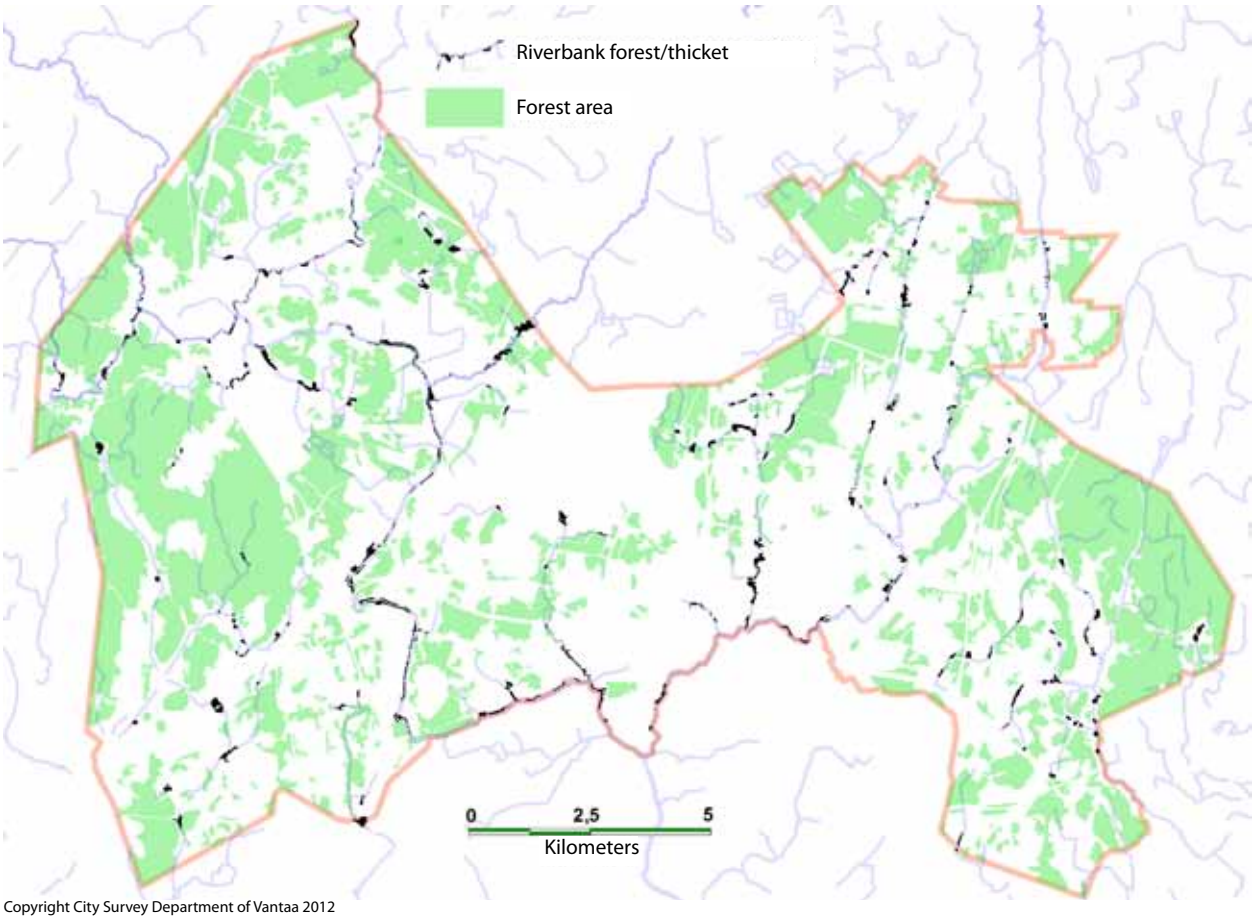

Photo 4. Vantaa's forests and existing riverbank connections with tree stand.

Non-native species threaten our nature

As regards non-native species in Vantaa what is best known is the situation of detrimentally spreading plants. Non-native plant species found in Vantaa include, among others, Persian hogweed, Himalayan balsam, large-leaved lupine, red elderberry, and rosa rugosa. The latest animal newcomers to Vantaa are European rabbit and Spanish slug, which wreaks havoc in the garden.

The Nature Conservation Act (§43) forbids spreading of non-native species in nature if the species may form permanent presence. It is extremely difficult to destroy most harmful non-native species that have formed permanent populations. It is easier and more cost-effective to prevent such species from spreading in the first place.

The international treaty on biodiversity—ratified in 1992 in Rio de Janeiro—requires the contracting countries to devise their own national strategies or programs for non-native species. In Finland, the Ministry of Agriculture and Forestry has coordinated the preparation of these strategies. The proposal for domestic non-native species strategy was completed in March 2011.

Photo: Jarmo Honkanen

Photo 5. Lupine is an effectively reproducing non-native species in Vantaa.

Ecosystem at our service

Biodiversity refers to life and all it entails: internal hereditary variation of species; multitude of species; and environmental diversity. Reduced biodiversity presents one of the most essential global environmental problems. Functional nature offers people immeasurably valuable commodities and services that are nowadays called ecosystem services.

For instance, pollination by insects and numerous other animals, disintegrating microbes in the soil, binding and filtering of rainwater into groundwater by plants and living soil, are some of the things nature does that benefit humans. In addition, raw materials and food derived from nature, as well as experiences and refreshment provided by nature, are ecosystem services whose availability depends on maintenance of living environments and the hereditary biodiversity of living environments, organisms and species.

Climate change and Vantaa

During the past hundred years, the average temperature of the globe has risen by around 0.8 degree. It is generally considered that the biggest reason for the temperature rise is the increase in greenhouse gas emissions. Cutting greenhouse gases to mitigate climate change is at present one of our biggest environmental challenges. Changes caused by the risen temperature—such as more common downpours and risen sea levels—demand adaptation measures to be taken by us. On local level, cities and municipalities can, to a significant extent, have a significant impact on cutting greenhouse gas emissions. Thus, cities and municipalities play a major role in implementing climate-change-adaptation measures.

Vantaa's greenhouse gas emissions

Vantaa's greenhouse gas emissions have increased 25% from 1990—when the international Kyoto agreement was made—to 2011. In 2011, Vantaa's emissions totaled 1.35 million tons. Emissions per resident have been falling slightly since 2007. In 2011, emissions per resident amounted to 6.7 tons equivalent carbon dioxide (CO2-e), which is 1.5% less than in the previous year and 5% less than in 1990. Changes in annual emissions are mainly related to changes in economic situations or changes in national electricity production methods. The most significant sources of greenhouse gas emissions in Vantaa consist of heating, traffic, and electricity consumption. (Photos 1 and 2)

Climate change mitigation and adjustment in Vantaa

Climate change can no longer be stopped, but its progress can be mitigated and decelerated, which reduces harm to the environment and to people. Cutting greenhouse gas emissions affects greenhouse gas contents and the earth's average temperature slowly, since the gases stay in the atmosphere for a long time, i.e., they have a long lifespan. Therefore, it is imperative that we adjust and prepare for the changes brought about by climate change.

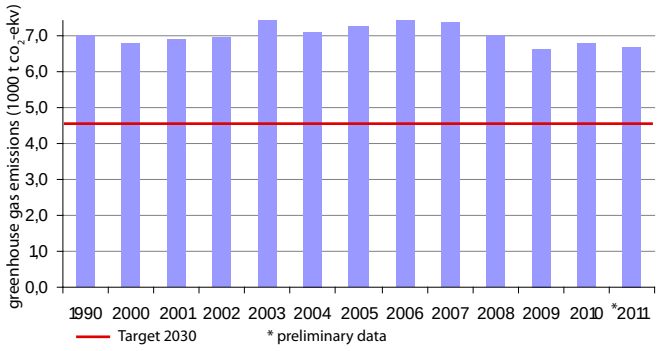

Photo 6. Resident-specific greenhouse gas emissions in Vantaa in 1990 and from 2000 to 2011. (Source: HSY)

Compliant with the 2030 Metropolitan Area Climate Strategy, Vantaa is committed to reducing its greenhouse gas emissions by 39% from the year 1990 level by 2030. This means that emissions per resident are cut to 4.3 tons CO2-e. Vantaa has also signed the Covenant of Mayors (energy and climate agreement), which requires Vantaa to cut its emissions by more than 20% by 2020. In addition, the goal of reducing greenhouse gas emissions 5% per year has been set for the 2009-2013 council period. The metropolitan area's joint climate-change-adaptation strategy was completed in April 2012.

The City of Vantaa has set a climate-change management group to be in charge of the city's climate work. Different departments' goals and actions to cut greenhouse gases are included in the departments' climate and environmental programs. The city can influence the emissions by integrating and condensing the urban structure. It is also essential to reduce the greenhouse gas emissions caused by energy and electricity consumption. Vantaa Energy's (partly owned by the City of Vantaa) ways to produce district heating have a significant impact on Vantaa's emissions.

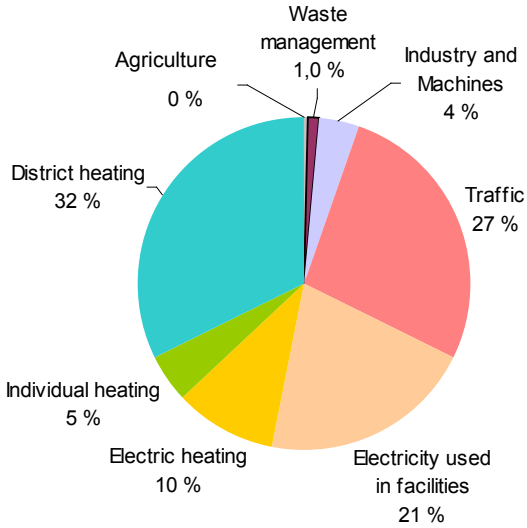

Photo 7. Distribution of total greenhouse gas emissions between different functions in Vantaa in 2011. (Source: HSY)

Preparing for floods

Climate change makes floods increasingly more common and frequent in Finland. On average, flooding along the main bed of the River Vantaa is deemed to diminish, because the amount of snow is projected to decrease due to climate change. By contrast, flooding may slightly increase in the future in the smaller tributaries of the River Vantaa, the Kerava and Luntaanmäenjoki rivers, which is mainly used to increased downpours and winter floods. (Photo 8)

The impacts of climate change remain uncertain. For instance, rains heavier than anticipated at present may bring about more changes. Nevertheless, based on observations, the flood charts compiled are serviceable also when accounting for climate change. A flood occurring, on average, once every 100 years would cause major damage. We can reduce the harm caused by future floods to, for instance, buildings, by preparing and planning for them already at this stage.

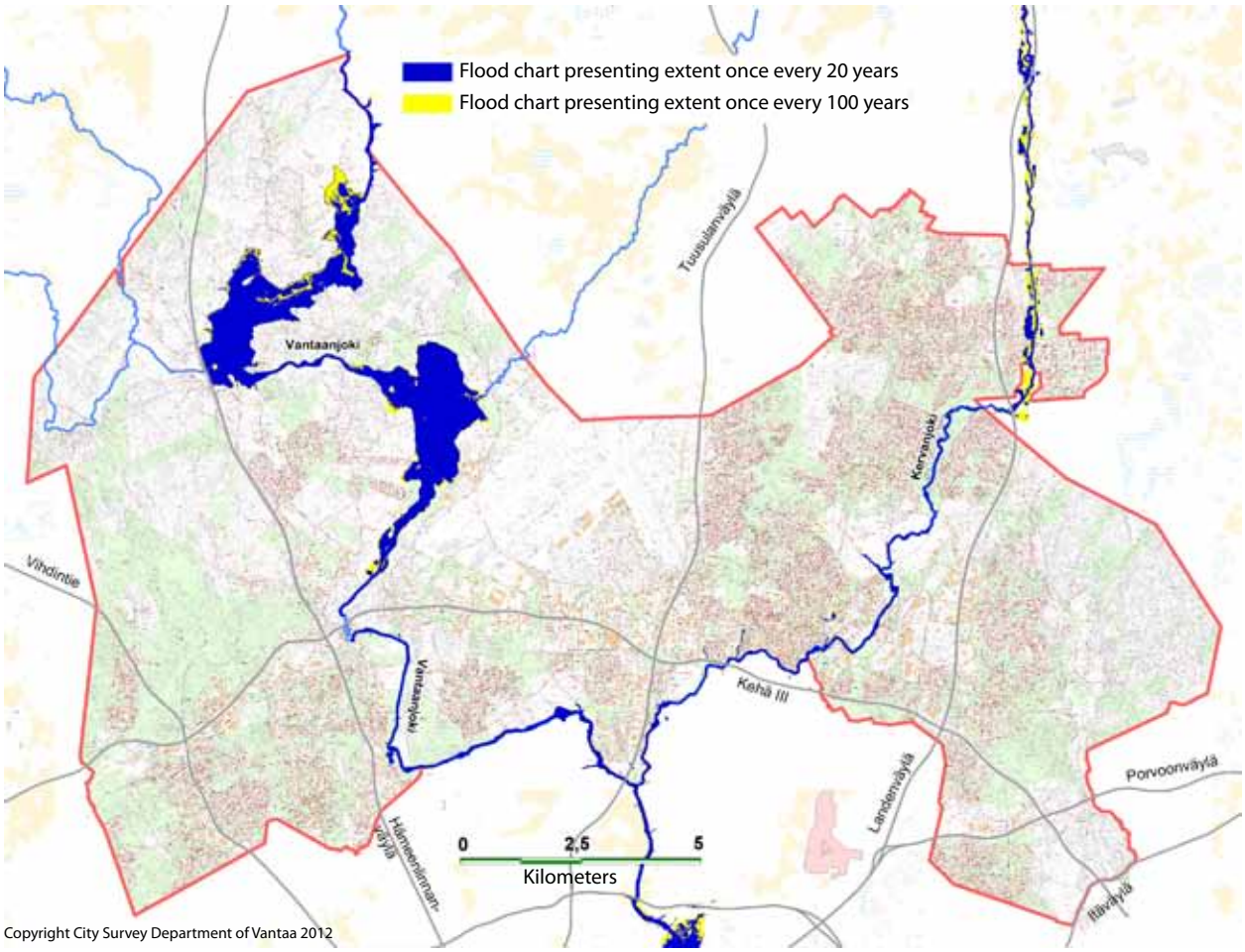

Photo 8. Flood chart presenting the extent of floods along the Vantaa and Kerava rivers once every 20 years and once every 100 years.

Air quality

Clean air is a condition for the well-being of both people and nature. Air pollution contents in Finland are generally on a fairly low level, even though impurities may momentarily and locally arise. Gaseous and corpuscular impurities either come from nature or are caused by human action. These impurities may cause worldwide, regional or local harm. In the metropolitan area, the most significant air impurities consist of particles, nitric oxides, ozone, sulphur oxide, carbon monoxide, and volatile organic compounds. Energy production and traffic emissions in particular pollute air in cities, a situation that is made worse by the following factors: industry, heating of small houses, and drifts from neighboring countries and Central Europe.

Guideline values for nitric oxide are surpassed in Vantaa as well as in the rest of Finland usually in the spring, as well as occasionally in the centers of the largest cities. Particle contents surpass the guideline value usually in the spring, especially along busy roads and streets. By contrast, the maximum values for sulphur oxide and particles are not usually exceeded, even though this may happen in the very center of big cities and along busy streets surrounded by high-rise buildings.

Air pollution is detrimental to health. Exposure to air pollutants is most severe along areas with heavy traffic and in the vicinity of permanent sources of emissions. The contents of air pollutants in Finland normally remain on a fairly low level and do not cause significant detriment to most people. There are, however, individual differences.

Maximum values and guideline values have been set for air impurities by means of decrees. The maximum values set for air quality specify the maximum acceptable contents of air impurities.

Air quality in Vantaa

Guideline values for nitric oxide are surpassed in Vantaa usually in the spring, as well as occasionally in the centers of large cities. Particle contents exceed the guideline value usually in the spring, especially along busy roads and streets. The maximum values for sulphur oxide and particles are not usually exceeded, even though this may happen in the very center of big cities and along busy streets surrounded by high-rise buildings.

The contents of suspended particular matter in Vantaa have remained almost unchanged in the past ten years. No clear changes in the contents of fine particles have been noticed for the past ten years.

The contents of carbon monoxide have diminished thanks to catalytic converters' becoming more common in cars. In the long run, the contents of nitric oxide have fallen significantly slower than those of carbon monoxide; at Tikkurila measuring station, the contents of nitric oxide have only taken a very small downward turn during the past ten years.
In the metropolitan area, ozone contents have climbed in the long run, especially in places with heavy traffic, since the amount of ozone-depleting impurities—especially carbon monoxide—in the air has reduced.

Sulphur oxide contents have long remained on a very low level, and sulphur oxide is not considered a significant air-quality problem. Likewise, the slight fall in sulphur oxide contents continues and the contents remain low in all the measuring stations.

Air quality monitoring

Air quality in both Vantaa and elsewhere in the metropolitan area has long been monitored by HSY Waste Management's Seututieto. The aim is to provide the residents with up-to-date information on air quality and its development.

In the metropolitan area, air quality is assessed by means of continuous and indicative measurements, models, and bioindicators. HSY monitors air quality in the metropolitan area with the help of continuous measurements and mobile measuring stations. The measurements analyze the impacts of traffic and energy production, as well as air quality in residential and other areas. The stations measure the contents of the most important air pollutants: particles, nitric oxides, ozone, sulphur oxide, carbon monoxide, and benzene. In addition, factors describing the climate are measured.

Based on their location, the measuring stations can be classified as urban, suburban, rural or back-

ground stations. Mobile measuring stations monitor air quality usually per one-year periods.

Permanent measuring stations are situated in Mannerheimintie, Vallila, Kallio and Vartiokylä, in Helsinki; in Leppävaara, in Espoo; and in Tikkurila, in Vantaa. A regional background station is situated in Luukki, Espoo. Tikkurila's permanent measuring station on Neilikkatie represents a busy urban environment in Vantaa. The device in Heureka Science Centre measures ozone contents that depict ozone levels in suburban areas.

Monitoring impacts on nature

Air pollutants also harm nature. Soil and waterway acidification and eutrophication accelerate due to impacts of air pollutants. In addition, air pollutants harm plants directly through leaves and needles as well as through damage to plant roots.

Regional prevalence of air pollutants and their potential impacts on forests are monitored by means of needle, lichen and moss tests. A bioindicator survey in the Uusimaa region was most recently conducted in 2009. The survey charted the lichen growing on pine trunks and assessed the condition of the most common species of lichen, i.e., Hypogymnia physodes, on the following scale: 1 = healthy, 2 = slight damage, 3 = clear damage, 4 = severe damage, and 5 = dead or missing.

The bioindicator survey in Vantaa's 33 observation areas did not find any severe damage to Hypogymnia physodes (4), which was the case in the previous survey as well. Hypogymnia physodes was classified as clearly damaged (3) in 17 observation areas, in mainly central and eastern Vantaa. In the remaining 16 observation areas—mostly in western Vantaa—the damages were slight (2). Compared with the year 2004 results, there was an increase in areas with clearly damaged (3) lichen.

Biggest emissions from traffic and energy production

The biggest emissions of air impurities in Vantaa and in the entire metropolitan area are generated by traffic and energy production. Most of the energy-production-related emissions come from power plants. In small residential areas, use of fireplaces generates emissions that affect air quality locally. The most significant impact on air quality comes from vehicular traffic, since these emissions are let loose at breathing height. Besides direct emissions, car traffic generates indirect emissions by lifting dust particles from road surfaces. Street dust causes situations, especially in the spring, where the contents of pollutants may be quite high.

Air-protection action program aims at better air quality

Vantaa has devised an air-quality action program for 2008-2016 to prevent the maximum values for nitric oxides and particle contents from being exceeded. The program aims to provide the citizens with a healthy and pleasant residential environment. Vantaa's action program is based on the metropolitan area's joint air-protection program, implemented in cooperation with the metropolitan area municipalities and HSY.

The air-protection action program consists of long-term measures to lower the contents of air impurities. The program describes goals and measures to promote air protection related to, for instance, land-use planning, traffic, street dust, combustion, information, and education. The program presents altogether 21 actions to lower the contents of airborne nitric oxides, particles, and fine particles.

Groundwater

Groundwater filtered by layers of earth is a highly valuable natural resource that is to be, by any means possible, protected from pollution. Nevertheless, decrease in natural, filtering soil and general chemicalization of the environment pose a threat to the quantity and quality of groundwater. Progress can, however, be seen in protecting groundwater: In the late 2000's, use of groundwater in Vantaa has diminished due to closing of water intake plants.

Quantity of groundwater

The amount of rain and the extent of drain-permeable soil affect the amount of groundwater. Building reduces the amount of groundwater, as the amount of unbuilt land diminishes and the amount of soil not permeable to water increases. To promote formation of groundwater, city plans have increasingly strict demands for infiltrating clean roof water into the soil in groundwater areas.

The level of groundwater is annually monitored from hundreds of groundwater pipes. Of all the big infrastructure projects, only the Savio railroad tunnel has had local impacts on the level of groundwater surface. A critical point in building the tunnel was the Kuusijärvi region, but its impacts on the level of the lake have not been verified. Another large-scale observation project focuses on the environs of the Ring Rail Line, to be completed in 2014.

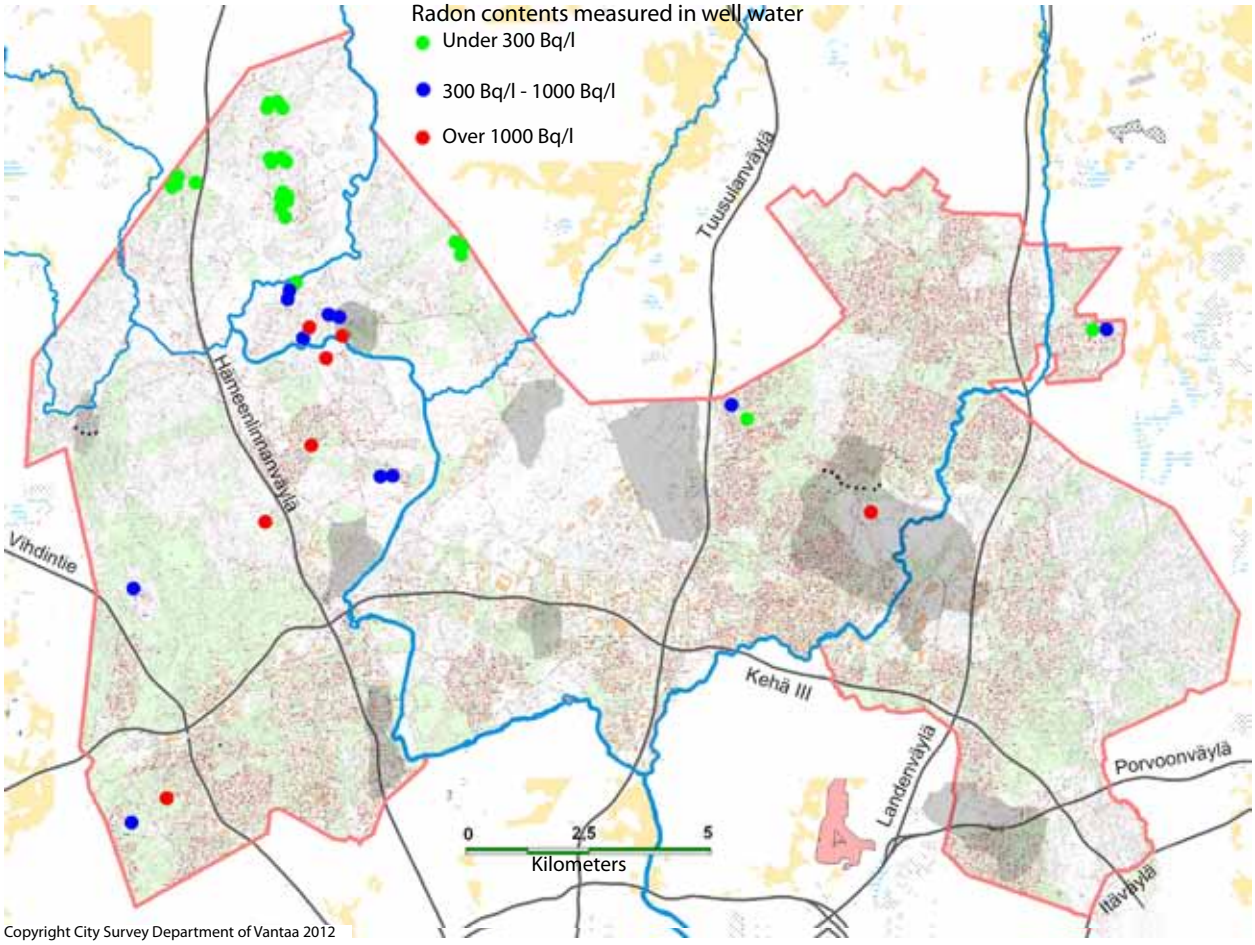

Photo 9. Groundwater areas (in gray) and radon contents measured in well water.

Use of groundwater

Water intake plants are in active use in Fazerila groundwater area, Lavango, and Vestra. Use of Valkealähde water intake plant was terminated in 2008, due to pesticides found in the water. The Helsinki-Vantaa International Airport was attached to Vantaa Water's (at present HSY Water) water system in 2009. Valkealähde and the airport act as reserve water intake plants. Also, real estates excluded from the water system, located outside the urban area, use groundwater.

Quality of groundwater

The quality of groundwater is monitored at water intake plants and in their environs, in the vicinity of functions required by environmental permits, and in large building projects. Households are responsible for monitoring the quality of water in their wells. Factors deteriorating the quality of groundwater consist of pesticides, solvents, chloride (used in road maintenance), and high radon contents in household wells.

Pesticides

In the 2000s, chemicalization of groundwater has been concretely manifested as pesticides in groundwater. The highest levels detected in Vantaa are 2,6-dichlorobenzonitrile (BAM), atrazine, and simazine including their decay products. The substances were commonly used to control weeds, but their use is nowadays forbidden. Atrazine was withdrawn from the markets as early as in 1991.

In Valkealähde groundwater area, pesticides have been found in various groundwater areas from the vicinity of the main railroad to Vanha Porvoontie. According to estimates, there have been numerous sites where pesticides have been used and emitted. At its highest, the total contents or pesticides in samples amounted to 1.73 µg /l. The highest contents of BAM were 0.99 µg /l, and 0.36 µg /l at the intake water plant. In Fazerila groundwater area, the highest BAM contents amounted to 3.7 µg /l. Quality criteria for household water are as follows: 0.10 µg /l for an individual pesticide and 0.50 µg /l for combined pesticide contents. Use of water from the above sources is not, however, estimated to be hazardous to health. The World Health Organization's (WHO) imputed guideline values for BAM are 450 µg /l for adults and 150 µg /l for children.

Pesticides can be removed from groundwater at the waterworks by means of, for instance, activated carbon filters. One of these is in use at Valio water intake plant.

Chlorinated solvents

Chlorinated solvents have been detected in Fazerila groundwater area ever since monitoring began. In 1996, the contents of trichloroethene exceeded 5,000 µg/l. The value set for household water is 10 µg/l. Chlorinated solvents have been found in smaller quantities also elsewhere in Vantaa, for instance, in the groundwater areas of Valkeanlähde and the Helsinki-Vantaa International Airport. Trichloroethene is poisonous and may cause genetic damage and cancer. It is harmful to organisms in water and may cause long-term damage to aquatic ecosystems. Trichloroethene is mostly used in Finland for removing grease from metals and for cleaning in the metal, chemical, paper, and publishing industries.

Cleaning groundwater polluted by solvents was tried with the help of a reactive wall in Fazerila groundwater area from 2004 to 2006. When groundwater flowed through the wall, 95%-99% of trichloroethene dissolved. Cleaning was terminated, since the required environmental permit would have made the cleaning operations too difficult to manage and too burdensome to the real estate.

Risks

Protection of important groundwater areas has progressed by accounting for them already when making land-use plans. Risky operations that pose danger to groundwater and require environmental permit are primarily placed outside groundwater areas. Groundwater protection is also important for those who take their household water from their own wells. Risks to water quality arise from, among other things: oil and chemicals accidents in traffic and loading places, underground oil tanks, wastewater wells and drains, and old refuse pits and waste fills.

Contaminated land in Vantaa

Contaminated land is a health and environmental hazard. Substances degrading the soil usually originate from the local industrial plant, fuel supply station, chemicals storage, or dumping area. In Vantaa, the most common sources of contaminated soil are petroleum hydrocarbons and heavy metals. Nevertheless, contaminated soil substances—previously unknown—are found from time to time.

What constitutes contaminated land?

Until 2007, classifying soil as contaminated was based on the SAMASE guideline values, whereas present focuses are land-use purpose, quality of contamination, and significance of soil features for the treatment requirement. The Government Decree 214/2007 specifies the threshold values for harmful substances as well as lower and higher guideline values. In case of concentrations below the threshold, soil substances pose no risk of contamination of soil, groundwater, or the environment as a whole. When the threshold is exceeded, the scope of soil contamination and the need for cleaning must be assessed. Higher concentrations are accepted in industrial, storage and traffic areas than in, for instance, residential areas.

Migration, exposure, and impacts

Harmful substances can spread in the soil and be transported to the air, groundwater, waterways, or bottom sediments of waterways. If people, animals or other living organisms are exposed to harmful substances through air, drinking water, food or skin, they may suffer from adverse effects. For instance, children are very sensitive to lead.

Register of contaminated countries

Real-estate-specific data on soil contamination are maintained in the government's soil-status database. Around 400 sites in Vantaa have been entered in the register. In the database, the sites are divided into the following four categories: operating site, site to be investigated, site to be assessed or cleaned, no need for cleaning. The register is updated by local business, transport and environmental centers that also provide site-specific data upon request.

Situation in Vantaa

A significant number of soil contaminations in Vantaa have been caused by the emissions from Grönberg lead smelter, which operated until 1984 and is situated along the Jokiniemi main line. High lead concentrations have been measured within 500 meters from the smelter (Photo 10), especially in forest humus. The most severely contaminated areas were treated in the late 1990s and in the 2000s. The last two, Winterinmäki in Jokiniemi and Männistönpuisto in Tikkurila, were treated in 2008 and 2010 respectively.

Many incidences of soil contamination originate from oil leakages and accidents, fuel supply stations, and repair and maintenance of motor vehicles. Of the 115 sites treated in Vantaa from 2002 to 2009, 68 consisted of soil contaminated by oil.

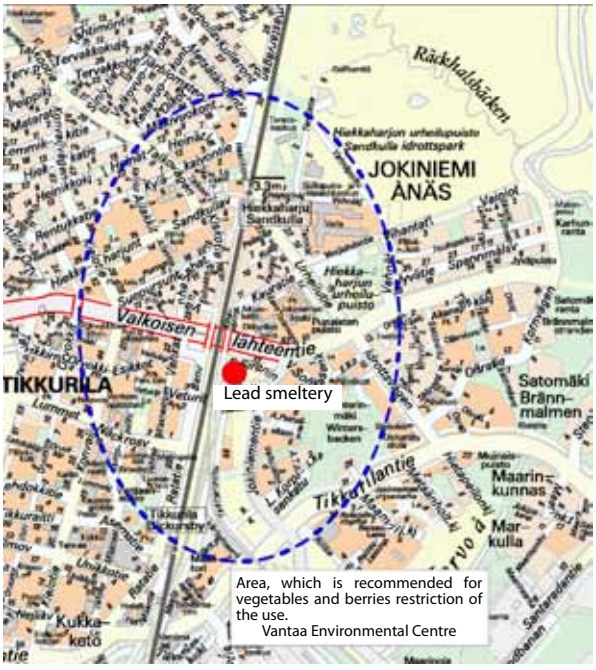

Photo 10. Area with the highest lead concentrations measured in the soil. (Source: Vantaa Environmental Centre)

Background concentrations

Background concentrations of heavy metals and PCB in the soil were studied in Vantaa in 1996, 1997, and 2006. In two forest-soil samples, the threshold value for antimony (2 mg/kg) was exceeded, and the threshold for lead (60 mg/kg) was exceeded in three samples, the highest lead concentration of which amounted to 170 mg/kg. Excess threshold values were also detected in arable-land samples: antimony was found in Petikko and chromium in Kuninkaanmäki. The PCB concentrations remained well below the threshold value in Vantaa, whereas in Helsinki 39% of samples contained PCB in excess of the threshold value. Helsinki also has higher background concentrations of lead than Vantaa; almost half the samples taken in Helsinki exceeded the threshold.

Treating contaminated soil

The party responsible for contaminating the soil is also responsible for cleaning it. If the guilty party cannot be held responsible, the present owner of the area is responsible for treating the contaminated soil.

Before treating the soil can be started, the local ELY Centre must be notified or the local administration must be applied for an environmental permit. In case of acute oil- and chemicals accidents, emergency measures are taken as stipulated by the law. Treating old contaminated sites often starts when new construction begins.

The most common treatment method has been exchange of mass: the contaminated soil is dug out and replaced with fresh clean one. In the late 2000s, the mass-exchange amounts have been smaller than in the initial years, which is due to the fact that the treated sites have been smaller than before and because there have been legislative changes. If all contaminated soil cannot be removed, structures are built to isolate the contaminated area or layer from clean soil. Pore gas treatment has been used to some extent to treat sites contaminated by volatile petroleum hydrocarbons or solvents.

Heavy metals in plants

Metal concentrations in plants were studied from 1999 to 2007 in the environs of former Grönberg, in the vicinity of a scrap yard operating in Kiila, and in the environs of former Pakkasakku, in Tammisto.

Lead concentrations in berries exceeded the threshold value for commercial sales in six Grönberg samples, in four Pakkasakku samples, and in two Kiila samples. Two incidents of excess concentrations in salad samples were detected in Tammisto and three in Kiila. Around half of the salad samples deviated from the background concentrations, more than in the case of berries. The threshold value for cadmium was only exceeded in the four Grönberg berry samples and in one Kiila salad sample. In a sample of fireweed leaves taken near Kiila scrap yard, lead concentrations were as high as 22 mg/kg. In addition, excess lead concentrations were also found in dandelions. The cadmium and lead concentrations in mushrooms varied greatly, depending on soil metal concentrations. The highest concentrations were detected in mushrooms near factory plants, of which half the samples contained cadmium or lead in excess of the commercial threshold value.

Growing and consuming vegetables and berries in the Tikkurila and Jokiniemi areas, within a 500-meter radius of Grönberg smelter, is still not recommended, unless the soil lead concentrations have been verified to be minor or unless the soil is treated.

Waterways and small inland water habitats

The City of Vantaa mostly belongs to the Vantaa River drainage basin. The Vantaa River—flowing through the city—is the most important waterway in the area, together with is biggest tributary, the Keravanjoki. In addition to numerous creeks and streams, Vantaa has a few lakes and ponds. The city also has plenty of small inland water habitats that bring aquatic nature close to many Vantaa residents.

Large surfaces, impermeable to water, caused by the scarcity of lakes and condense building, expose the Vantaa River's tributaries and creeks to flooding. Around a million people live in the Vantaa River's area, which is not only the most densely populated part in the country, but also an important agricultural area. Harmful substances and nutrients deteriorating water quality enter the river and creeks. Water protection has, nevertheless, been successful, and the quality of water in the rivers and creeks has significantly improved from the 1970s when untreated wastewater was let to enter the river. Likewise, the value of small inland water habitats has been acknowledged in Vantaa, and a lot of work and effort is currently being made to protect and renovate urban creeks and other small inland water habitats.

Recreational use of waterways

There are six public beaches in Vantaa, the most significant and popular of which is Kuusijärvi. The others are: Havukoski, Matari and Nikinmäki beaches along the Keravanjoki, and the outdoor swimming pool in Leppäkorpi. In addition, the beach in the Vetokangas outdoor recreation area was renovated and opened as a public beach in June 2012. The quality of water in Kuusijärvi and Leppäkorpi has generally been good, whereas the hygiene of the beaches along the Keravanjoki has varied. In sunny, low-rain seasons,

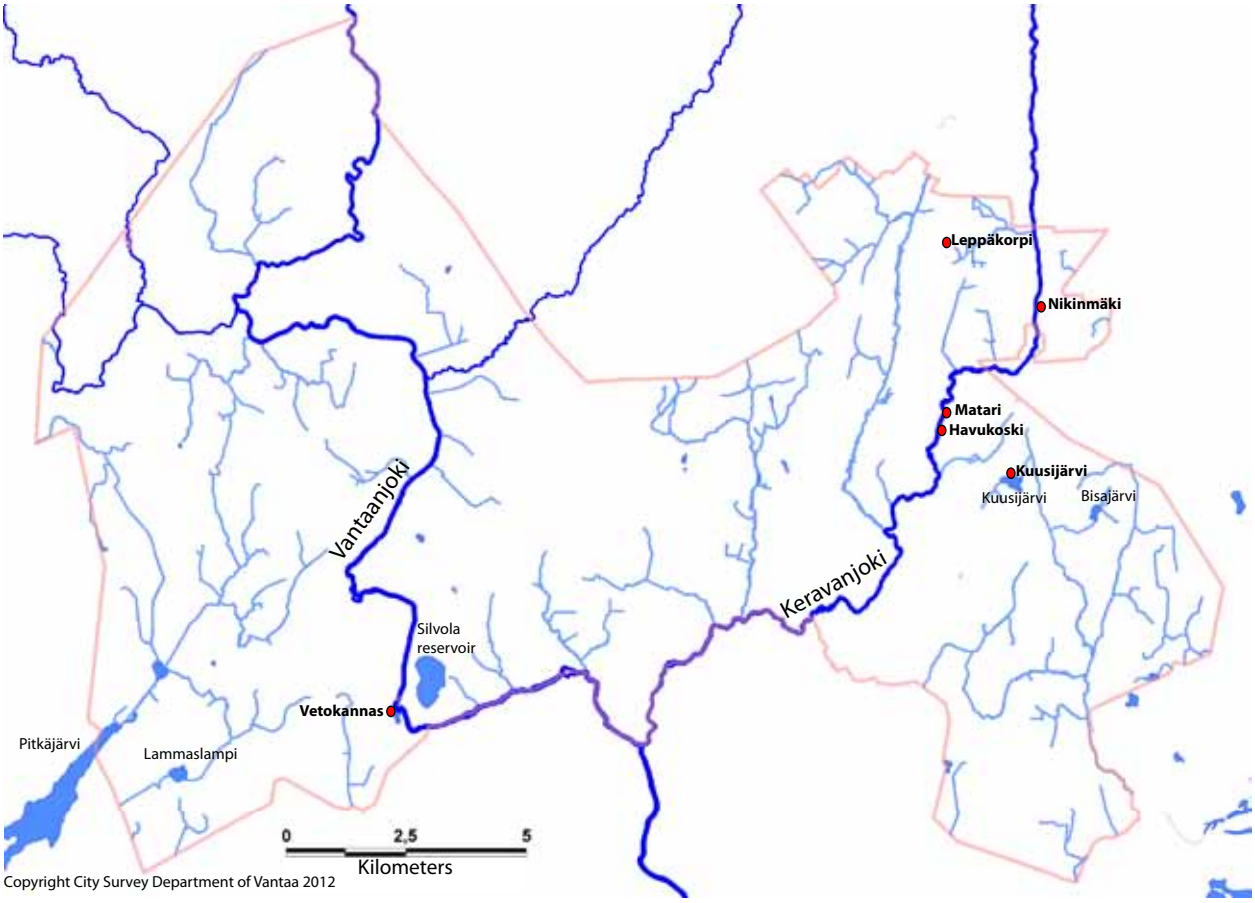

Photo 11. Public beaches (•), lakes, ponds, rivers, and small inland water habitats in Vantaa.

the quality of water has been better than in heavy-rain seasons, when rainwater brings suspended substance, garbage and dirt into the river.

Vantaa's creeks are rich in fish. The survey on Vantaa's small inland water habitats shows that—as far as creeks are concerned—the City of Vantaa has scarce data on aquatic nature and water quality. In the summer of 2009, Skes (a Finnish fishing-tourism promotion association) conducted a survey of 57 small inland water habitats. According to the results gained, the Vantaa River's tributaries and the large creeks in Central and Eastern Vantaa have a versatile fish population. A survey on the status of Vantaa streams' fish population and other living organisms was started in 2010.

Loading of waterways

The goals of the EU Water Framework Directive (entered into force in 2000) are: to protect the ecosystem against pollution and deterioration; to protect and improve its state; to promote long-term conservation-based use of water; and to reduce groundwater pollution. Another goal is to reduce emissions endangering the health of water and to reduce the impacts of floods and droughts. Surface water shall be in good condition and groundwater shall be in good quantitative and chemical condition by the year 2015. In Finland, the Water Framework Directive is executed by legislative means, and action programs have been compiled for all water-management areas.

Photo: City of Vantaa

Photo 12. Fugitive emissions from agriculture are the biggest source of eutrophication in Vantaa.

According to Environmental Administration's data, 44% of the Vantaa River drainage basin's nitrogen loading and around 57% of phosphorus loading originate from agriculture. Agriculture in Vantaa primarily translates into cultivation of grain and other food plants. Cattle breeding is a minor industry, whereas horse hobbies are popular: There are approximately 50 stables in Vantaa with around 460 horses and ponies. Stipulations of the Nitrate Decree (931/2000) aim to reduce the emissions of nitrate nitrogen from agriculture in waterways. Furthermore, the City of Vantaa's environmental protection regulations and stable's environmental guide (published in 2010) consist of rules and recommendation to protect both surface and ground water.

The sewer system, emissions from dispersed settlements, and functioning of package plants

Ninety-seven percent of Vantaa residents are connected to the public sewer system. There still remain 1,500 real estates in the city's large dispersed settlements in the east and west where 4,000 residents' wastewater is handled real-estate-specifically. The loading of waterways in the Vantaa River drainage basin's dispersed settlements amounts to around 12% of nitrogen loading and 26% of phosphorus loading.

Compliant with the Act on Water Services, a plan for developing Vantaa's water management was complied. The plan presents the expansion schedule and costs of the city's water pipes and sewer system. Some of the dispersed settlements will have access to the water system in the near future, but, on the other hand, new residential buildings are built in the dispersed settlements. There are around 500 real estates in the area that could have but have not joined the public sewer system. Not all the real estates are urged to join the sewer system; guidance and monitoring has been particularly targeted at real estates in the groundwater areas and along the shores.

The majority of the Vantaa River's loading is directed from wastewater treatment plants to the upper regions of the Vantaa River. According to the Vantaa River and Helsinki Region Water Protection Associa-

tion, the loading from wastewater treatment plants to the waterways diminished during the control period (2005-2009) as regards organic matter and nutrients. In other words, the increased amount of wastewater was cleaned more efficiently than earlier. The average removal of nitrogen loading was slightly more efficient than before, but the average loading of organic matter and phosphorus remained the same, compared with the earlier control period.

Stormwater

Besides Vantaa's condense urban environment, stormwater flows from the airport area and large logistics areas. Stormwater consists of rainwater and melted water flowing down from built surfaces. Stormwater most often cumulates on roofs, paved yards and parking areas, and roads. The City of Vantaa's stormwater program aims at better management of stromwater, enhancing the quality of stormwater, decreasing the amount of stormwater, increasing urban biodiversity, improving groundwater quality, and maintaining the surface level of groundwater. Further objectives consist of: increasing appreciation for waterways, utilizing stormwater as a positive resource, functioning cooperation and flow of information between authorities, and developing Vantaa's stormwater operating model.

Environmental noise

In the Environmental Protection Act of 2000, noise is defined as sounds or comparable vibrations that cause harm to health or considerably decrease the amenity of the environment or hinder work. In Vantaa, the principal sources of noise are vehicle traffic on main roads of national significance and aircraft traffic at the Helsinki-Vantaa International Airport.

Action programs and guidelines for noise prevention

The European Community adopted the Environmental Noise Directive (2002/49/EC) in 2002. The directive requires noise assessments and action programs for cities and high-traffic arteries. The directive aims at securing that citizens receive information about environmental noise and its impact, and so do the amendments of the Finnish Environmental Protection Act and Decree in 2004 which were based on the directive .

The first noise assessment according to the Environmental Noise Directive was made in 2007. In Vantaa the railways, the roads with the highest traffic and the Helsinki-Vantaa Airport were assessed. The second phase of the noise assessment, completed in 2012, also includes main streets and collector streets.

The objective of the 2006 Government resolution on noise abatement is to reduce substantially, by 2020, the levels of environmental noise as well as the number of people exposed to environmental noise.

Today, every sixth Finn lives in an area with a day-time noise level above the recommended maximum of 55 dB. The general noise level in residential areas can be addressed through urban planning in particular.

Noise exposure in Vantaa

Traffic noise

Traffic noise is loudest in the vicinity of the national roads that transverse Vantaa. Fortunately only few dense housing areas are within the noise zones of the national roads. High levels of noise have also been measured along high-traffic streets. In 2010, the areas in Vantaa with a day-time noise level above 55 dB had a population of 52,170 people, 2190 of whom lived in areas with day-time noise above 65 dB.

Railroad noise

Along the railways, people are exposed to the clanking and squeaking of train wheels against the tracks. In Vantaa, railway noise mainly affects those

living by the national main rail line with its rapid trains and heavy cargo traffic. According to statistics from 2010, a total of 5010 people lived in railway areas with a noise level above 55 dB.

Aviation noise

At the Helsinki-Vantaa Airport, there are about 550 departures and arrivals every workday, and during weekends the daily total of departures and arrivals is around 400. In spite of increasing airline traffic, Vantaa residents are decreasingly exposed to aviation noise thanks to more silent aircrafts, better route planning and optimized landing procedures. In 2010, around 11,000 inhabitants were exposed to aviation noise above 55 dB.

Other noise

Other sources of noise in Vantaa are stone crushing, pile driving and other building activities. With the construction of the Ring Rail Line and the upgrading of Ring Road III, the number of notifications about pile-driving noise rose to about 40 in 2009 and so did the amount of other noise notifications. In 2010, the number of noise notifications was approximately the same as in 2009.

Silent areas in Vantaa

In 2003, a report was made on silent areas in Vantaa. This report was one of the first in Finland that studied silent areas within urban housing districts. According to the report, all areas in Vantaa are at least occasionally exposed to traffic noise or other environ-mental noise. Still there are relatively silent areas where noise mainly stays below 45 dB and the sounds of nature dominate. The most silent areas in Vantaa are found in Sotunki and Sipoonkorpi along the east limit of the city. Even areas with noise levels below 50 dB are generally perceived as silent. According to the 2003 study, silent recreational areas, residential areas and street milieus existed in east Vantaa and espe-cially in the forest and farmland areas in the northwest parts of the city.

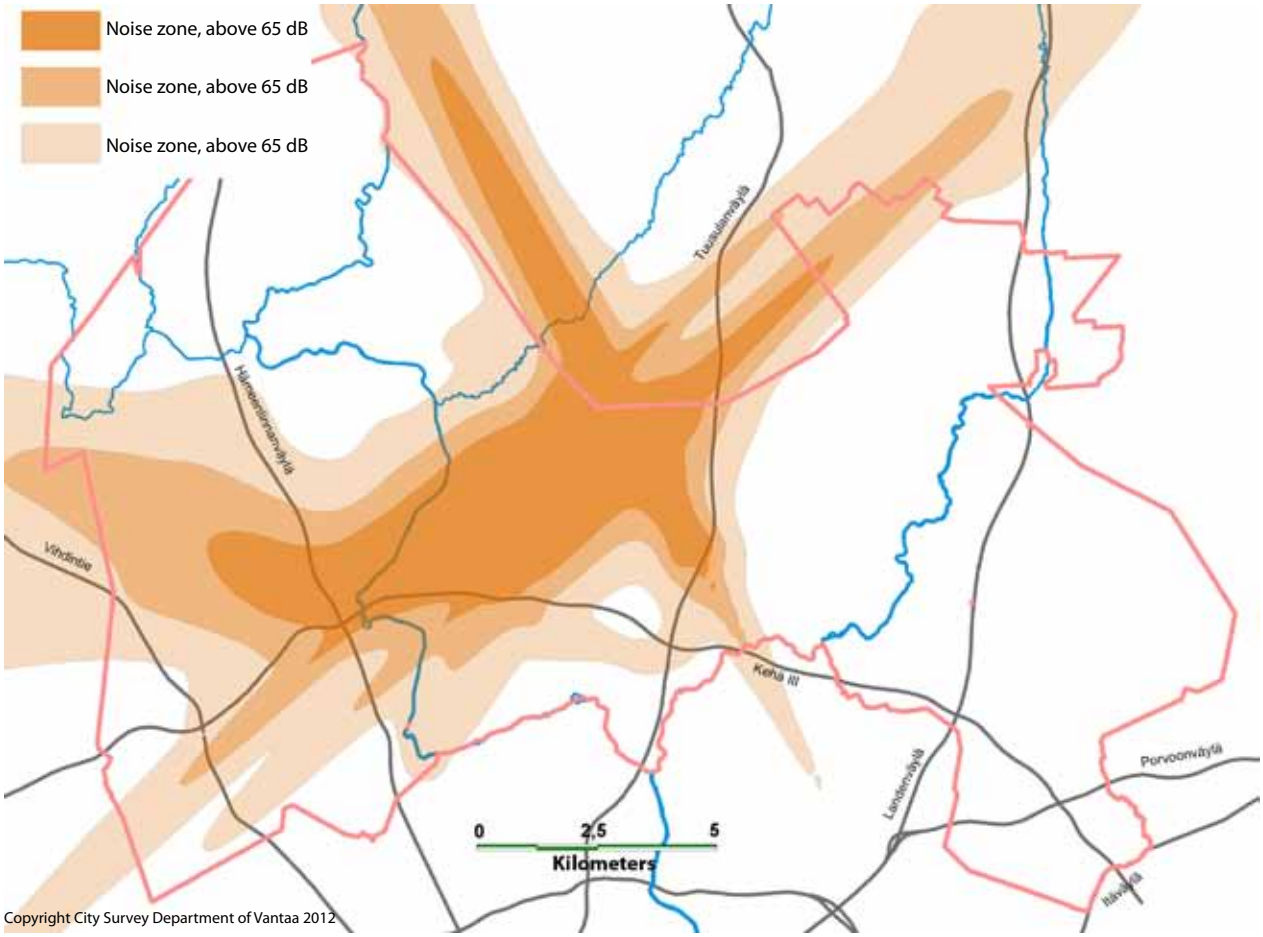

Photo 13. Noise zones in Vantaa.

Vantaa

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