Environmental report 2016

OSLO LUFTHAVN

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ENVIRONMENTAL STATUS

Oslo Airport (OSL) is the largest and most important traffic hub in Norway, as well as being one of the country's biggest workplaces. Environmental consideration is entirely fundamental to the operation and development of business, and we must be associated with the environment in a positive way.

We are proud to have won ACI's prestigious "ECO Innovation Award" for the second time in three years for our systematic and comprehensive environmental work. This award is presented to an airport that has demonstrated outstanding environmental performance and an innovative approach to environmental management. This proves that while expansion of the airport has been our most important focus over the past few years, we have succeeded in implementing important environmental measures and establishing smart new environmental solutions.

Avinor's environmental policy and strategy constitute the framework for environmental work at OSL. Following the merger with Avinor, our former environmental management system has now been implemented in a group-wide management system with a range of local adaptations. We achieved accreditation to the environmental standard EN-NS ISO14001 for the first time in 2014, but as of 2016 our initiative is part of a joint group certificate.

Climate, aircraft noise and water and soil are the primary focus areas in Avinor's environmental strategy. OSL's environmental report 2016 indicates the status of these and the other environmental aspects at the airport.

OSL is one of few airports at the highest level in the European Airport Carbon Accreditation scheme (ACA). Our objective is to have no fossil greenhouse gas emissions from directly controllable activities by 2020, and to work through our climate programme together to reduce the airport's climate impact.

A new noise prevention regulation gives us opportunities to help limit overall aircraft noise impact on the population. Curved approaches show good environmental effects in terms of both aircraft noise and greenhouse gas emissions.

Besides strict monitoring, we are making excellent progress on exciting, innovative solutions designed to improve the decomposition of de-icing chemicals in the soil and clear up old PFOS contamination.

We are among the best in the world as regards the public transport share for surface access to the airport, and we were also the first airport in the world to be able to offer biofuel to aircraft. The environment is now firmly rooted in everything we do thanks to clear environmental requirements with regard to the goods and services we procure, efficient facilitation of waste sorting, implementation of a series of energy efficiency measures and responsible administration of the natural environment around the airport.

The T2 project has focused strongly on the environment throughout all phases. The new expansion element of the terminal building is certified to "Excellent" level at the "Design stage", and "As built" certification is now being prepared in accordance with the environmental classification system BREEAM Bespoke. The building has also achieved passive building standard. In 2016, the T2 was voted as the "Nordic Best Practice" project in a new Nordic guidance for the procurement of eco-friendly building materials.

"Green Airport" is an important point on OSL's strategy map. With this, we aim to carry on our excellent environmental work and strengthen our reputation. We measure ourselves against other airports and aim to be one of the best.

Gardermoen, April 2017

Øivind Hasaas
Managing Director

ENVIRONMENTAL MANAGEMENT

OSL must maintain ISO14001 certification and ACA level 3+ certification, and achieve BREEAM status "excellent" for "design stage" and "as built" within the T2 project

Environmental policy

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

Environmental and corporate social responsibility – group policy

This policy describes general principles for the environment at Avinor, with the following objectives:

Environment: Avinor must improve its own environmental performance and act as a driving force for environmental work in the aviation industry.

Principles:

- 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 on 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 in order 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, and in 2016 it has been updated and built up in a new tool (SMART). OSL has held accreditation to EN-NS ISO14001:2004 since March 2014 and has now achieved re-certification according to a new version of the standard, ISO14001:2015. A total of 13 Avinor airports are to undergo certification in this round, and OSL is included in a collective 14001 certificate for the group.

OSL uses environmental management methodically in order 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 licence requirements relating to public transport share and noise, 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 in order to implement risk-reducing measures at the airport.

OSL's three-year audit programme focuses on environmental audits. Three audits of its own unit were carried out in 2016, along with one audit relating to environmental aspects among OSL's contract parties. Two audits have also been carried out together with the group in connection with the Airport Carbon Accreditation scheme (ACA). OSL was also audited during the Avinor group audit focusing on waste disposal.

OSL 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. OSL is also focusing on the environmental aspects of waste and emissions to air.

Group-wide measures have been put in place for transport and climate, noise from aircraft and helicopters and consumption of chemicals with emissions to water and soil. OSL is supporting these and also has its own sub-targets and targets for other environmental aspects.

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

In June 2016, OSL won the prestigious "ECO Innovation Award" for systematic and comprehensive environmental work. This award was presented by Airports Council International Europe (ACI). This award is presented to an airport that has demonstrated outstanding environmental performance and an innovative approach to environmental management. OSL also won this award in 2014.

Dag Falch Pedersen receives the environmental award presented to Oslo Airport

Green Airport

"Green Airport" is a strategic objective for OSL. This involves improving performance and understanding the mechanisms that influence our environmental reputation.

In connection with the "Green Airport" strategy, OSL is taking part in an international benchmarking procedure in which OSL's environmental performance is being assessed against that of 25 comparable airports all over the world.

TRANSPORT AND CLIMATE

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

OSL must have no fossil greenhouse gas emissions from directly controllable activities by 2020.

OSL must have a public transport share of 70 per cent by 2020.

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 in order to avoid harmful climate changes.

OSL 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. In this context, OSL includes both Oslo Airport and 50 per cent of Oslo Lufthavn Tele og Data AS (OLTD). The greenhouse gas inventory includes emissions linked with all of the company's own activities categorised as direct or indirect emissions, along with a selection of indirect emissions from other sources.

OSL has held accreditation to the European Airport Carbon Accreditation scheme (ACA) at the highest level since 2009. The ACA scheme operates using emissions categories linked with the degree of control the airport operator has over its activities. 173 airports in 50 countries are now certified to ACA, of which 29 are at "Neutrality" level (March 2017).

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

Airport Carbon Accreditation (ACA) comprises four accreditation levels: mapping, reduction, optimisation and neutrality. For 2016, accreditation has been applied for at the highest level (3+ neutrality). This requires OSL 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 in order to compensate for remaining emissions.

Status, climate 2016

The greenhouse gas inventory for Oslo Airport, 2016:

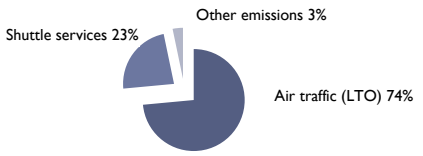
Control *Directly controlled by the airport operator*	**Guide/manage** *Carried out by a third party, but central to the operation of the airport*	**Influence** *Independently carried out by a third party*
Own vehicles (including airside bussing) Thermal energy Runway de-icing Fire drills Purchased electricity 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
5 093 tonnes	**96 570 tonnes**	**188 939 tonnes**

A number of the records in the greenhouse gas inventory are unpredictable and greatly dependent on winter conditions. This is primarily applicable to the areas of OSL-owned vehicles, thermal energy and de-icing. OSL calculates electricity emissions even if the airport purchases electricity with the Guarantee of Origin.

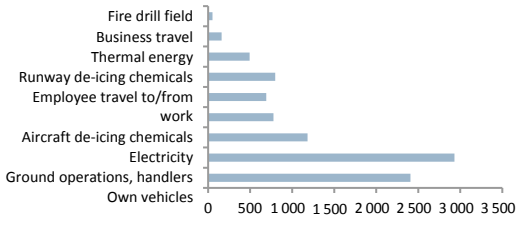
District heating from Statkraft Varme AS is not included in the carbon inventory, in the same way as recovered heat from OSL's groundwater wells and heat recovery units. Nevertheless, these forms of energy help to limit the need for procured electricity.

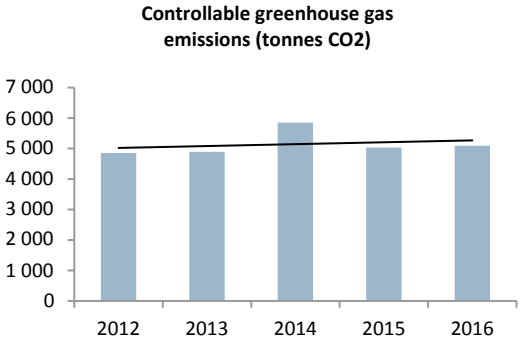
The figure shows the distribution of greenhouse gas emissions at the airport. The major sources of emissions at OSL are the LTO cycle (i.e. emissions from aircraft below 3 000 feet; approach, landing, taxiing, take-off and climbout) and surface access (passengers' emissions en route to the airport). The remaining emissions, which account for 3 per cent of total emissions, are specified in the columns in the figure below.

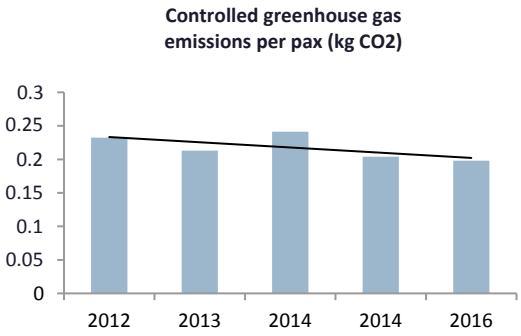
Distribution of greenhouse gas emissions at OSL, tonnes CO_2



Distribution of other emissions (3%), tonnes CO2







In May 2014, OSL's management decided that the airport should have no fossil greenhouse gas emissions from its own activities by 2020. To achieve this ambitious target, a Climate Programme was established in June 2014 which aims to identify short-term and long-term measures to reduce greenhouse gas emissions within each of the airport's emissions sources. This target is related only to own greenhouse gas emissions. However, the Climate Programme is operating far beyond that, and workgroups have been established to work with measures for reducing greenhouse gas emissions in the following areas: vehicles, energy, waste, LTO cycle (this work also includes measures beyond 3 000 feet), travel (including the surface access, employee travel to/from work and business travel), fire drills and handlers/other stakeholders.

To reduce greenhouse gas emissions, the transport sector must use alternative energy sources to fossil fuel to a greater extent. At OSL, we are paving the way for various energy sources to help reduce greenhouse gas emissions from the airport.

Norway's first flights using biofuels were done in November 2014. In January 2016, OSL, in collaboration with AirBP, SkyNRG, Lufthansa Group, KLM and *S*AS, became the first international airport with regular supplies of biofuel for all airlines refuelling there. The first consignment of biofuel was made from oil from the Camelina plant, which was cultivated as part of the EU ITAKA project in Spain. In the fourth quarter of 2016, a new supply of biofuel was received from AltAir in California. This fuel was made from Used Cooking Oil, UCO.

Filling up with bio-jet fuel

One important initiative required if we are to achieve our aim of zero greenhouse gas emissions from own activities by 2020 is to reduce emissions from the vehicle fleet by focusing on both electrification and biofuel. 2015 saw the start of a test project for the use of biofuel for heavy snowploughs, and this has been extended in 2016. Avinor has a framework agreement for the purchase of second-generation biodiesel. This is a climate-neutral fuel which meets the EU's sustainability criteria and is guaranteed not to contain palm oil or palm oil products.

The fleet of administrative vehicles at OSL included 18 zero emissions vehicles at the end of 2016. Emissions from administrative vehicles have been reduced by 246 tonnes in 2016 as a consequence of the transition to zero emissions vehicles. In 2016, OSL had 265 charging stations for electric cars. This will increase considerably in 2017 in accordance with a new parking regulation.

Public transport share

OSL is working to increase the public transport share at the airport. Surface access – in other words, how our passengers get to and from the airport – is our second biggest source of greenhouse gas emissions. The public transport share in 2016 was 70 per cent.

OSL has the highest public transport share in Europe

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.

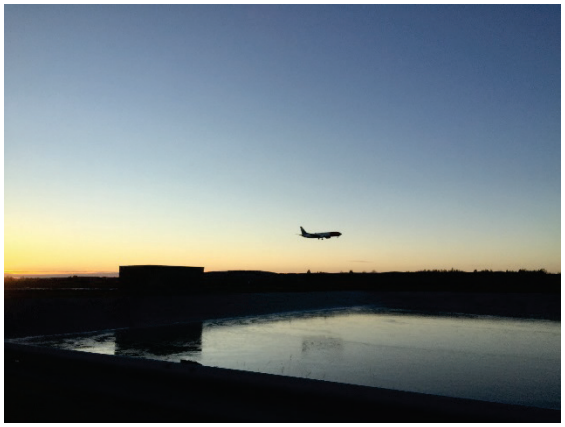
OSL must see annual improvement in the degradation conditions in the soil and groundwater in areas under high stress along the runways.

Water and soil in brief

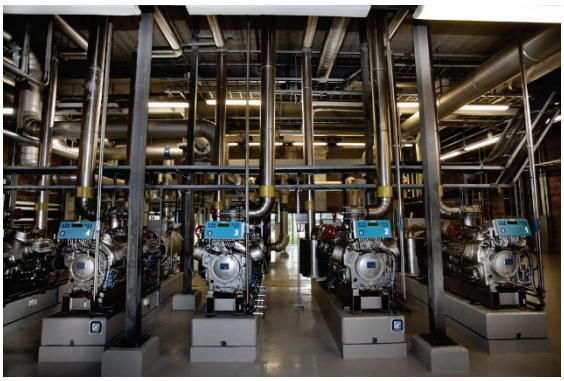
OSL is located on parts of the Romerike aquifer. About half of the east runway to the north is in contact with that part of the groundwater reservoirs that has the potential to become a future source of drinking water. The airport borders three protected landscape areas. The area south-west of the airport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

In general, surface water is handled locally at the airport. In the case of major run-offs, particularly during snow-smelts, there will be some influx of unprocessed surface water from the west runway to the river Sogna. The first meltwater 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 in order 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 share 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.



Interim storage pool prior to discharge to the Gardermoen treatment plant



Management of glycol collected

Climatic conditions vary considerably between the individual seasons: snow volume, days involving frost on aircraft, temperatures, wind, etc. This manifests itself 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 drips off the aircraft or remains on the aircraft and is collected or spread with the wind. All these conditions result in variation in collection levels from year to year. De-icing chemical residues degrades locally in the ground and soil along the runway systems.

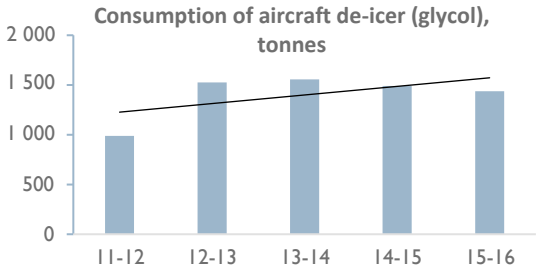
The biggest challenges in the area of water and soil are linked with increases in traffic volumes in combination with a wilder, wetter winter climate. This increases the consumption of de-icing chemicals, which in turn means that larger volumes of de-icing chemicals have to be degraded in the soil above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

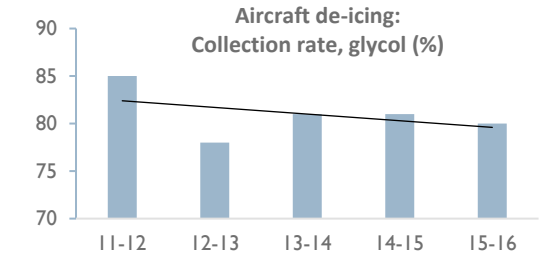
Status, water and soil (2015/16 season)

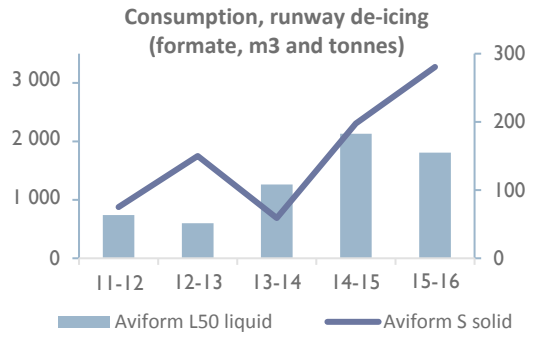
De-icing

Overall consumption of aircraft de-icing chemicals is slightly lower than in the previous season, and the consumption of runway de-icing chemicals is also slightly lower than in the previous season. The collection rate for aircraft de-icing fluid was 80 per cent during the 2015/16 season.

Aircraft de-icing







Sweepers prepare the runway before spreading chemicals

Two minor violations of the emissions permit for groundwater were detected in 2016 (formate, glycol and chemical oxygen consumption). Measures such as pumping groundwater to the municipal wastewater system, alternative pumping and re-infiltration of the groundwater and ongoing air injection at the south end of the west runway – which is the area most heavily affected by de-icing chemicals – were implemented. These measures were also followed up with sampling so that the effects of the measures could be documented.

Two violations of the discharge permit were detected in the waterways during the 2015-2016 winter season. The source of the discharge was eliminated and follow-up samples showed no impact. No exceeding of the limits for discharge of water containing oil from the fire drill site to the municipal wastewater network was recorded in the 19 samples taken.

For a number of years, Oslo Airport has evaluated what long-term effects the de-icing chemicals used on runways and taxiways have on the soil and groundwater. One limiting factor for local decomposition in the most critical areas is access to oxygen. 2011 heralded the start of a pilot project where the objective was to see the effect of injecting air to the soil and groundwater. This pilot project yielded good results and has demonstrated that it will help in the long term to re-establish natural conditions in the soil if sufficient oxygen-rich air is added to the ground. The next stage of the project commenced in the autumn of 2014, and 65 ventilation wells were drilled in the summer of 2015. Trenches measuring approx. 1 000 metres were excavated in the spring of 2016, and 12 000 metres of well pipes, air pipes, ducts and power cables were laid. The pipes and cables are connected to three containers accommodating units that ensure air is pumped out to the wells.

Management of air injection

Measures such as fertilisation of the relevant areas with sodium nitrate, providing bacteria with enough nutrition to break down the de-icing chemicals, were also assessed and implemented during the de-icing season. Snow containing chemicals from the stressed areas along the runway is removed, and pumping and watering are carried out if the presence of chemicals is detected in any one groundwater well.

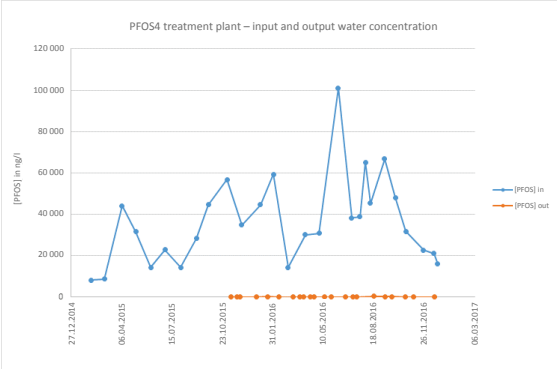
Soil contamination

Locations with contaminated soil due to activities preceding the establishment of the main airport, and soil and groundwater contaminated later, are still undergoing follow-up. These are relatively small sites. There has been one acute contamination event involving emissions to soil in 2016. A tanker overturned, causing diesel to run out into the soil. All contaminated soil was excavated and delivered to an approved waste treatment plant.

PFOS (perfluorooctane sulphonate) is a persistent organic pollutant. It used to be a legal component in firefighting foam. Groundwater treatment with the assistance of a separate treatment plant with active carbon has been ongoing since 2013 on account of a PFOS discharge at a hangar in 2010.

The PFOS treatment plant, container solution

Treatment of groundwater and wastewater contaminated with PFOS from the fire drill area has had good results. A separate treatment plant has been installed, consisting of three containers with treatment filters to ensure that no wastewater contaminated with PFOS is spread to the treatment plant for the municipality of Ullensaker. In 2016, a washing process has started to remove large quantities of PFOS in the unsaturated zone. The initiative is being closely monitored in order to document the effect.



Removal of PFOS from one of the four PFOS treatment plants at OSL The input and output concentrations are both illustrated, demonstrating that the plant's treatment is effective.

Spillages

There are still too many incidents at the airport involving small spills, particularly from vehicles and equipment. A project is in progress to implement a regime at OSL for accountability for these events, and also to increase emphasis on preventive maintenance.

Spillages from equipment and vehicles

AIRCRAFT NOISE

Avinor must work actively to limit noise levels (from aircraft and helicopter traffic) for residents in areas close to the airports.

The number of residents exposed to aircraft noise at outdoor levels in excess of L_{den} 60 dB and L_{night} 55 dB must not increase between 2012 and 2017.

Aircraft noise in brief

Aircraft noise affects the local areas around the airport. OSL is working actively to ensure that aircraft noise is predictable for its neighbours. This is why 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 in the vicinity of the airport. This data is assessed for compliance with the regulations for arrivals and departures in order to highlight any deviations from the regulations.

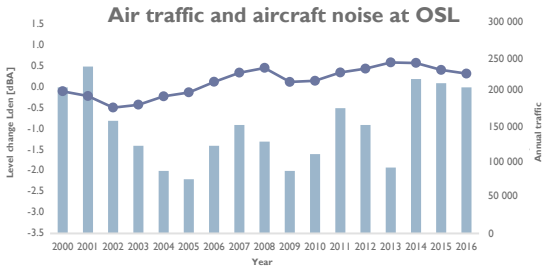
OSL's NTMS records the aircraft noise level continuously at 11 points around the airport

OSL'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 OSL with regard to aircraft noise. OSL also has a separate contact phone line 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.

Aircraft noise status 2016

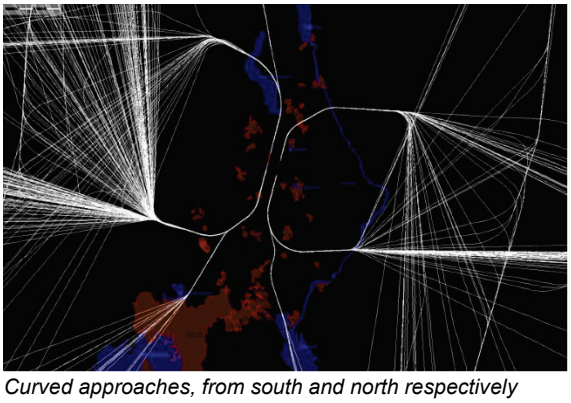
The figure shows the development of aircraft noise and air traffic volumes at OSL between 2000 and 2016. Total noise emissions (L_{den}) from all registered traffic are calculated for every year. According to this, there are changes in level calculated for every year from 2000, and these are plotted together with total traffic development. This representation provides a view of noise development independently of the geographical areas affected.

The combined aircraft noise impact around OSL increased by 1.2 dB between 2015 and 2016, while the number of aircraft movements increased by 1.9 per cent. This change in level is due to factors such as the fact that flights using the aircraft type Boeing 737-300 are reduced considerably, while the percentage of newer aircraft of type B737 (models B737-600 to B737-900) increased further in 2016.



The noise level for 2016 was the same as in 2000, based on calculations for all traffic recorded. The traffic increase of 25 482 aircraft movements between 2000 and 2016 corresponds to a level increase of 0.51 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, revised noise regulation issued by the Civil Aviation Authority took effect for OSL. The purpose of these regulations is to avoid unnecessary noise loads 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 run between densely populated areas. Furthermore, the regulations indicate an adjusted departure corridor for departures from the airport's northeastern corner. Compliance with the new departure corridors exceeds 95 per cent. 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

5 169 curved approaches had been completed by the end of the year.

OSL received aircraft noise enquiries from 285 people in 2016. Residents of Ullensaker, Eidsvoll and Nannestad submit the highest number of complaints and include the highest number of complainers.

ENERGY

Oslo Airport must phase out the use of fossil fuels and switch to renewable energy solutions, and use energy efficiency measures to reduce the energy consumption of existing technical installations by at least 1 GWh every year until 2020.

Energy in brief

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

The district heating plant ensures that the buildings are kept sufficiently warm in winter. This plant uses water-based heating. OSL has its own district heating plant and also uses district heating from Statkraft Varme AS, which uses woodchips. The district cooling plant ensures that the buildings are kept sufficiently cool in summer. 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 stormwater provide the primary contribution to OSL's high percentage of renewable energy.

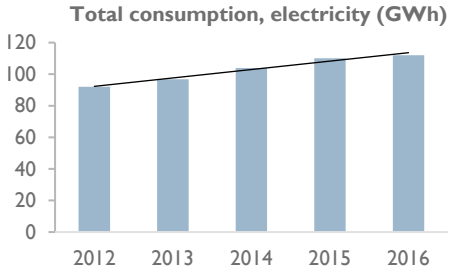
OSL's Energy central has a high capacity and is therefore subject to regulations regarding GHG emission allowance trading. OSL has a quota-regulated emission permit from the Norwegian Environment Agency for emissions subject to quotas, and compensates annually for CO_2 emissions in the EU's quota system.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

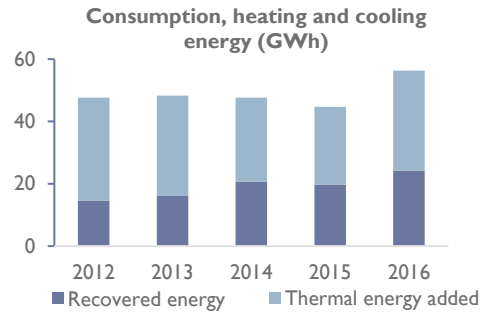
OSL has been working actively with energy efficiency measures over the past few years, and its percentage of renewable energy stands at well in excess of 90 per cent annually. There has been considerable expansion at OSL over the past few years, and energy consumption is expected to increase in years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

Status, energy 2016

In 2016, energy efficiency measures have been implemented resulting in an overall reduction of 982 MWh per year. Further efforts to replace halogen runway lights with LED lights are one of the contributors to this reduction. Around 867 runway lights were replaced in total, giving an overall power consumption reduction of 117 MWh. Some LED lights were also replaced at the terminal, helping to bring about a reduction of 68 MWh. The main contribution to the savings in 2016 was made by replacing heat recovery units in two ventilation systems, switching from battery recovery units to much more efficient rotary recovery units, giving an estimated reduction of 710 MWh. The temperature in Hangar 8 has also been reduced, which will save a lot of energy and power in winter. It is estimated that this contributed 87 MWh in 2016.

OSL, with the support of Enova, mapped the entire terminal building for energy measures in 2016. The aim of mapping was to identify energy-saving measures resulting in reductions of at least 10 per cent, but it identified potential reductions of no less than 29 per cent. The measures concerned covered everything from better heat recycling in ventilation systems, the replacement of lighting systems with LED lighting, optimised control of the baggage handling system, and better control of snow-melting systems (ground heating).





The snow cooling system has been put into operation. The accumulation of snow in winter is used to cool the terminal in summer

The snow storage facility is filled with the winter's snow

The snow storage facility is covered with woodchips

WASTE

The volume of unsorted waste (waste code 99- in accordance with NS 9431) must not exceed 3500 tonnes per year.

Waste in brief

Airlines, handling agents, catering companies, cargo handlers, tenants, passengers and OSL itself all produce waste at the airport.

All companies at the airport participate in a joint waste management scheme whereby all waste is handled by the same waste disposal company. The waste management scheme is flexible, and waste fractions, container sizes and collection rates are adapted according to requirements. Waste is separated at source and dropped off at fixed 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. The administration building and Flyporten are also connected to this disposal system. The waste disposal company deals with the waste and delivers it to approved final processing and recycling plants. The waste disposal company reports on the monthly source separation rates and tonnages for all collection points.

Source separation at the terminal

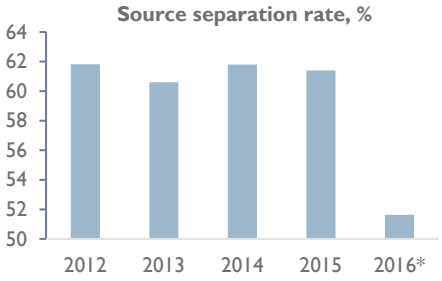
OSL is responsible for organising the waste management scheme at the airport and acts as a driving force, ensuring that the airport as a whole achieves good results in terms of waste. Waste from the T2 project's building and construction activities is reported separately.

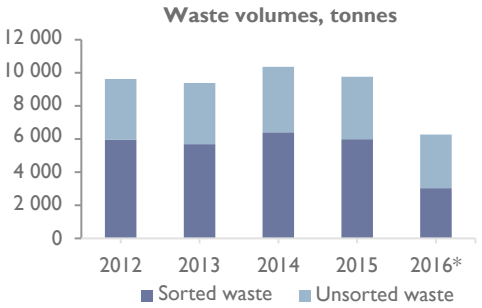
Status, waste 2016

The total waste volume for the whole airport in 2016 was 9 437 tonnes, compared with 9 767 tonnes in 2015; a reduction of 3.4 percent.

From 2016, OSL has opted to define targets for and report only the waste invoiced via OSL. The total waste volume in this case was 6 272 tonnes. The definition of unsorted waste has also been changed from 2016, and is now in accordance with NS9431 Classification of waste. There were 3 238 tonnes of sorted waste and 3 033 tonnes of unsorted waste. Source separation rates stood at 51.63 per cent.

Collection of recyclable beverage containers made of steel, aluminium and PET (plastic) from aircraft has continued in 2016. SAS, Thomas Cook and Sodexo are all taking part in this scheme. A total of 27.5 tonnes of recyclable material has been received from this initiative, representing a reduction of 5.9 tonnes compared with 2015. The airlines donate surplus revenues from deposits and aluminium returns to charity. OSL 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, OSL has collected boxes and bottles worth a total of more than NOK 2 million from public areas in the terminal building, and the funds are being donated to humanitarian schemes.





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

In 2016, paper-based declarations were replaced by the electronic system for declaration of hazardous waste. OSL and all companies that submit waste to the waste management scheme at the airport have received training on the system, or they have authorised the waste disposal company to make declarations on their behalf in the electronic system.

PURCHASING, BUILDING AND CONSTRUCTION PROJECTS

Consumption of products and materials in brief

OSL undertakes procurement procedures for services, products and materials by means of purchases linked with regular operation, or via construction projects. OSL has its own processes which ensure that all purchases are made in accordance with public procurement regulations. Purchasing in connection with operation must take place using framework agreements as far as possible, while purchases linked with construction projects will take place via agreements with contractors.

Environmental requirements are specified in both framework agreements and agreements with contractors in order to ensure procurement sustainability and selection of the most eco-friendly products and materials. Requirements are specified as quality requirements (mandatory requirements) or as allocation criteria where suppliers compete to provide the most eco-friendly solutions, products, materials and services.

Environmental requirements in procurement processes are an important element in following up OSL's environmental policy and help to reduce OSL's greenhouse gas emissions. They also provide financial benefits beyond safeguarding and preserving the environment.

Materials are also selected on the basis of environmental considerations

Status, consumption of products and materials 2016

As a basis, OSL specifies requirements for environmental management systems or equivalent in the qualification documents, where relevant. Product suppliers are also required to have membership of the packaging return scheme (*Grønt Punkt*, Green Dot).

To ensure that environmental considerations are taken into account throughout the entire procurement process, the purchasing function has assistance from environmental advisors on specific procurement procedures, for formulation of qualification requirements, requirement specifications and weighting of the environment in respect of allocation. For example, specific environmental requirements are defined when procuring rolling stock, fuel and lubricant oils, and also when running canteen services at the terminal.

High proportion of recycled material in reinforcement bars

OSL specifies requirements in a separate annex to construction contracts to ensure that environmental targets and strategy are taken into account in building and construction projects. Strict environmental requirements are defined for materials, particularly in connection with interior design work at the new terminal. Environmental requirements are also stipulated in all contracts with stakeholders operating on the airside.

Environmental documentation requirements are specified for products and services with significant environmental impact. Systematic efforts are being made to substitute and reduce the number of chemical products. All products used must meet environmental requirements from local and central authorities

NATURAL ENVIRONMENT

Biodiversity in brief

OSL has mapped and charted the important areas for biodiversity, with descriptions of flora, vegetation and bird life within the airport area, on OSL 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 a number of rare and endangered species that we wish to preserve. Unfortunately, blacklisted species are also registered at the airport. These are unwanted as they suppress the natural Norwegian flora.

Status, biodiversity 2016

OSL 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 varieties lupin, giant hogweed, Canadian goldenrod and Japanese knotweed has been compiled on the basis of 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. These measures were successful, and this work has continued in 2015 and 2016. However, clearance is a long-term project and will require efforts for several years to come.

Cutting Canadian goldenrod roots

In connection to work carried out on an unofficial dumping ground in a ravine on OSL property at the entrance to the Romerike nature conservation area, OSL was required to remove unwanted foreign species that may have established themselves at the location. When accessing the site in July 2016, strong growth of a variety of bindweed was recorded, noted as a foreign species in Norway with very high risk status. OSL has planned measures to remove this plant so that it does not suppress any native vegetation or spread to new locations.

Hedge bindweed, an unwanted species in the ravines

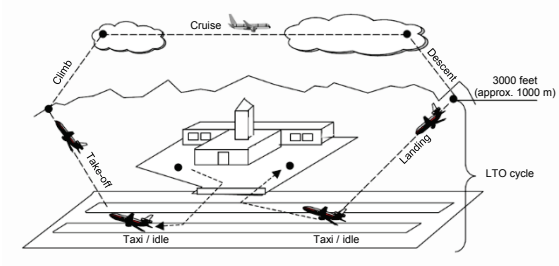
CITES

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).

For several years, OSL has provided guidelines to passengers during the holiday season, via various social media, to tell people not to buy “endangered holiday souvenirs”, which include objects made from ivory, turtle shells, hippo teeth, shark teeth, snakeskin, conches and corals. This campaign has been run in partnership with Norwegian Customs and the Norwegian Environment Agency. OSL also supported World Wildlife Day on 3 March, using our Facebook page to encourage passengers to practise responsible tourism. “Don’t buy souvenirs made from endangered animals!”

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 emissions

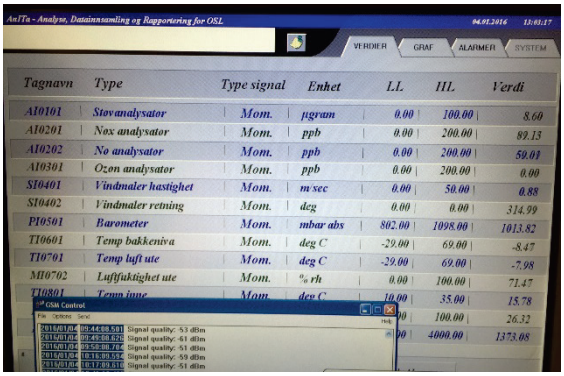
The municipalities bear primary responsibility for assessment of air quality, but if there are reasons to suspect that limits have been exceeded, then owners of facilities that make significant contributions to these levels will be responsible for assisting to map the levels and assessing measures. OSL 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.

Avinor has participated in the project entitled “Assesment 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 µg/m^3) that occur in central urban areas”.

OSL’s mobile air quality monitoring system outside the departures hall

Status, emissions to air 2016

In 2016, emissions have been measured directly outside the arrivals hall at the terminal. We have received enquiries linked with unpleasant odours in this area. This relates to the smell of perfume emerging from the ventilation system, the smell of paraffin from aviation fuel and exhaust fumes from buses and taxis collecting passengers. These measurements show that NO_2 limits were exceeded 14 times, while PM_{10} limits were exceeded 10 times. This was within the regulatory requirements, where exceeding the limit is restricted to 18 instances for NO_2 and 30 for PM10. The concentration of contamination in outdoor air must not exceed the limits more than the permitted number of times.



Air quality monitoring

In 2001, NILU, the Norwegian Institute for Air Research, carried out a major survey of local air quality on behalf of OSL. Calculations were performed and measurements were taken at various locations around the airport. NILU’s report concluded that air quality at and around the airport was much better than in urban areas. This report was updated in 2016 and includes four different points: mapping of air quality around OSL, odour problems occurring occasionally, whether the blackening of residential buildings in the areas around OSL is due to emissions from aircraft, and whether the surface tension in pools and ponds is reduced as a consequence of emissions from aircraft. The report shows that concentrations of nitrogen oxides are well below applicable threshold values and there is no reason to suspect that they lead to health concerns. Although it is possible to smell aircraft fuel, it is present in such small quantities that it is far from being a health problem at such concentrations. Furthermore, there is no indication that the blackening of residential buildings around OSL is due to emissions from aircraft. The effect of surface tension on water must be examined in greater detail.

Blackening of buildings is due to mould growth, not emissions from aircraft

THE T2 PROJECT

OSL has almost finished its expansion so that it can serve 28 million passengers each year when phase 1 is completed in April 2017. The T2 project has included: Expansion and modification of the existing terminal building and of airside facilities, alterations to the operational areas and technical installations, new remote aprons, a temporary pier south of the existing terminal and upgrading of the railway station.

At the end of 2016, the T2 project has emerged as a national and international model project for the environment. The construction holds BREEAM certification at “Excellent” level for “Design stage”. All documentation from the construction work itself, “Post construction stage”, will be submitted in early 2017. The building will receive a new certificate, “As built”.

Environmental results do not come into being by accident. With extensive environmental requirements and a total of approx. 150 contracts, the T2 project has been groundbreaking as regards the development of an effective, environmentally managed project management model. The methodology is rooted in the concept of both stick and carrot in the form of a combination of requirements, guidelines and clear distribution of responsibilities among all parties involved. Having unambiguous environmental requirements for all deliveries has also been an absolutely crucial factor.

A total of 1 984 safety inspections were carried out as part of T2 by the end of 2016, focusing on the external environment. Separate environmental inspections are also carried out at regular intervals with executing contractors. All stakeholders are actively encouraged to report unwanted incidents and environmental accidents that may result in harm to the external environment. 23 such incidents were reported in 2016. None of these incidents resulted in lasting, irreversible environmental damage. None of the incidents was of high severity. Most of the incidents involved minor oil spills from site machinery. The spills were cleared up immediately.

The T2 project’s construction waste has been sorted. Accumulated figures show no less than 91 per cent waste sorting by the end of 2016. The project target was to achieve a minimum of 80 per cent waste sorting, while the regulatory requirement is 60 per cent. In total, 15 082 tonnes of accumulated construction waste was produced by the T2 project by the end of 2016, excluding concrete. Central Building West and Pier North have generated 65.7 kg construction waste per m^2.

Reduction of waste has been one of the environmental targets for T2. Good construction materials should be reused and not become part of the waste statistics. In 2016, the project was able to reuse large constructions that were demolished. The temporary wall constructed to separate Pier North and the existing terminal during the construction phase has now been removed and delivered to Hernesmoen in the municipality of Sør Odal for reuse as a museum for classic cars. This initiative is reusing 157 tonnes of insulated and fully usable façade instead of the materials ending up as demolition waste.

After being crushed, old concrete can be used as full-quality material in new facilities. All concrete demolished in T2 is crushed locally and reused. This is applicable to old concrete floors that have to give way to the T2 project. Large parts of the concrete have already been reused in the development of new taxiways, gates and other airside installations.

Many thousands of square metres of wooden panels used to cover newly laid stone floors at Central Building West were also reused to cover the parquet at Pier North during the construction phase. OSL has now taken most of the remaining panels for later use in new construction projects.

Results such as this require a conscious attitude towards reuse on the part of the developer, followed up with clear requirements for the contractor.

Strict environmental requirements have been defined for executing contractors to ensure that the T2 project does not involve contaminated emissions to soil, groundwater or waterways, and that the natural water balance is maintained. This includes requirements for handling bilge water, securing tank areas, carrying out repairs and cleaning equipment, and requirements for machine fleets. All contaminated excavation soil is handled in accordance with applicable requirements in permits from the Norwegian Environment Agency.

There have been no incidents in 2016 resulting in lasting environmental damage to the soil, groundwater or waterways. There have been some minor, local escapes, particularly minor oil leaks from construction activities. These were cleared up as they occurred, in line with applicable procedures. Contractors fill in daily checklists for machine inspection, and also indicate that they have absorbents available in the event of accidents/leaks.

The new terminal buildings are constructed to be energy-efficient. The aim is to halve actual energy consumption compared with the existing terminal. The new terminal buildings are what are known as passive buildings. This means that the need for energy for heating and cooling is reduced by investing in everything from insulation to special windows and sunshades. The new terminal building has been awarded passive building grants by ENOVA.

Energy-efficient shape of the roof at Pier North

A greenhouse gas inventory were compiled for the new terminal buildings in 2013 as an integral part of the design and construction process. The www.klimagassregnskap.no model has been used. The inventory includes emissions from operational energy consumption, operational transport and the production of the materials used in the building. The inventory shows that the solutions selected will provide significant reductions in greenhouse gas emissions compared with similar buildings using standard

solutions for materials, energy and transport. The material inventory will be updated with “as built” figures in 2017.

Construction activities as part of the T2 project in 2016 have resulted in the consumption of 51 677 litres of fuel; representing a major decrease compared with 2015, when there was far greater construction activity. A total of 6.4 million litres of fuel had been used by T2 by the end of the year.

In 2016, the T2 was voted as the “Nordic Best Practice” project in a new Nordic guidance for the procurement of eco-friendly building materials. This guide is published by Nordic knowledge centres for eco-friendly construction, including the Norwegian Green Building Council. “Best practice” is due to both the progress of T2 and the requirements specified for various building materials. T2 has addressed the contributions of building materials to greenhouse gas emissions, indoor air/emissions, use of resources, substances hazardous to health and the environment, and sustainable logging.

The use of large quantities of wood in load-bearing structures, European oak on the roof of Pier North, a high proportion of recycled metals and extensive use of green concrete (low heat concrete) are all examples of eco-friendly material selections in T2.

Systematic environmental assessments of materials and chemicals are carried out before these are used. The developer has guided its contractors on the basis of environmental requirements specified in the contracts. The tool ProductXchange has been used for checking the environmental properties of building materials.

The T2 project has generated some construction noise at times, but the noise requirements have been met. Contractors have also planned their activities to prevent the spread of dust. The aim of this is to ensure that air traffic and passengers are not affected by dust.

All construction in 2016 has been carried out following a strict clean and dry building regime. RIF’s clean building standard has been used as a basis. Construction sites and adjacent public areas have been kept clean and tidy while maintaining very low dust levels, partly to ensure that the ventilation system is not subject to dust accumulation. The areas handed over to OSL in 2016 have remained clean to a satisfactory level following completion of building cleaning prior to handover. A clean and tidy construction site has also been of major significance for the prevention of occupational accidents, and for achieving satisfactory fire safety and efficiency during the extension works.

Selection of materials at Pier North

KEY FIGURES

		2012	2013	2014	2015	2016
Air traffic						
passengers	number	22 080 433	23 159 093	24 269 361	24 678 195	25 787 391
Domestic	number	10 387 621	10 583 935	10 907 550	10 917 495	11 220 648
International	number	11 897 173	12 575 158	13 361 811	13 760 700	14 543 699
Aircraft movements	number	227 114	231 460	237 595	234 974	247 560
Passengers per aircraft movement (scheduled / charter)	number	101	104	106	109	104
Public transport share						
Public transport share for surface access	%	64	65	68	69	70
Noise						
Change in total noise impact relative to reference year 2000	dBA	-0.9	-0.6	0.2	0.1	0
Inquiries, aircraft noise (persons)	number	144	192	142	264	285
Energy						
Total consumption of electricity	GWh	92,0	96.8	103.9	109.8	112
Electricity for electricity-specific installations	GWh	80.4	83.7	95.9	99.0	104.8
Purchased heating and cooling energy	GWh	33.0	32.2	26.9	25.0	32.1
Electricity for electrode boiler	GWh	5.1	4.8	8.1	11.1	7.2
Electricity for compressors, pumps, etc.	GWh	6.5	8.3	9.4	8.7	9.3
Statkraft Varme AS	GWh	20.7	18.9	8.8	4.9	14.7
Heating oil (Energy central)	GWh	0.7	0.2	0.6	0.3	0.8
Recovered energy	GWh	14.6	16.1	20.7	19.7	24.2
Consumed heating and cooling energy	GWh	47.6	48.3	47.6	44.7	55.9
Non-renewable resources						
Jet fuel	m^3	540 000	598 790	639 600	613 500	618 192
Heating oil/diesel*	m^3	205	110	135	103	182
Bio heating oil	m^3	0	0	6.1	11.4	21
Fuel for OSL vehicles**	m^3	829	668	902	820	632
Biofuel for OSL vehicles	m^3	0	0	0	9.3	81.0
Fuel for fire drills (paraffin)	m^3	34.4	21.1	12.9	14.8	17.8
Fuel for fire drills (propane/Jet A1)	tonnes	0.7	0.6	0.3	0.4	0.3
Waste						***
Sorted waste	tonnes	5 950	5 688	6 405	5 996	3 238
Residual waste	tonnes	3 675	3 694	3 956	3 771	3 033
Total amount of waste	tonnes	9 625	9 382	10 361	9 767	6 272
Source separation rate	%	61.8	60.6	61.8	61.4	51.6
Hazardous waste	tonnes	55	90	368	298	213
Greenhouse gas emissions						
Control – OSL emissions	tonnes CO	4 855	4 889	5 852	5 031	5 093
Control – OSL emissions, kg per passenger	kg CO_2 /passenger	0.220	0.213	0.241	0.204	0.198
Guide – third-party emissions -	tonnes CO	85 740	87 560	96 942	93 922	96 570
Impact –third party emissions	tonnes CO	179 966	180 654	182 031	169 861	188 939
Water supply and sewage						
Water consumption, OSL	m^3	201 000	215 000	207 000	215 000	221 000
Wastewater volume, airport	m^3	278 000	289 000	265 000	283 000	297 000
Drainage water volumes	m^3	1 937 722	1 498 000	1 955 000	2 205 000	1 870 000
De-icing chemicals (per season)		**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**
Aircraft de-icing						
Total consumption, glycol	tonnes	988	1 526	1 557	1 491	1 437
Specific consumption, glycol	kg/aircraft	130	139	139	146	142
Collection rate for glycol	%	85	78	81	81	80
Runway de-icing						
Aviform L50	m^3	739	600	1263	2132	1806
Aviform S	tonnes	75	150	59	198	281
* Total heating oil						
** This figure does not include airside bus services and winter maintenance carried out by Veidekke						
*** New methodology from 2016. OSL's own waste only. All code 99- fractions in accordance with NS9431 count as unsorted						