Environmental report 2018

OSLO LUFTHAVN

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ENVIRONMENTAL STATUS

Oslo Airport is Norway's largest and most important traffic hub, as well as being one of the country's biggest workplaces. Avinor's environmental policy and strategy forms the framework for our environmental work. Environmental consideration is entirely fundamental to the operation and development of business, and we must be associated with the environment in a positive way. An important point on Oslo Airport's strategic map is "Green Airport". With this we wish to perform well in our environmental work and strengthen our reputation. While we conduct innovative projects and are pioneers in many fields, daily work through good routines and solid experience is crucial for operating the airport with the least environmental impact.

We are certified according to the EN-NS ISO14001 environmental standard and accredited at the highest level in the European Airport Carbon Accreditation (ACA) scheme. We are also at the top of the world when it comes to public transport and Oslo Airport also has solid experience with curved approaches to limit both noise and greenhouse gas emissions.

The future is electric! We have replaced 6 204 lights in P-10 parking house and 11 000 runway lights with LED lights. We are in the process of establishing the necessary technical infrastructure and phasing in electric shuttle buses between the terminal and remote-parked aircrafts. We are upgrading, modernizing and expanding the offering of electric vehicle charging stations to meet an ever-increasing demand. We have entered into an agreement that the transportation of waste from now on will be with electric trucks. We are a driving force for energy efficiency and constantly modernizing the aircraft fleet, as well as phasing in sustainable jet biofuels. Not least, we will contribute to Norway becoming a pioneer in the field of electrification of aviation, -just as the country has been in the field of electrification of the car fleet. We are proud of that the first flight with an electric aircraft in Norway took place at Oslo Airport on 18 June 2018. An important milestone in the Norwegian aviation history. Hopefully, electric aircraft will contribute to reducing the overall greenhouse gas emissions from Norwegian aviation over the next few decades.

When we have a strategy that says we should be a driving force in the environmental work in the aviation industry, we must also dare to focus on innovative solutions. We can be proud of using ground-breaking technology and drilling Norway's deepest land-based geothermic energy well (1500 meters deep), - a big step in the work on renewable energy. With cold water, hot stone and innovative technology, heat from deep energy wells supplies the ground heating system at the aircraft engine test area at Oslo Airport. This is a technology and product that we have great faith in. Deep energy wells have a lifetime of several generations because the bedrock does not stop giving heat.

Long-term effects on ground and groundwater because of the use of de-icing chemicals are followed closely and measures are continually being considered. Due to the historical use of PFOS-containing fire foam, we have ongoing treatment and further plans for the treatment of the sites with serious PFOS- contamination. Oslo Airport also follows up the new national strategy to ensure viable populations of wild bees and other pollinating insects by defining areas around the airport that can be good habitats for these. Not least, to ensure sustainability in procure-ment, environmental requirements are set in both framework agreements and construction contracts.

Oslo Airport's environmental report for 2018 shows the status of the focus areas of climate, aircraft noise, water and ground, as well as the other environmental aspects of the airport.

Gardermoen, April 2018

Øyvind Hasaas
Managing Director

ENVIRONMENTAL MANAGEMENT

Oslo Airport must maintain ISO14001 certification and ACA level 3+ accreditation

Environmental policy

Avinor has adopted a group-wide environmental and corporate social responsibility policy to create a clear, collective direction for Avinor's environmental work.

Environmental and corporate social responsibility –policy

his policy describes the general principles for environmental and social responsibility in Avinor. The purpose is to improve Avinor's own environmental performance, be a driving force in the environmental work in the aviation industry and be a leader in the work on corporate social responsibility in Norwegian aviation.

Principles environment:

- Avinor works to constantly improve its environmental performance and will work actively to reduce the impact of the enterprise on the environment
- Avinor must comply with regulatory requirements and its own requirements, and its environmental management must be in accordance with ISO14001, ensuring a systematic approach to coordination and follow-up of environmental work
- Avinor must ensure there is a high level of environmental awareness and expertise throughout the entire group. Employees and partners at the airport must be aware of the group's significant environmental aspects
- Avinor must emphasise and integrate environmental considerations early in the planning and implementation of projects and when purchasing products and materials. There must be strong emphasis on the environment in expansion projects
- Avinor wishes to maintain open, constructive and proactive communication with partners, local communities, authorities, aviation organisations and other stakeholders to reduce environmental impact
- Avinor seeks solutions to environmental challenges through cooperation with research and development communities, authorities and other organisations both nationally and internationally

Management of environmental work

Environmental management is an integral part of Avinor's management system. In March 2014, Oslo Airport was certified according to EN-NS ISO14001: 2004 and is now a part of a common Avinor certificate according to ISO 14001:2015.


CERTIFIKAT

ISO 14001

Avinor AS

Oslo Airport uses environmental management methodically to maintain a comprehensive approach to environmental work both internally within the company and among other stakeholders at the airports. To manage environmental work, it is necessary to maintain a constant overview of the company's environmental impact and regulatory environmental requirements. The requirements relating the proportion of public transport, the discharge permit for water and soil from the Norwegian Environment Agency, and the Norwegian Civil Aviation Authority's noise prevention regulation are particularly important framework conditions for the airport operations.

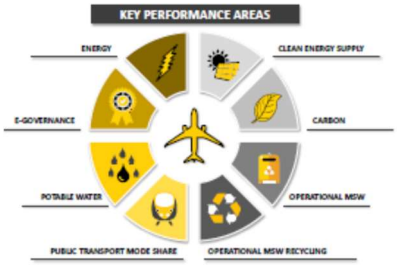
Risk assessments are an important tool in respect of environmental management and are used to prevent or mitigate potential unwanted events. Environmental risk analyses are carried out regularly to implement risk reducing measures at the airport. Auditing is also an important tool and in 2018 an internal audit of Oslo Airport's environmental management was carried out in preparation for ISO14001 audit, as well as an audit of the handling of chemicals at the airport.

Oslo Airport has mapped the airport's environmental impact, and this is being addressed by means of Avinor's identified significant environmental aspects: Consumption of chemicals, transport and climate, noise from aircraft and helicopters, energy, purchasing, building and construction projects and the natural environment. Oslo Airport is also focusing on the environmental aspects of waste and emissions to air.

An Environment and Noise Committee has been established, involving the mayors of the Øvre Romerike municipalities and a representative from Oslo Airport. The purpose of this committee is to discuss challenges linked with noise and other environmental effects when expanding and running Oslo Airport. The committee also facilitate communication with the airport's neighbours by meetings with a forum of neighbours and other surrounding municipalities.

Green Airport

"Green Airport" is a strategic objective for Oslo Airport. This involves improving performance and understanding the mechanisms that influence our environmental reputation. Oslo Airport participates in an international benchmarking where Oslo Airport's environmental performance is assessed against 25 comparable airports around the world with respect to peak, latitude, altitude etc Oslo Airport is at the top of most of the indicators.



Indicators included in the benchmarking

TRANSPORT AND CLIMATE

By 2020, Avinor must reduce its own total controllable greenhouse gas emissions by 50 percent, compared with 2012, and help to reduce greenhouse gas emissions from surface access and air traffic.

Oslo Airport's proportion of public transport should be 70 percent by 2020 and 75 percent by 2030.

Greenhouse gas emissions in brief

The UN's climate panel has defined greenhouse gas emissions as the biggest challenge of our time. There is international agreement that the increase in the average global temperature must be limited to 2˚C compared to the pre-industrial era to avoid harmful climate changes.

Oslo Airport has mapped its climate impact annually in accordance with the Greenhouse Gas Protocol and the ISO14064 series and prepared a greenhouse gas inventory verified by a third party. The greenhouse gas inventory includes emissions linked with all the company's own activities categorised as direct or indirect emissions, along with a selection of indirect emissions from other sources.

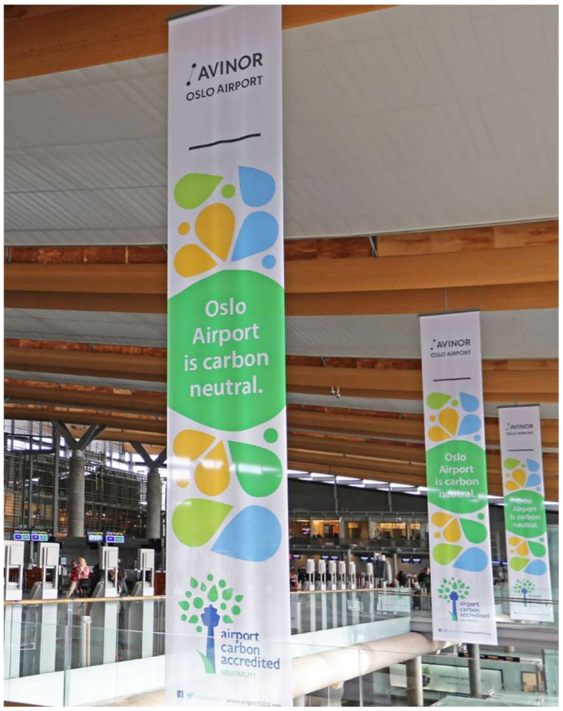
Oslo Airport has held accreditation to the European Airport Carbon Accreditation scheme (ACA) at the highest level since 2009. 260 airports are now certified to ACA, of which 49 are at "Neutrality" level (January 2019). The ACA scheme operates using emissions categories linked with the degree of control the airport operator has over its activities. ACA comprises four accreditation levels: mapping, reduction, optimisation and neutrality. For 2018, Oslo Airport will still have the accreditation at the highest level (3+ neutrality). This requires Oslo Airport reducing its own emissions from year to year (in relation to the number of passengers), taking the initiative to involve other parties at the airport in a joint effort to reduce the airport's total greenhouse gas emissions, and investing in climate quotas to compensate for remaining emissions.

The Oslo Airport Energy Central is subject to the regulations regarding GHG emissions allowance trading and Oslo Airport compensates for greenhouse gas emissions through trade in the European Emissions Trading System (EU ETS). To compensate for the remaining greenhouse gas emissions under Oslo Airport's control, annual investment is made in emissions allowances through the UN's CDM, Clean Development Mechanism.

Status, climate 2018

The greenhouse gas inventory for Oslo Airport, 2018:

Control ***Directly controlled by the airport operator***	Guide/manage ***Carried out by a third party, but central to the operation of the airport***	Influence ***Independently carried out by a third party***
Own vehicles (including airside bussing) Thermal energy Runway de-icing Fire drills Purchased electricity Business travel	Aircraft operation: taxiing Ground operations Aircraft de-icing Waste: transport from airport to processing plant	Aircraft operation: movement in the air up to approx. 1000 m above airport level Surface access Employee commuting Not mapped: Business operations for tenants and lessees Transport of goods and services
5 491 tons	**88 806 tons**	**203 278 tons**

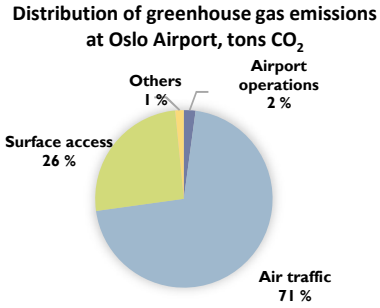


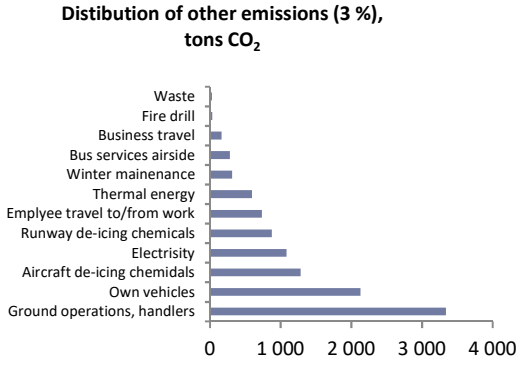
Promoting Oslo Airport ACA certification in the airport terminal

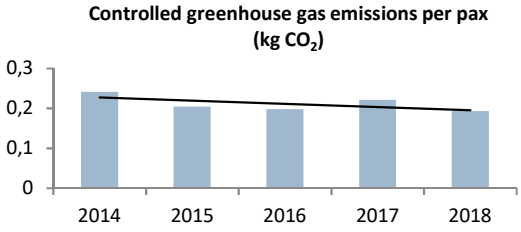
Several records in the greenhouse gas inventory are unpredictable and greatly dependent on winter conditions. This is primarily applicable to the areas of Oslo Airport-owned vehicles, thermal energy and de-icing. Remote heating from Statkraft Varme AS is not included in the carbon inventory, in the same way as recovered heat from Oslo Airport's groundwater wells and heat recovery units.

Nevertheless, these forms of energy help limiting the need for procured electricity.

The figure shows the distribution of greenhouse gas emissions at the airport. The major sources of emissions at Oslo Airport are the LTO cycle (i.e. emissions from aircraft below 3 000 feet; approach, landing, taxiing, take-off and climb out) and surface access (passengers' emissions on their way to the airport). The remaining emissions, which account for three per cent of total emissions, are specified in the figure below.







Vehicles

Avinor has a framework agreement for the purchase of advanced biodiesel, which is a climate-neutral fuel that fulfills the EU's sustainability criteria and is also guaranteed without palm oil or palm oil products. Advanced biodiesel is used on vehicles that are not yet electrified). During the reporting year 2018, the consumption of biodiesel accounted for approximately 20 percent of the total consumption of diesel on our own vehicle fleet.

At the end of 2018, the vehicle fleet of administrative vehicles at Oslo Airport consisted of 18 zero emission vehicles. The hydrogen car drove during 2018 7 848 km and the electric car park a total of 50 560 km. In addition, 250 000 liters of biodiesel were refueled. This led to a reduction in greenhouse gas emissions of just under 687 tons of CO_2. As of 2018, Oslo Airport had approximately 850 charging options for electric cars and a new charging infrastructure has been introduced. Enova has given Oslo Airport financial support for the purchase of eight electric shuttle buses on the airport's airside during 2020. It will also be necessary to establish the technical infrastructure. Advanced biodiesel has also been tested as a heating medium at some heating plants with successful results and is being introduced fully in 2019.

New chargers in the parking garage

Surface access

The surface access, i.e. how our passengers come to and from the airport, is our second largest source of green-house gas emissions. Oslo Airport facilitates that as much of the transport to and from the airport can take place through public transport. The public transport share was 71 percent in 2018. Oslo Airport is especially working on incentives to convert "kiss&fly" travelers to public transport. A car license recognition solution was introduced in 2018 and means that the vehicles must pay for a stay beyond a given free time at the pickup area at the terminal.

Oslo Airport has the highest public transport share in Europe

Air traffic

Through curved approaches, fuel consumption and greenhouse gas emissions are reduced. So far, there have been 25 000 curved approaches at Oslo Airport, which corresponds to a saving of approx. 6 000 tons of CO_2. In January 2016 Oslo Airport became the world's first international airport that can deliver biofuels to all airlines as their thoughts. The jet biofuel sold to the airlines in Norway is produced without palm oil or palm oil products. Unfortunately, there was very little available jet biofuel on the market in 2018, and therefore only a limited volume was introduced during the year.

Electrification can help aviation to reduce overall greenhouse gas emissions over the next few decades. 18 June 2018, the Minister of Transport and Avinor's CEO carried out the first Norwegian electric flight at Oslo Airport The flight was an important milestone in the work of electrifying the Norwegian aviation.

First flight with electric aircraft in Norway

CONSUMPTION OF CHEMICALS AND EMISSIONS TO WATER AND SOIL

Activities at Avinor airports must not cause new ground contamination or reduce the environmental status of the water environment.

Water and soil in brief

Oslo Airport is located on parts of the Romerike aquifer. About half of the east runway to the north is in contact with that part of the groundwater reservoirs that has the potential to become a future source of drinking water. The airport borders three protected landscape areas. The area south-west of the airport is a characteristic ravine land-scape. In this landscape the rivers Sogna and Vikka are located.

In general, surface water is handled locally at the airport. In the case of major run-offs, particularly during snowmelt, there will be some influx of unprocessed surface water from the west runway to the river Sogna. The first melt-water contains a quantity of de-icing agent, and this is collected and treated. The natural groundwater level has been lowered along the west runway and the railway route to safeguard the infrastructure. Groundwater pumped out is released into the Sogna or re-infiltrated into the groundwater reservoir

Much of the glycol used will be collected at a de-icing platform. The proportion with the highest concentration is delivered to a local recycling plant, where it is concentrated before being transported and reused as industrial glycol. Wastewater and some of the collected de-icing chemicals (glycol and formate) are treated at the Gardermoen treatment plant.

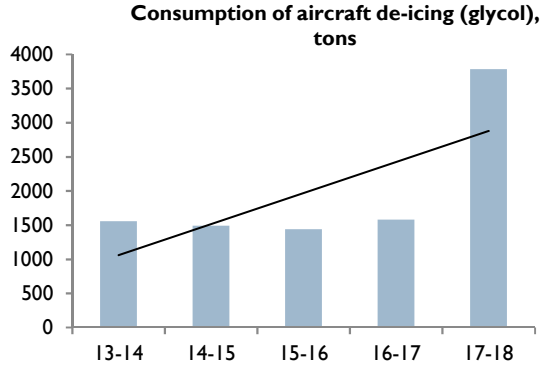
Climatic conditions vary considerably between the individual seasons: snow volume, days involving frost on aircraft, temperatures, wind, etc. This manifests in differences in the consumption of de-icing chemicals – in terms of quantity, mixing ratio and the use of different liquid types – and how this drip off the aircraft or remains on the aircraft and is collected or spread with the wind. All these conditions result in yearly variation in collection levels. Chemical residues from de-icing degrades locally in the ground and soil along the runway systems.

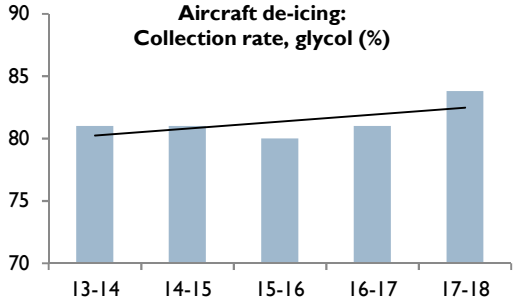
The biggest challenges in water and soil are linked with increased traffic volumes in combination with a wilder, humid winter climate. This increases the consumption of de-icing chemicals, which in turn means that larger volumes of de-icing chemicals must be degraded in the soil above the groundwater. Contaminated soil from activities prior to the opening of the airport also presents challenges in local areas.

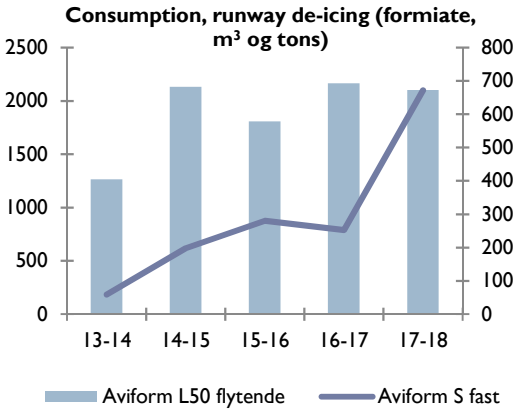
Status, water and soil (2017/18 season)

De-icing

Due to the tough climatic conditions during the 2017/2018 season, the total consumption of aircraft de-icing chemicals was more than twice as high as last season. The total consumption of fluid runway de-icing chemicals was about last season, while the consumption on the solid form was higher than before. The collection rate for aircraft de-icing fluid was 83.8 percent during the 2017/18 season.







Aircraft de-icing

Runway de-icing

Violations of the discharge permit for groundwater were detected in seven groundwater wells during 2018 (formate and glycol). Two of these wells are in the same area and showed high values over a long period of time compared to the remaining wells. Here, a pumping measure was implemented where contaminated groundwater was pumped up and spread over a green area to get a new circulation through the ground and natural degradation. The measure was followed up with regular sampling to document the effect and determine when we could finish.

In Sogna, three violations of the discharge permit were detected in the winter season 2017-2018 (glycol and additives).

According to the permit from Nannestad municipality, no more than 20 mg/l of oil per day should be released, which is an annual average. The annual average for 2018 was lower than this limit.

Management of air injection

Oslo Airport has long been working on the assessment of long-term effects on the soil and groundwater because of de-icing chemicals that spread along runways and taxiways. One limiting factor for degradation in the most critical areas is access to oxygen. In 2011, a pilot project began, with the aim of looking at the effect of injecting air to soil and groundwater. The pilot project showed good results and demonstrated that in the long run it will help re-establish natural conditions in the ground if enough oxygen-rich air is added to the ground. The project was expanded to a total of 65 air wells and started in spring 2016. Air is now injected in the most stressed areas along the western runway.

During the de-icing season, other measures are also considered and implemented. One of these is the fertilization of the relevant areas with sodium nitrate. This will give the bacteria enough nutrients to break down the de-icing chemicals. Another measure is to remove chemical-contaminated snow from some highly loaded areas along the runway, which is to reduce the burden to the ground.

Soil Contamination

There is ongoing follow-up of sites with contaminated ground due to activities from before the establishment of the main airport, as well as of contaminated soil and groundwater encountered in recent times. These are sites with limited distribution. During 2018, we received permission from the Norwegian Environment Agency to terminate the pumping measure in an area where there was a leakage of glycol to the ground in 2013. There have been no new acute pollution incidents with discharges to the ground during the year 2018.

PFOS (perfluorooctyl sulphonate) was previously a legal additive in fire foam. Today, PFOS is classified as an environmental toxin that is not degraded in nature, is accumulated in food chains and has harmful effects even at low concentrations. Several of Avinor's airports, including Oslo Airport, are polluted with PFOS due to the historical use of PFOS-containing fire-fighting foam. The highest concentrations have been measured in ground and groundwater on the fire drill fields. In addition to the fire drill field at Oslo Airport, there is a PFOS-polluted area from an accidental discharge at a hangar in 2010.

On the fire drill field on Oslo Airport, the spread of PFOS to surrounding areas is halted by the establishment of a groundwater treatment plant and a plant that purifies PFOS from wastewater. The treatment has yielded good results. In 2018, investigations have been carried out on which measures are to be taken to remove PFOS from the ground and groundwater on the fire training field, and it has been decided that large quantities of masses will be excavated and transferred to an approved landfill. At the PFOS-contaminated area at the hangar, the spread of PFOS is stopped by the establishment of a corresponding groundwater purification plant as in the fire training field.

Use of fire foam has led to the large concentrations of PFOS in ground and groundwater at Oslo Airport.

AIRCRAFT NOISE

Avinor must work actively to limit noise levels (from aircraft and helicopter traffic) for residents in areas close to the airports at 10 of Avinor's most noisy airports by 2020 (including Oslo Airport)

Aircraft noise in brief

Aircraft noise affects the local areas around the airport. Oslo Airport is working actively to ensure that aircraft noise is predictable for its neighbours. Therefore, the monthly reports on traffic development and noise levels sent to the authorities are also made available to neighbours on our website. The Noise and Track Monitoring System (NTMS) records aircraft movements and carries out continuous noise measurement near the airport. This data is assessed for compliance with the regulations for arrivals and departures to highlight any deviations from the regulations.

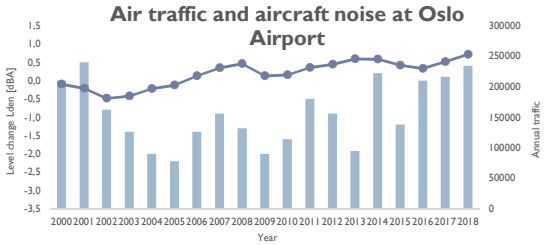
Oslo Airport's NTMS records the aircraft noise level continuously at 11 points around the airport

Oslo Airport's website for neighbours is designed to help the airport's neighbours find information on the regulations on traffic management and the airport's aircraft noise zone map and contact Oslo Airport about aircraft noise. Oslo Airport also has a separate phone number for enquiries relating to aircraft noise. A summary of the enquiries and how traffic management affects the noise situation at the airport are reported to the Norwegian Civil Aviation Authority in the monthly report from the NTMS.

Status, aircraft noise 2018

The figure shows the development of aircraft noise and air traffic volumes at Oslo Airport between 2000 and 2018. Total noise emissions (L_{den}) from all registered traffic are calculated for each year. According to this, there are changes in level calculated for every year from 2000, and these are plotted together with total traffic development. This provides a view of noise development independently of the geographical areas affected.

The combined aircraft noise impact around Oslo Airport increased by 0.3 dB between 2017 and 2018, while the number of aircraft movements increased by 5.1 percent. This change in level is due to factors such as considerably reduced use of the aircraft type Boeing 737-300, and increased use of newer aircraft type B737 (models B737-600 to B737-900) in 2018.



The noise level for 2018 was 0.4 dB higher as in 2000, based on calculations for all traffic recorded. The traffic increase of 48 750 aircraft movements between 2000 and 2018 corresponds to a level increase of 0.93 dB above 2000 traffic levels. This means that modern new aircraft types have more than compensated for the increase in traffic.

On 26 May 2016, a revised noise regulation issued by the Civil Aviation Authority took effect for Oslo Airport. The purpose of these regulations is to avoid unnecessary noise levels in the areas around the airport, while also meeting requirements in terms of safety, operational conditions, capacity and other environmental conditions. The regulations allow for permanent use of curved approaches, where the routes are directed outside densely populated areas. Furthermore, the regulations indicate an adjusted departure corridor from the airport's north-eastern corner. Compliance with the new departure corridors exceeds 95 percent. This adjustment will make it possible to maintain the departure capacity at the airport, whilst preventing aircraft from flying over the most densely populated areas.

Curved approaches, from south and north respectively

6 728 curved approaches had been completed by the end of the year. In total, 25 790 curved approaches have now been completed.

Oslo Airport received aircraft noise enquiries from 150 people in 2018. Residents of the municipalities Ullensaker, Eidsvoll and Nannestad submit the highest number of complaints and include the highest number of complainers.

ENERGI

Avinor will reduce purchased energy by 25 per cent by 2020 compared with energy consumption in buildings and constructions in 2012.

Energy in brief

The energy system that supplies Oslo Airport's buildings, tenants and road heating systems with energy for heating and cooling consists of a remote heating plant, a remote cooling plant, a snow cooling plant, a groundwater plant and a waste water heat exchanger system (sewage).

The remote heating plant ensures that the buildings are kept sufficiently warm in winter. This plant uses water-based heating. Oslo Airport has its own remote heating plant and uses remote heating from Statkraft Varme AS, which uses woodchips. The remote cooling plant ensures that the buildings are kept sufficiently cool in summer. Snow which is stored during the winter season in a large basin, and the melting water is used for cooling the terminal on days in the summer with extra cooling needs. The groundwater plant provides interim storage for surplus energy. Large heat pumps, groundwater wells, heat exchangers to sewers (from the municipality of Ullensaker's treatment plant) and surface water provide the primary contribution to Oslo Airport's high percentage of renewable energy.

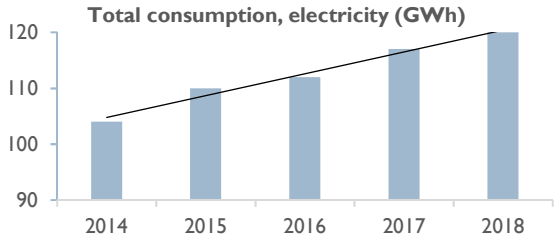
Oslo Airport's Energy central has a high capacity and is therefore subject to regulations regarding GHG emission allowance trading. Oslo Airport has a quota-regulated emission permit from the Norwegian Environment Agency for emissions subject to quotas and compensates annually for CO_2 emissions in the EU's quota system. The fossil fuel boilers have low priority and are used only for test operation and during periods when Statkraft Varme and the electric boiler are unable to supply enough energy.

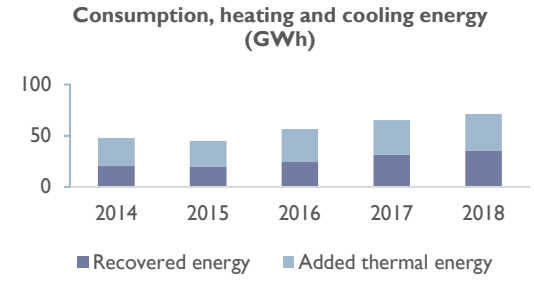
Oslo Airport has been working actively with energy efficiency measures over the past few years, and its percentage of renewable energy excess 90 percent annually. There has been considerable expansion at Oslo Airport over the past few years, and energy consumption is expected to increase in years to come, even when energy efficiency measures are phased in. Oslo Airport's objective is to use only renewable energy by 2020. This objective can be achieved by choosing energy efficient solutions when modernising and replacing equipment and when switching from fossil energy to bioenergy.

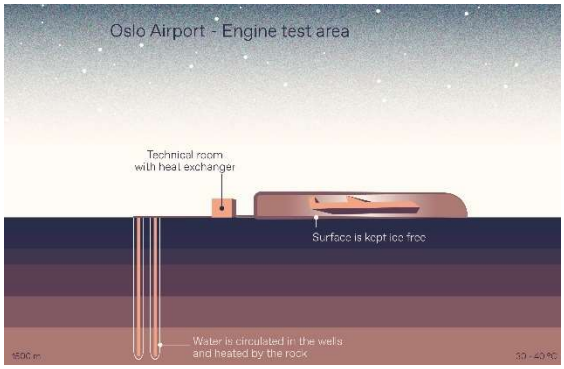
Status, energy 2018

In 2018, energy measures were implemented that resulted in a total reduction of 5 102 MWh/year. About 800 MWh/year was saved only by controlling the energy better. This was done by setting time control and night reduction on ventilation, and by programming extinguishing pulses on lighting. This work is a result of the introduction of energy management, supported by Enova. A set energy group is working on finding simple measures that can be implemented with little or no investment.

The largest savings has come after the replacement of the entire lighting system in the parking garage P-10. 6 224 luminaires have been replaced with more efficient LED lighting with motion detection, corresponding to the new luminaires in P-11 from 2017. Overall, this has resulted in a saving of 3 000 MWh/year. In addition, two ventilation units in the pier vest have been replaced with one larger unit with much higher heat recovery and more efficient fans. A lot of old lighting has also been changed in other buildings, and the good work to replace lane lighting for modern LED lighting has also continued in 2018. Overall, these measures have resulted in a reduction of around 1,300 MWh/year.







Geothermal energy

In collaboration with the company Rock Energy AS, the pilot project for the establishment of two deep geothermal 6.5 "energy wells to 1 500 meters was completed in 2018. This is the deepest that has been drilled in bedrock in Norway. The project was carried out with support from Innovation Norway to see Avinor has the desire to become more self-sufficient in energy, and this technology can be an important contribution in this context. Today the wells are used to supply the ground heating system at the aircraft engine test area. Keeping snow and ice free all year, the wells currently supply between 60-100 kW with heat each, without the use of heat pump.

WASTE

Waste in brief

Airport operations generate waste from public areas with security control, serving, shops and waiting areas, but also from cleaning of aircraft, from trading companies, airlines, catering, cargo, workshop, garages, office space and, not least, from construction projects.

All companies at the airport participate in a joint waste management scheme whereby all waste is handled by the same waste handling company. The waste management scheme is flexible, and waste fractions, container sizes and collection rates are adapted according to set requirements. Waste is separated at source and dropped off at waste collection points. Waste generated in the public areas of the terminal is transported to a central waste collection point by means of a waste extraction system (an underground pipe network which creates negative airflow that sucks the bagged waste from each inlet to large containers.) The administration building and Flyporten are also connected to this disposal system. The waste handling company deals with the waste and delivers it to approved final disposal and recycling plants. The waste handling company reports monthly the source separation rates and tonnages for all collection points.

Source separation in the terminal

Oslo Airport is responsible for organising the waste management scheme at the airport and acts as a driving force, ensuring that the airport achieves good results in terms of waste. Waste from the building and construction project activities is reported separately.

Status, waste 2018

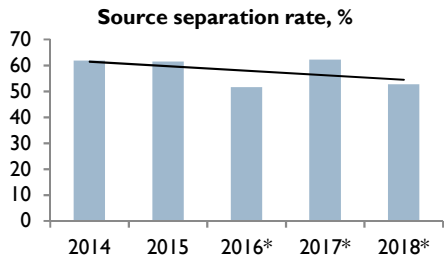
The total amount of waste for the entire airport in 2018 was 10 305 tons. The amount of waste that is invoiced via Oslo Airport was 6 677 tons. Sorted waste accounted for 3 515 tons and unsorted waste 3 161 tons, with the result of a source separating rate of 52.65 percent. Both the smaller amounts of waste and the lower degree of sorting than last year are mainly due to extraordinary delivery of large quantities of contaminated soil from the fire drill field in 2017.

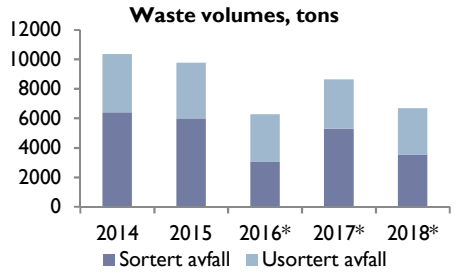
When implementing a new acquisition of waste handling services, great emphasis was placed on quality and environment as criteria. This resulted, among other things, in that transport of the waste from now on will be by electric car. A fast charging station has been established to serve this.

Transportation of waste with electric car

Collection of recyclable beverage containers made of steel, aluminium and PET (plastic) from aircrafts has continued in 2017. SAS, Thomas Cook and Sodexo are all taking part in this scheme. A total of 23.2 tons of recyclable material has been received from this initiative. The airlines donate surplus revenues from deposits and aluminium returns to charity.

Oslo Airport also works with the Norwegian Red Cross to handle beverage containers collected from public areas in the terminal building. This assignment has been delegated to the local Red Cross division in Ullensaker. The Red Cross is responsible for receiving, sorting and returning bottles efficiently and can spend the profit from deposits as it pleases. With efforts from employees and the public, Oslo Airport has collected cans and bottles worth a total of more than NOK 1.8 million from public areas in the terminal building, and the funds are being donated to humanitarian schemes.





** Only waste invoiced via Oslo Airport and new definition of unsorted waste from 2016*

PURCHASING, BUILDING AND CONSTRUCTION PROJECTS

Consumption of products and materials in brief

Oslo Airport, through Avinor's centralized purchasing function, undertakes procurement for services, products and materials by means of purchases linked with regular operation, or via construction projects. The processes ensure that all purchases are made in accordance with public procurement regulations.

Environmental requirements in procurement processes are an important element in the environmental policy and help to reduce Oslo Airport’s greenhouse gas emissions. They also provide financial benefits beyond safeguarding and preserving the environment. Through the acquisitions we can influence suppliers in several sectors in a more environmentally friendly direction.

As a basis, Oslo Airport places demands on environmental certification or equivalent in the qualification basis where relevant. Requirements are set as quality requirements (must requirements) or as award criteria where suppliers compete to deliver the most environmentally friendly solutions, products, materials and services.

With certificate for sustainable harvesting

Status, consumption of products and materials 2018

Environmental requirements are set in all contracts with operators operating in the airport area and in all our construction projects, and we are constantly working to further develop our environmental requirements in line with the industry's development.

The environment is part of Avinor's project management system as a separate process. In the case of major construction projects, environmental follow-up plans are drawn up that safeguard the external environment in all phases and ensure environmental considerations in the choice of materials and solutions.

Environmental documentation is required for products and services that have a significant environmental impact. There is systematic work on substitution and reduction of the number of chemical products. All products used must satisfy environmental requirements from local and central authorities.

For example, in 2018, specific environmental requirements were set for the purchase of electric buses for airside and for the winter maintenance service.

NATURAL ENVIRONMENT

Biodiversity in brief

Oslo Airport has mapped and charted the important areas for biodiversity, with descriptions of flora, vegetation and bird life within the airport area, on Oslo Airport properties, leased area and influenced areas. Management advice has also been prepared, which is being followed up.

The areas between the runways and the side areas within the airport site mainly have trivial grassland that is cut and fertilised regularly. Just outside, however, there are greater natural assets such as ravine forests, meadows and calcareous lakes with several rare and endangered species that we wish to preserve. Unfortunately, black-listed species are also registered at the airport. These are unwanted as they suppress the natural Norwegian flora.

Status, biodiversity 2018

Oslo Airport maintains an overview of the scope and potential for the spread of blacklisted species on and around the airport site. A maintenance plan for combating the four plant species Lupine, Giant hogweed, Canadian goldenrod and Japanese knotweed has been compiled based on an assessment of consequences and prioritisation of species and localities. Major efforts to combat these plants began back in the summer of 2014, mainly involving several rounds of root cutting, weeding and cutting down before the plants seeded, as well as a certain amount of spraying with pesticides. These measures were successful, and this work has continued since. However, clearance is a long-term project and will require efforts for several years to come.

In the summer of 2017 a survey of humblebees and several other insects and plants was carried out at Oslo Airport. Both at the inside and outside of the fence of the airport there are lots of flowers suitable for a large variety of insects, and especially plants in the pea flower family that are important for long-tonged, red-listed humblebees. The areas have the basic nature, location and extent that make them important to many insects and proper management is crucial for facilitating pollinators.

In 2018, the government presented a national strategy to ensure viable populations of wild bees and other pollinating insects. Oslo Airport follows up the strategy and has defined areas that can be good habitats for pollinating insects. This has, among other things, significance for grass cutting frequency, that we avoid pesticides and activities that can destroy the habitat, as well as removing black-listed species. In 2018, tests with hot water and steam have been made as alternatives to pesticides.

Plenty of red clover in bloom

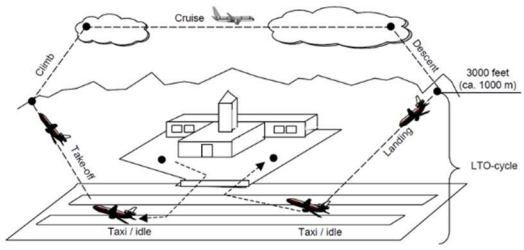
CITES

The purchase and introduction of endangered species or products of endangered species are illegal and regulated in accordance with CITES (Convention on International Trade of Endangered Species).

Oslo Airport has a role here in that the airport can be used as a transport route. For several years, Oslo Airport has provided guidelines to passengers during the holiday season, via various social media, preventing them to buy “endangered holiday souvenirs”, which include objects made from ivory, turtle shells, hippo teeth, shark teeth, snakeskin, conches and corals and so on.

LOCAL AIR QUALITY

Air quality in and around the airport area is affected by local and regional emissions, as well as by weather conditions and the local terrain. Emissions from airport operations have the greatest impact on ambient air quality locally at the airport, with aircraft and vehicles being the largest contributors. Off the airport site, road traffic is the most important source of emissions. Industrial emissions, emissions from heating and long-range contamination are other factors that affect air quality.



Sources of emission

The municipalities bear primary responsibility for assessment of air quality, but if there are reasons to suspect that limits have been exceeded, then owners of facilities that make significant contributions to these levels will be responsible for assisting to map the levels and assessing measures. Oslo Airport has operated a facility for monitoring air quality since the early 2000s. This was originally related to measurement of air quality close to the fire drill area. The historical data for previous years shows that concentrations of particulate matter and nitrogen dioxide at the selected measuring point were within both regulatory requirements and national targets, with few instances where the recommended air quality criteria were exceeded.

In 2001, NILU, the Norwegian Institute for Air Research, carried out a major survey of local air quality on behalf of Oslo Airport. Calculations were performed, and measurements were taken at various locations around the airport. This report was updated in 2016. NILU's report concluded that air quality at and around the airport was much better than in urban areas.

NILU has further concluded that the smell of aviation fuel that may occasionally occur in the airport area is present in such low concentrations that there is no reason to believe that it could cause health problems. Furthermore, there is no indication that the blackening of residential buildings around Oslo Airport is due to soot drop from airplanes but is mainly due to black moulds growth.

Avinor has participated in the project entitled "Assessment of exposure to diesel exhaust particles in the Norwegian labour market, using elementary carbon (EC) as a marker". The National Institute of Occupational Health (STAMI) concludes in its report that "Operators at the airport who are exposed to diesel exhaust fumes and exhaust fumes from stationary, parked aircraft are exposed to air concentrations (= 2.7 $\mu g/m^3$) that occur in central urban areas".

Status, emissions to air 2018

In 2018, Oslo airport did not carry out measurements of air quality. Previous years' measurements show values well below regulatory requirements and national targets.

KEY FIGURES

		2014	2015	2016	2017	2018
Air traffic						
Passengers	number	24 269 361	24 678 195	25 787 391	27 482 315	28 518 584
Domestic	number	10 907 550	10 917 495	11 220 648	11 630 750	12 005 355
International	number	13 361 811	13 760 700	14 543 699	15 851 565	16 513 229
Aircraft movements	number	237 595	234 974	247 560	242 555	249 290
Passengers per aircraft movement (scheduled(charte	number	106	109	104	113	114
Public transport share						
Public transport share for surface access	%	68	69	70	70	71
Noise						
Change in total noise impact relative to reference year	dBA	0,2	0,1	0	0,1	0,4
Inquiries, aircraft nose (persons)	number	142	264	285	245	150
Energy						
Total comsumption of electricity	GWh	103,9	109,8	112	117	120
Electricity for electricity-specific installations	GWh	95,9	99,0	104,8	111,2	112,4
Purchased heating and cooling energy	GWh	26,9	25,0	32,1	33,9	35,6
Electricity for electrode boiler	GWh	8,1	11,1	7,2	5,7	7,7
Electricity for compressors, pups, etc.	GWh	9,4	8,7	9,3	8,6	11,4
Statkraft Varme AS	GWh	8,8	4,9	14,7	15,3	15,3
Heating oil (Energy central)	GWh	0,6	0,3	0,8	3,6	1,8
Recovered energy	GWh	20,7	19,7	24,2	31,4	35,5
Consumed heating and cooling energy	GWh	47,6	44,7	55,9	64,6	71,1
Non-renewable resources						
Jet fuel	m^3	639 600	613 500	618 192	672 000	700 000
Heating oil/diesel*	m^3	135	103	182	465	220
Bio heating oil	m^3	6,1	13	21	60	64
Fuel for Oslo Airport vehicles**	m^3	902	820	632	604	770
Biofuel for Oslo Airport vehicles	m^3	0	9,3	81,0	176,5	248,6
Fuel for fire drills (Paraffin/Jet A1)	m^3	12,9	14,8	17,8	17,4	8,5
Fuel for fire drills (propane)	tonnes	0,3	0,4	0,3	0,3	0,2
Waste				***	***	***
Sorted waste	tonnes	6 405	5 996	3 238	5 301	3 515
Residual waste	tonnes	3 956	3 771	3 033	3 335	3 162
Total amaount of waste	tonnes	10 361	9 767	6 272	8 833	6 677
Source separation rate	%	61,8	61,4	51,6	62,2	52,7
Hazardous waste	tonnes	368	298	213	197	320
Greenhouse gas emissions						
Control - Oslo Airport emissions	tonnes CO_2	5 852	5 031	5 093	6 055	5 491
Control - Oslo Airport emissions , kg per passenger	kg CO_2 /passenger	0,241	0,204	0,198	0,220	0,193
Guide- third party emissions	tonnes CO_2	96 942	93 922	96 570	82 803	88 806
Impact - third party emissions	tonnes CO_2	182 031	169 861	188 939	198 538	203 278
Water supply and sewage						
Water consumption, Oslo Airport	m^3	207 000	215 000	221 000	277 000	271 000
Wastewater volume, airport	m^3	265 000	283 000	297 000	337 000	341 000
Drainage water volumes	m^3	1 955 000	2 205 000	1 870 000	1 444 000	1 411 000
De-icing chemicals (per season)		**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**
Aircraft de-icing						
Total consumption, glycol	tonnes	1 557	1 491	1 437	1 441	3 785
Specific comsumption, glycol	kg/aircraft	139	146	142	136	211
Collection rate for glycol	%	81	81	80	81	84
Runway de-icing						
Aviform L50	m^3	1263	2132	1806	2164	2102
Aviform S	tonnes	59	198	281	252	682
* Total heating oil						
** The figure does not include airside bus sevices and w inter maintanance carried out by Veidekke						
*** New methodology from 2016. Oslo Airport's w aste only. All code 99- according w ith NS9431 count as unsorted.						