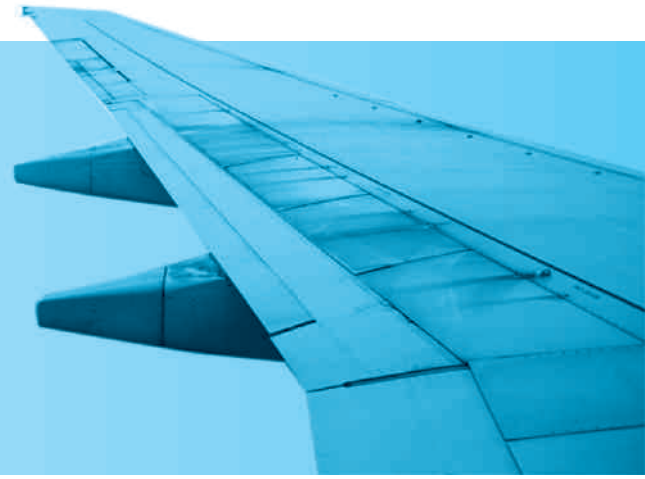
FINAVIA

ENVIRONMENTAL REVIEW 2008

Finavia And The Environment 2008



WHAT AFFECTS AIRPORT ENVIRONMENTS

Runway skid prevention. Nowadays more environment friendly substances are used in skid prevention, but they can still pollute water systems. Finavia is responsible for runway skid prevention.

Aircraft ice prevention and removal. A non-toxic glycol solution is used for preventing ice and removing it from aircraft surfaces. The solution consumes oxygen as it degrades in surface and ground water. Anti-icing and de-icing for aircraft is handled by ground service companies.

Aviation. The movement of commercial, private and defence force aircraft causes noise and exhaust gas emissions.

Decisions have been made on permits for airports

For Finavia, the environmental permit processes of airports are part of normal environmental work, a question of satisfying the requirements of the legislation which was amended in 2000, and interaction with the areas that it serves.

In 2008, Finavia was granted environmental permits for the Helsinki-Malmi, Joensuu and Oulu airports. The environmental permit applications for the airports of Jyväskylä and Kittilä were submitted. In addition, the application for Helsinki-Vantaa Airport was supplemented. The permit applications for the Turku, Kuopio and Halli airports were being processed by the authorities at the end of the year.

Improved collection of aircraft de-icing substances

In accordance with permit requirements, at Oulu Airport the runoff into the soil and ditches of the mixture of propylene glycol and water used in the anti-icing and de-icing of aircraft must be restricted. A target of 50% of the glycol used by ground service companies was set as the targeted efficiency rate for glycol water collected from treatment areas. The collection will start from the beginning of 2009.

In 2008, Finavia acquired two suction vehicles for Oulu and Kuopio airports for the collection of glycol water and built facilities for short-term storage of glycol effluent. Following the local storage, the liquid is transported to the municipal wastewater treatment plant.

Helsinki-Malmi Airport is operated as a part of the urban structure

Helsinki-Malmi Airport functions side by side with the urban structure. The regulations set in its environmental permit are strict, but do not prevent the airport from functioning as the most important pilot training location in Finland and as a base for the Finnish Border Guard.

Restrictions were set in the decision on the operating hours of the airport, for example, as well as on flights during public holidays. The regulations called for technical studies on the prevention of effects of possible environmental accidents, such as liquid fuel leaks, and the implementation of measures in the sewer network during 2008. These requirements have been met.

Various obligations for supplementary studies and measurements related to environmental impacts set out in the permit regulations are extensive, concerning, for example, odours spreading to residential areas from the airport area, as well as aircraft noise.

The current operating procedure at Helsinki-Vantaa ensures noise control and the airport's high level of service

The environmental permit application for Helsinki-Vantaa Airport was supplemented in spring 2008. The permit authority announced the application in late summer. The statements and remarks provided by officials, municipalities and residents were related to the noise effects of air traffic, land use planning, emissions into the air, the transmission of runoff water, the storage of chemicals, as well as waste.

The permit application also included information in accordance with the Environmental Noise Directive on noise management measures. The collection of remarks from the public in accordance with the directive was carried out simultaneously with the permit process.

In its replies, Finavia underlined the fact that safeguarding the air traffic and good transfer connections of Helsinki-Vantaa, not to mention air safety, is of primary importance to Finland. This can be achieved by the continuation of the current noise preferential use of runways and by ensuring the requirements for operations in the late evening and early morning.

Reducing the runoff water load at Helsinki-Vantaa

During the winter, the first area dedicated to more effective collection of ice protection and de-icing substances was taken into use at Helsinki-Vantaa Airport. Based on the experiences gained with this area, planning started for a second remote de-icing area serving departing traffic in the opposite runway direction. The new area will be completed in stages and its first part will be taken into use in 2011.

New parking areas used for the aircraft anti-icing and de-icing were connected to sewage pipelines and the pumping capacity was increased further. The tunnel which functions as a balancing pool for surface waters of the terminal area was cleaned manually in the spring to prevent any polluting effluents to be taken to the surface waters during the summer. Three new, more effective suction vehicles were acquired for the collection of glycol water. The operation

of the runoff water storage and treatment banks located underneath the third runway was improved by increasing the efficiency of aeration and by spraying part of the runoff water on the swamp area between the runways.

The decomposition products of the propylene glycol used as an de-icing substance have a strong odour even in small concentrations. VTT (Technical Reseach Center of Finland) studied the occurrence of odour in the vicinity of Helsinki-Vantaa Airport in the spring and summer of 2008 by using field observations. The spread of a distinct odour was mostly restricted to the immediate vicinity of ditches and the odour was not considered to be a significant nuisance to comfort in residential areas.

Room for pilots to reduce emissions and noise

At Helsinki-Vantaa Airport, Finavia launched the three-year Continuous Descent Approach (CDA) development project which aims for greater adoption of more environmentally friendly flight procedures. The intention of the project is to reduce noise, exhaust gas emissions and fuel consumption of landing aircraft by changing the operating methods of pilots, airlines and air traffic control, especially during night time.

At the end of 2008, one-third of all landings were CDA approaches. Air traffic control creates the possibility for a pilot to carry out a continuous descent approach. This enables the pilot, with the support of the aircraft's technical systems, to perform an approach whose speed and altitude profile is optimal, and avoid the usual level flight segment. In the best cases, emissions during the approach can be reduced by 10–30%. In large aircraft this means savings of up to two hundred kilograms of fuel per approach. Noise is also decreased.

From energy monitoring to energy management

Implementation of Finavia's energy and climate programme, completed in 2008, started by project groups that seek concrete ways of improving energy efficiency in various operations. These operations include airport buildings and structures, vehicles and machinery, guidance of movement and air navigation services.

The aim of the programme is the continual systematic improvement in energy efficiency so that Finavia complies with the requirements of the forthcoming act on energy saving in the public sector. The general targets for Finavia's energy efficiency and emissions will be specified during 2010.

Anti-skid agents are suitable for asphalt

The Finnish Environment Institute (SYKE) studied the effects of environmentally less harmful anti-skid substances on road and runway coatings. According to the study, substances based on acetate and formate do not create harmful oil hydrocarbons on asphalt coatings nor do the substances accumulate in the structures of roads and airports.

In the study, samples were taken of asphalt from road sites and Helsinki-Vantaa and Kuopio airports that had been subjected for years to different skid prevention substances. The analyses did not detect increases in the concentrations of harmful oil-based hydrocarbons or any other damage despite long-term use of anti-skid chemicals.

European solutions for air traffic and airports

Air traffic is the only form of transport in which a decision has been made to manage carbon dioxide emissions by international emissions trading. According to the directive approved in October 2008, emissions trading in air traffic will start from the beginning of 2012 on flights inside the European Union and between EU countries and non-EU countries. In 2012, airlines in the EU will be allocated emission rights equal to 97 per cent of the average of emission rights during 2004–2006 and the amount will decrease in stages. The Ministry of Transport and Communications started preparations to amend Finland's legislation to comply with the directive.

The European Environmental Strategy Committee of Airports Council International (ACI) gathered the environmental directors of Europe's large airports in Helsinki in April. The meeting addressed EU legislation in particular, the management of the emission of carbon dioxide and nitrogen oxides and studies in the sector. ACI is one of the many channels through which Finavia participates in international decision-making and the exchange of information on environmental issues concerning airports.

Vantaa March 20, 2009

Samuli Haapasalo, President and CEO
Mikko Viinikainen, Environmental Director

DOCUMENTATION DESCRIBING THE ENVIRONMENTAL LOAD ON AIRPORTS AND AVIATION

The attached figures and tables present, by airport, the volumes of used skid prevention substances, aircraft ice prevention substances, accumulated waste, energy consumption and water consumption. With respect to these statistics, the developments over the last few years are also described and causes explained.

Airport traffic volumes and emissions of exhaust gases from aircraft using the airports are also presented in tables. Emission data for Finavia's ground equipment is also presented. Finavia's calculations on the emission of exhaust fuels from air traffic in Finland's airspace are released through the LIPASTO system http://www.lipasto.vtt.fi/

Table 1. *Number of landings by aircraft at Finavia's airports in 2008 and the change from the previous year.*

	Year 2008				Change from previous year (%)			
Airport	Commercial Aviation	General Aviation	Military Aviation	Total	Commercial Aviation	General Aviation	Military Aviation	Total
Enontekiö	81	6	0	87	-15	100	-100	-12
Halli	4	346	2 070	2 420	400	-8	-16	-14
Helsinki-Malmi	15	55 113	54	55 182	36	4	74	4
Helsinki-Vantaa	91 952	1 908	866	94 726	3	-6	-11	2
Ivalo	743	130	76	949	-1	-64	17	-19
Joensuu	1 521	1 164	104	2 789	-1	-21	68	-9
Jyväskylä	2 090	2 521	9 918	14 529	-7	-22	-4	-8
Kajaani	878	117	64	1 059	3	-15	-26	-2
Kauhava	0	198	6 527	6 725	-100	-51	-14	-15
Kemi-Tornio	1 391	705	13	2 109	1	-20	225	-6
Kittilä	1 172	125	78	1 375	8	-63	-65	-16
Kruunupyy	1 688	1 394	253	3 335	-3	-20	-23	-12
Kuopio	2 960	3 328	5 903	12 191	5	39	8	14
Kuusamo	635	99	71	805	-5	-24	446	-1
Lappeenranta	956	978	179	2 113	24	21	184	29
Mariehamn	3 171	1 213	0	4 384	9	39	0	16
Oulu	5 652	3 220	1 465	10 337	5	-10	90	6
Pori	1 446	8 876	55	10 377	-10	-18	-49	-17
Rovaniemi	2 273	1 464	4 760	8 497	-18	-15	2	-7
Savonlinna	498	168	13	679	-7	24	86	0
Tampere-Pirkkala	6 370	10 681	5 076	22 127	25	-11	-9	-3
Turku	5 394	9 780	372	15 546	7	-9	18	-4
Utti	9	622	2 721	3 352	0	-12	-18	-17
Vaasa	4 453	2 342	182	6 977	2	-24	-4	-8
Varkaus	380	51	3	434	219	122	50	201
Total	**135 732**	**106 549**	**40 823**	**283 104**	**3**	**-4**	**-4**	**-1**

Table 2. *Use of airport skid prevention substances and aircraft ice prevention substances and accumulated waste by airport in 2008. Skid prevention substances are used by Finavia and aircraft ice prevention substances are used by airlines and their ground service contractors . The waste volumes include waste recovered under contract from other operatives at Finavia airport sites.*

	Anti-skid and de-icing chemicals (Winter season 2007–2008)					Energy and water consumption (year 2008)			Waste volumes (year 2008)		
Airport	Urea t	Acetate 100% t	Formiate 100% t	Betaine 100% t	Glycol, factory solution m^3	Electricity MWh	Heat MWh	Water m^3	Unsorted waste t	Recyclable waste t	Hazardous waste t
Enontekiö	1	13	0	0	29	0*	1 006	272	3	6	0.1
Halli	0	18	0	0	0	36	215	70	3	9	1.8
Helsinki-Malmi	0	0	10	0	0	915	2 166	2 600	54	31	6.4
Helsinki-Vantaa	0	0	1 157	0	3 022	51 685	28 926	132 058	937	1 728	10.3
Ivalo	0	87	0	0	64	952	1 976	2 798	39	13	2.1
Joensuu	0	0	45	0	51	746	1 762	8 417	22	8	1.9
Jyväskylä	0	47	1	0	50	1 371	2 023	4 557	26	48	0.4
Kajaani	0	0	48	0	30	560	1 212	2 239	13	2	0.0
Kauhava	27	35	0	21	0	117	320	204	1	15	0.1
Kemi-Tornio	0	72	0	0	21	669	1 226	3 019	23	103	1.0
Kittilä	0	114	0	0	151	1 480	1 804	3 259	24	2	2.3
Kruunupyy	0	55	3	0	26	425	709	2 033	1	32	0.2
Kuopio	0	64	0	56	103	2 048	2 617	6 338	18	15	2.1
Kuusamo	0	0	36	0	68	575	841	804	25	7	0.0
Lappeenranta	0	0	21	0	2	451	903	1 233	6	12	0.0
Mariehamn	0	7	3	0	2	415	890	2 040	37	8	0.0
Oulu	0	0	112	0	269	3 443	3 063	5 123	44	31	10.2
Pori	4	0	40	0	4	578	1 285	1 886	12	7	0.3
Rovaniemi	2	30	44	0	195	4 278	5 366	5 824	151	37	0.6
Savonlinna	0	0	14	0	0	336	316	828	14	57	3.3
Tampere-Pirkkala	0	14	6	126	127	2 150	1 992	3 671	270	38	11.9
Turku	3	106	7	0	83	2 650	1 899	5 495	24	29	0.7
Utti	0	0	8	0	0	60	150	142	3	34	5.1
Vaasa	0	77	3	0	80	1 504	2 575	3 233	10	85	9.6
Varkaus	0	0	0	0	0	410	334	140	6	7	2.2
Total	**37**	**739**	**1 558**	**203**	**4 377**	**77 854**	**65 576**	**198 283**	**1 766**	**2 364**	**73**

** The amount of electric energy consumed is included in the amount of heat energy.*

Table 3. *Fuel consumption and emissions by aircraft at an altitude under 915 metres (3000 feet) altitude (during the LTO cycle) and fuel consumption and emissions by Finavia's ground equipment by airport in 2008. The total amounts of emissions and fuel consumption by aircraft during the LTO cycle increased by an average of 4% compared with 2007. The total amounts of emissions and fuel consumption by Finavia's ground equipment increased by an average of 10% compared with 2006 and compared with the correceted figures of 2007.*

	Aircraft emissions (2008)							Finavia ground equipment emissions (2008)						
Airport	LTO-cycle number	CO (t)	HC (t)	NO_x (t)	SO_2 (t)	CO_2 (t)	Fuel (t)	CO (t)	HC (t)	NO_x (t)	Particles (t)	SO_2 (t)	CO_2 (t)	Fuel (t)
Enontekiö	100	0	0.1	0.4	0.0	100	30	0.3	0.1	0.6	0.04	0.001	80	20
Halli	400	2	0.0	0.0	0.0	10	2	0.3	0.1	0.6	0.03	0.001	80	20
Helsinki-Malmi	53 700	380	4.8	0.8	0.2	1 100	360	0.7	0.2	0.8	0.05	0.001	120	40
Helsinki-Vantaa	93 700	850	90	640	60	176 600	56 500	14.7	4.5	24	1.34	0.034	3 190	1 010
Ivalo	900	10	1.0	5.5	0.5	1 500	490	2.3	0.6	2.5	0.13	0.004	300	90
Joensuu	2 100	10	0.6	4.9	0.5	1 500	480	0.6	0.2	1.4	0.08	0.002	180	60
Jyväskylä	4 300	20	0.8	6.7	0.6	1 900	620	0.9	0.3	1.7	0.09	0.002	210	70
Kajaani	1 100	7	0.5	3.3	0.3	1 000	330	0.4	0.1	0.8	0.04	0.001	100	30
Kauhava	200	1	0.1	0.0	0.0	20	5	0.5	0.2	0.8	0.05	0.001	110	40
Kemi-Tornio	2 000	6	0.4	4	0.4	1 100	360	0.6	0.2	1.3	0.07	0.002	160	50
Kittilä	1 200	10	1.5	10	0.8	2 500	790	1.2	0.5	2.9	0.16	0.004	350	110
Kruunupyy	3 000	10	0.4	4.0	0.4	1 200	380	0.4	0.2	1.1	0.06	0.001	130	40
Kuopio	5 800	40	2.2	12	1.2	3 900	1 200	1.3	0.5	2.9	0.16	0.004	370	120
Kuusamo	700	7	0.8	3.4	0.3	1 100	340	0.7	0.3	1.5	0.08	0.002	170	60
Lappeenranta	1 800	7	0.9	0.8	0.1	300	110	0.5	0.2	0.8	0.05	0.001	110	30
Mariehamn	4 000	50	1.2	1.1	0.2	600	180	0.3	0.1	0.4	0.03	0.001	60	20
Oulu	8 400	70	5.8	37	3.2	10 100	3 200	2.2	0.9	5.2	0.28	0.006	590	190
Pori	8 600	50	3.1	4.0	0.4	1 300	430	0.5	0.1	0.5	0.02	0.001	50	20
Rovaniemi	3 000	30	3.4	16	1.4	4 300	1 400	1.5	0.7	4.4	0.24	0.005	490	160
Savonlinna	700	2	0.1	1.1	0.1	300	110	0.7	0.2	0.5	0.03	0.001	70	20
Tampere-Pirkkala	15 600	110	3.7	29	2.6	8 200	2 600	1.3	0.4	2.4	0.14	0.003	330	100
Turku	12 700	110	6.4	22	2.1	6 800	2 200	2.2	0.7	4.2	0.22	0.005	500	160
Utti	500	5	0.1	0.0	0.0	20	5	0.4	0.1	0.4	0.02	0.001	70	20
Vaasa	6 700	40	2.7	14	1.4	4 600	1 500	0.9	0.3	1.4	0.07	0.002	170	60
Varkaus	500	1	0.0	0.7	0.1	220	70	0.4	0.1	0.3	0.02	0.001	50	10
Total	**231 500**	**1 820**	**130**	**820**	**70**	**230 400**	**73 600**	**40**	**10**	**60**	**3.0**	**0.09**	**8 020**	**2 550**

The figures in the tables have been rounded. The aircraft emission calculations do not include military aviation, helicopter flights or gliders. Data on particulate emissions for the airplanes is not available. 1 litre of kerosene = 0.800 kg.

Table 4. *Consumption of heat, electricity and water in Finavia's properties in 2008 and change from the previous year. The calculations of the figures per passenger do not include the airports in Kauhava, Halli, Utti and Malmi, all of which do not have regular passenger traffic.*

	Year 2008	Change
Consumption of heat energy	66 GWh	-1%
Consumption of heat energy per passenger	3.6 kWh/pax	-2%
Consumption of electric energy	78 GWh	1%
Consumption of electric energy per passenger	4.4 kWh/pax	2%
Consumption of water	198 000 m^3	-4%
Consumption of water per passenger	11.1 l/pax	-3%
Passengers	17.6 million	1%

Figure 1. *Amount of skid prevention substances used at Finavia's airports in 1991–2008, by winter season. In the case of liquid acetate, formiate and betaine, the water content of solutions (50%) has been subtracted when calculating the total amount. The amount of skid prevention substances used has stabilised during the last few winters. About half of the total amount is used at Helsinki-Vantaa Airport. Betaine is a new substance which has been in trial use at Tampere-Pirkkala, Kauhava and Kuopio airports*

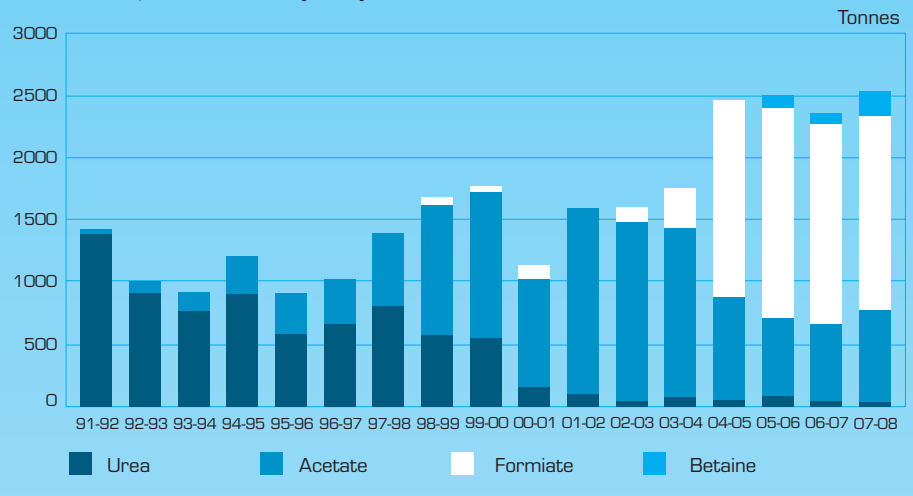


Figure 2. *Oxygen consumption load and nitrogen load resulting from the use of skid prevention substances by winter season 1991–2008. The load decreased significantly at the turn of the millennium due to the discontinuation of the use of urea. In the 2000s, the load has remained steady despite the increase in the consumption of skid prevention substances. The reason is the transition to less environmentally polluting liquid formiate.*

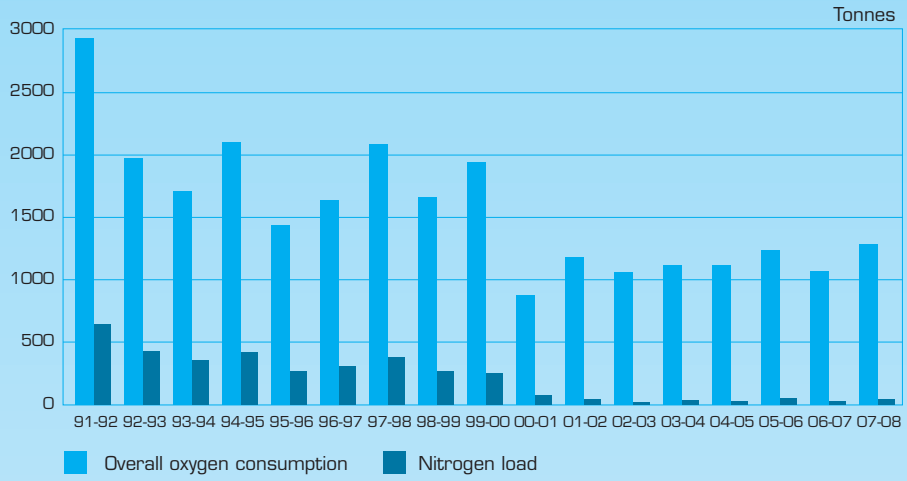


Figure 3. *Amounts of aircraft de-icing liquids used at Finavia's airports by winter season 1997–2008. The increase in the volumes was due to the increase of traffic, a change in the instructions for treatment and changes in the types of machinery. The last two winters have been mild and as a result the amounts of de-icing liquids used have decreased despite the increased traffic.*

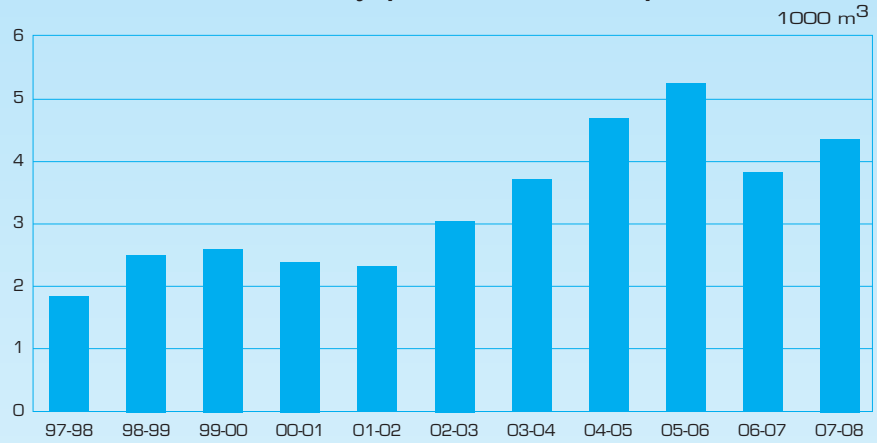
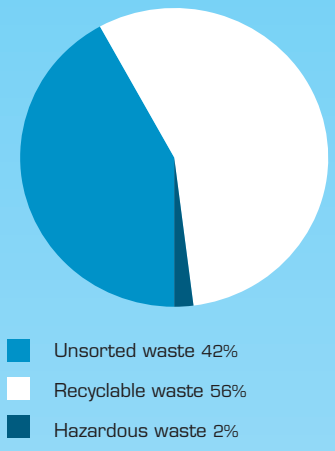


Figure 4. *Distribution of waste accumulated at Finavia's airports during 2008 and 2007 between unsorted waste, recyclable waste and hazardous waste.*

YEAR 2008



YEAR 2007

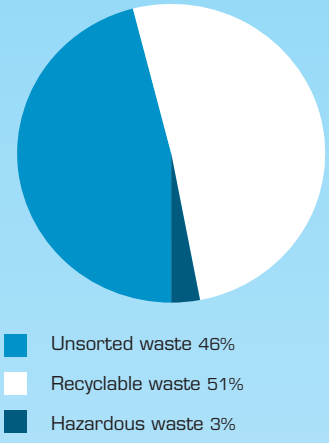


Table 5. *Total unsorted, recyclable and hazardous refuse handled by Finavia's waste management system in 2008 as well as polluted soil delivered for treatment (not included in the total amount).*

The table also shows the change from the previous year. Recyclable waste includes separately recovered biological, metal, glass, plastic, paper, cardboard, lubricating oil, used tyres, electrical equipment and separated construction refuse. The amount of polluted soil delivered for treatment has been increased by the removal of sludge from the glycol water equalising tank at Helsinki-Vantaa Airport.

Year 2008	Tonnes	Change
Unsorted waste	1 766	-1%
Recyclable waste	2 364	18%
Hazardous waste	71	-48%
Total	**4 201**	**7%**
Polluted soil	129	120%

FINAVIA

- maintains Finland's airport network and air navigation system
- is a commercial enterprise funded by its customers, with autonomous power to decide its own activities, finances and investments
- provides its clients – airline passengers, airlines, military aviation and the business community – with safe airport and air navigation services to a competitive international standard
- develops the operating environment for aviation in line with commercial principles
- is a good neighbour

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FINAVIA ENVIRONMENTAL ORGANISATION

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AIRPORTS
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  - Environmental Specialist
  - Technical Staff (acting)
- Other airports
  - Environmental Officer (acting)