



# Environmental Report 1999

SAS Danmark A/S • SAS Norge ASA • SAS Sverige AB

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SAS's environmental report is also available on the Internet ([www.scandinavian.net](http://www.scandinavian.net)). Additional information is found in both the environmental section of SAS's web site and other information units directed to various target groups (see text at right).

The next environmental report is expected to be published in March 2001.

Information about the scope of the environmental report and the accounting principles used is found on pp. 38–39. Airline industry-related terms, expressions and abbreviations are defined on p. 40.

The environmental report was presented to the SAS Group's Board of Directors in March 2000.

## Where to find SAS's environmental information

We provide environmental information via three main channels, each with a distinct focus, so that our readers can choose the kind of information best suited to their interests:

- **Environmental report** This report is primarily directed to readers with an interest in the environment, such as corporate customers, financial analysts, political decision-makers with responsibility for transportation and environmental issues, environmental journalists, others who monitor environmental work in our industry and key persons in SAS.
- **Financial annual report** The environmental information in SAS's annual report is aimed primarily at readers with an interest in the company's financial results and position, business situation and opportunities, such as stockholders and financial analysts.
- **Internet** The environmental section of SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)) contains the full environmental report as well as supplementary data and in-depth environmental information for those with a special interest.

## How to find your way in this environmental report

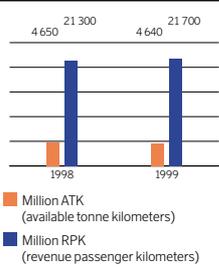
The information in this environmental report is structured so that you can concentrate on certain sections, depending on your key area of interest, and then proceed when supplementary or more detailed information is needed:

- **General summary** "Operations in brief" on pp. 2–3, SAS's environmental indexes on pp. 17–18 and the summary of key environmental and financial statistics on pp. 14–15 are designed to provide a very general overview.
- **Detailed report** For an in-depth look at SAS's environmental strategies and activities we recommend the President's statement, the Board of Directors' environmental report and the first section of the environmental data on pp. 5–18.
- **Environment and economy** Those seeking information about the financial consequences of SAS's environmental impact and efforts to exploit the commercial potential of environmental aspects will find a helpful overview on pp. 14–15. Other information can be found in the Board of Directors' environmental report on pp. 7–12 and the section on development of the regulatory framework for the airline industry on pp. 30–31.
- **Environmental work in practice** A general description of SAS's environmental management system is found on pp. 32–36.
- **Facts and figures** Those interested in a closer look at the quantitative data on which SAS's environmental indexes are based will find information on pp. 19–27.
- **Terms, expressions and abbreviations** Definitions of airline industry terminology and expressions are listed on p. 40. (Environmental definitions are found in the environmental section of SAS's web site).

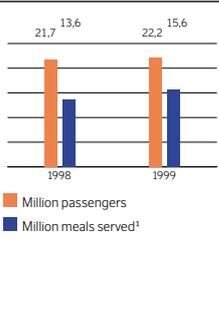
## The ins and outs of our operations

For reasons of space, this environmental balance sheet includes only items with a significant environmental impact. For a more detailed account, see the environmental balance sheets for the respective areas of operation on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

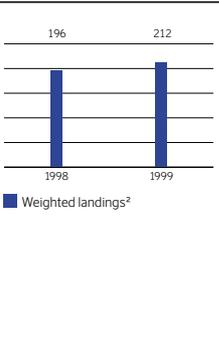
### Flight

In	Operations & production	Out	See page
<ul style="list-style-type: none"> <li>Fuel</li> <li>Engine oil</li> </ul>	  <p>Million ATK (available tonne kilometers) Million RPK (revenue passenger kilometers)</p>	<ul style="list-style-type: none"> <li>Carbon dioxide (CO<sub>2</sub>)</li> <li>Nitrogen oxides (NO<sub>x</sub>)</li> <li>Hydrocarbons (HC)/VOC</li> <li>Water vapor</li> <li>Oil aerosols</li> <li>Jettisoned fuel</li> <li>Noise</li> </ul>	19, 21 19, 21 – <sup>3</sup> – <sup>3</sup> – <sup>3</sup> 9 19, 20

### Cabin

In	Operations & production	Out	See page
<ul style="list-style-type: none"> <li>Food</li> <li>Beverages</li> <li>Packaging</li> <li>Disposables</li> <li>Non-disposable articles</li> <li>Goods for sale</li> <li>Newspapers/magazines</li> <li>Chlorinated water</li> <li>Germicides</li> </ul>	  <p>Million passengers Million meals served<sup>1</sup></p>	<ul style="list-style-type: none"> <li>Organic waste (food residue)</li> <li>Packaging (glass, plastic, cardboard, aluminum, paper)</li> <li>Unopened beverages</li> <li>Sold/unsold articles</li> <li>Waste (plastic, paper, cotton, aluminum)</li> <li>Waste water:</li> <li>Drainage and transport</li> <li>Treatment</li> <li>Lavatory waste:</li> <li>Drainage and transport</li> <li>Treatment</li> </ul>	23 <sup>3</sup> – <sup>3</sup> – – 23 <sup>3</sup> 23 <sup>3</sup> – – <sup>3</sup> – <sup>3</sup>

### Ground

In	Operations & production	Out	See page
<ul style="list-style-type: none"> <li>Glycol</li> <li>Urea/acetate</li> <li>Water</li> <li>Halons</li> <li>Freon</li> <li>Maintenance materials (components, chemicals, etc.)</li> <li>Energy (oil, electricity, diesel, gasoline, biofuel, gas)</li> <li>Office supplies</li> </ul>	  <p>Weighted landings<sup>2</sup></p>	<ul style="list-style-type: none"> <li>Glycol</li> <li>Urea acetate</li> <li>Waste</li> <li>Hazardous waste</li> <li>Waste water:</li> <li>Drainage and transport</li> <li>Treatment</li> <li>Halons</li> <li>Freon</li> <li>Sulfur dioxide (SO<sub>2</sub>)</li> <li>Carbon dioxide (CO<sub>2</sub>)</li> <li>Nitrogen oxides (NO<sub>x</sub>)</li> <li>Hydrocarbons (HC)/VOC</li> <li>Soot/particles</li> <li>Noise</li> </ul>	26 – 25 <sup>3</sup> 25 <sup>3</sup> 25 – – <sup>3</sup> – <sup>3</sup> – <sup>3</sup> – <sup>3</sup> – <sup>3</sup> – – – <sup>3</sup>

• SAS's responsibility.

◦ Airport operator's responsibility.

<sup>1</sup> Refers to flights within and from Scandinavia.

<sup>2</sup> Taking into account the various aircraft types' resource consumption at the gate.

<sup>3</sup> Data provided on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

# Operations in brief

## SAS Consortium Production and traffic<sup>1</sup>

1999	Available tonne kilometers (ATK)			RTK [Mtonkm]	ASK x10 <sup>6</sup>	RTK x10 <sup>6</sup>	Change [%]	Cabin factor <sup>2</sup>	
	[Mtonkm]	Change [%]	Share [%]					1999	(1998)
Intercontinental	1,655	4.5	36	1,283	10,171	7,708	2.3	75.8	(77.9)
Europe + Intra-Scandinavian	1,826	1.3	39	966	15,861	9,417	0.6	59.4	(59.9)
Denmark	80	-8.3	2	45	623	387	-9.8	62.1	(61.9)
Norway	381	20.2	8	197	3,699	1,960	2.4	53.0	(62.6)
Sweden	355	8.6	8	215	3,502	2,235	9.9	63.8	(63.6)
<b>Total<sup>3</sup></b>	<b>4,636</b>	<b>-0.2</b>	<b>100</b>	<b>2,938</b>	<b>33,910</b>	<b>21,707</b>	<b>2.1</b>	<b>64.0</b>	<b>(65.7)</b>

<sup>1</sup> Incl. SAS Commuter, excl. affiliated companies and other subsidiaries (see also p. 38).

<sup>2</sup> The figure includes paying passengers over a certain payment limit ("revenue passengers"). The total number of passengers is approximately 8% higher. Including all passengers, SAS's cabin factor for 1999 was 70.1%.

<sup>3</sup> Aside from the above traffic areas, the total figures also includes the ATK and RTK that SAS Cargo purchases from Lufthansa Cargo.

## Key financial statistics<sup>1</sup>

	1996	1997	1998	1999
Operating revenue [MSEK]	33,480	36,769	38,211	<b>38,630</b>
Income before taxes [MSEK]	1,746	2,067	2,588	<b>1,307</b>
Investments [MSEK]	4,132	2,938	5,554	<b>5,720</b>
Cash Flow Return On Investments (CFROI) [%] <sup>2</sup>	26.4	24.7	22.4	<b>14.3</b>
Return on capital employed (ROCE, market-based) [%] <sup>2</sup>	18.4	24.1	17.8	<b>9.0</b>
Number of employees	21,348	22,524	23,992	<b>25,754</b>
Environmentally related taxes and charges in relation to turnover [%]	1.8	1.4	2.3	<b>2.8</b>
Income in relation to CO <sub>2</sub> emissions [SEK/tonne]	460	510	620	<b>314</b>

<sup>1</sup> Incl. SAS Commuter, excl. affiliated companies and other subsidiaries (see also p. 38).

<sup>2</sup> See SAS's financial annual report for definitions.

## Key environmental statistics

	1996	1997	1998	1999	
Environmental index [1996=100] <sup>1</sup>	100	97	96	<b>89</b>	
Proportion of Chapter III aircraft in traffic [%]	81	88	89	<b>100<sup>3</sup></b>	
Fuel efficiency [kg/100 RPK]	6.1	6.2	6.2	<b>6.1</b>	
Cabin factor [%]	63.6	64.9	65.7	<b>64.0</b>	
Emissions of carbon dioxide (CO <sub>2</sub> )	[1,000 tonnes]	3,815	4,021	4,167	<b>4,164</b>
	[g/RTK]	1,540	1,517	1,510	<b>1,470<sup>4</sup></b>
Emissions of nitrogen oxides (NO <sub>x</sub> )	[1,000 tonnes]	14.4	14.8	15.3	<b>14.5</b>
	[g/RTK]	5.8	5.6	5.6	<b>5.1<sup>4</sup></b>
Packaging in cabin operations [g/passenger]		59	58	53	<b>55</b>
Newspapers/magazines in cabin operations [g/passenger]		239	210	225	<b>222</b>
Collected [tonnes]		1,038	1,573	1,351	<b>1,512</b>
Proportion collected [%]		22	36	28	<b>31</b>
Energy efficiency of installations managed [kWh/m <sup>2</sup> ]		452	409	354	<b>349</b>
Environmentally related taxes and charges [MSEK, approx.]		600	532	872	<b>1,096</b>

<sup>1</sup> The lower the index, the better the ecoefficiency. As of 1999, SAS's environmental indexes are calculated according to new grounds. See p. 16 for a description of these. The environmental indexes for previous years have been recalculated according to the new grounds to enable comparability.

<sup>2</sup> The figure includes paying passengers over a certain payment limit ("revenue passengers"). The total number of passengers is approximately 8% higher. Including all passengers, SAS's cabin factor for 1999 was 70.1%.

<sup>3</sup> This figure is 94% for the entire SAS-owned fleet. However, none of the 11 remaining Chapter II aircraft are used in SAS Airlines' own traffic.

<sup>4</sup> Not including the RTK purchased from Lufthansa Cargo.

# Concise report, details on the web

## Areas of operation

The SAS Group conducts passenger transportation, cargo services (SAS Cargo), sales of goods on board aircraft and at airports (SAS Trading), computer operations (SAS Data) and hotel operations SAS International Hotels under the Radisson SAS Hotels & Resorts name. SAS offers Scandinavian flight connections at the domestic, intra-Scandinavian, European and intercontinental levels.

## Scope of operations<sup>1</sup>

During 1999 SAS carried 22,225,000 (21,699,000) paying passengers to 105 destinations in Scandinavia and the rest of the world, and SAS Cargo transported 284,675 (279,924) tonnes of cargo and mail. The SAS Group's aggregate turnover in 1999 was 41,508 (40,946) MSEK.

## Key installations

SAS's main airports are in Copenhagen, Oslo and Stockholm, where the company has extensive operations. Most maintenance of SAS's aircraft fleet is carried out in the company's workshops in Oslo. In addition, SAS has its own operations at 36 line stations in Scandinavia and another 43 in the rest of the world. The head office is located in Frösundavik, Stockholm. Altogether, SAS has close to 29,000 employees, of whom approx. 9,300 work in Denmark, 7,800 in Norway and 9,500 in Sweden.

<sup>1</sup> Including SAS Commuter, excl. affiliated companies and other subsidiaries (see also p. 38).

Welcome to SAS's fifth environmental report.

In 1999 we have continued recent years' target group adaptation of our total environmental information. One goal is to make this report more concise and therefore more compact and easier to read.



Over the course of two years we have reduced the number of pages by 40%.

We have been able to achieve this without eliminating any relevant data thanks to the development of SAS's web site, where you can find data that supplements and elaborates the information in this report.

Another goal is to sort the total environmental information into separate units so that readers with different interest profiles can choose the level of detail that meets their needs.

## Better description of our ecoefficiency

In two respects, we have continued to develop the environmental information we report.

The main change is improved environmental indexes, one for total SAS and one for each area of operation, so that they better describe changes in our ecoefficiency.

The improved indexes have also affected which environmental data we present as charts and tables here, since our rule is to present all data used in the environmental indexes in this report, and all others only on the web site.

Another innovation is that previous years' overview of environmental projects has been omitted. At this point, our environmental work has grown to a scope where environmental projects are underway in all parts of the company, and it is increasingly impracticable to describe them all. Furthermore, the boundaries between environmental and other projects are gradually fading – environmental aspects are an integral part of all decisions made by SAS. Instead, we present more detailed descriptions of three projects with a distinct environmental profile.

But in one respect, nothing has changed – we welcome comments from our readers. Please use the reply form in the environmental section of our web site ([www.scandiavian.net](http://www.scandiavian.net)), or contact us by fax, mail or telephone.

Niels Eirik Nertun  
Environmental Director

## SAS's environmental work in words

### Development on two fronts

SAS's environmental work has two points of focus.

On one hand we strive to continuously reduce our environmental impact – from technological specifications for aircraft orders worth billions of dollars to the environmental awareness of each individual employee in his or her day-to-day work.

On the other hand, we collaborate with various players in the airline industry to develop environmental ground rules that are equal and unbiased for all. We naturally take responsibility for our own environmental impact according to the “polluter pays principle”. But no one likes to clean up after others, for which reason we promote the principle that both competing airlines and other transport types should do their share.



# New basis for effective measures

## SAS's President comments on the environmental year

In 1999 two reports were published, both on the airline industry's initiative, that made a valuable contribution to an impartial debate on aviation, the environment and the regulatory framework of the industry. Last spring the UN's Intergovernmental Panel on Climate Change (IPCC) presented its study on aviation and the global atmosphere, its first report to consider a particular industrial subsector. The study was requested by the ICAO in 1996. Shortly thereafter, in autumn 1999 the Danish consulting firm COWI, which was commissioned by SAS to study the conditions and environmental impact of the various transport types in Scandinavia, presented its final report.

The IPCC predicts that global passenger air travel will grow by about 5% per year to the year 2015, whereas consumption of aviation fuel, and subsequently also CO<sub>2</sub> emissions, are expected to increase by 3% per year. The difference is largely attributable to improved technology. This forecast is supported by SAS. In light of the IPCC forecast, the aviation industry must work even harder to develop technology and routines for reduced fuel consumption and environmental impact.

Our vision is for all four transport types – road, rail, sea and air – to bear their own costs for both infrastructure and the environment according to the “polluter pays principle”. The four transport types should be allowed to compete in a market where all are subject to the same rules and regulations, which the COWI report shows is not the case today.

In another report, the Norwegian work group for investigation of competitive terms in the aviation industry, with members from several departments, public authorities and airlines, concluded that passenger and CO<sub>2</sub> charges seriously impair the competitiveness of Norwegian airlines. I agree with this assessment, although I interpret the significance of the competitive distortion differently. In any case, the report confirms that the aviation industry is burdened with a range of taxes and charges that do not promote optimal utilization of resources.

To read more about these reports, see pp. 30–31.

### **New aircraft provide major environmental gains**

1999 was SAS's first full year with a number of the new Boeing 737s in traffic. SAS is first to use this aircraft with DAC engines that dramatically reduce NO<sub>x</sub> emissions.

The additional investment of 250 MSEK in DAC engines for the 55 aircraft on order is consistent with SAS's policy to use the best available environmental technology. Even if we don't believe that the Swedish

emission-based charge system offers the greatest environmental gains, the new aircraft will lower SAS's costs in Sweden. In 1999 the cost benefits were limited to one or two million SEK, since few of the aircraft were in traffic yet. Due to rising oil prices in 1999, the new engines' enhanced fuel-efficiency, which also reduces CO<sub>2</sub> emissions, has an even greater influence on SAS's results.

SAS has entered an intensive period with investments of over 30,000 MSEK. Over the next few years, we plan to procure a total of 110 aircraft and phase out around 90. Since flight operations account for the absolute bulk of SAS's total environmental impact, these investments are crucial for our environmental performance.

One important step was taken at the end of 1999 when SAS's Board of Directors decided to procure ten new longhaul aircraft, an investment of around 10,000 MSEK. The choice fell to Airbus A330 and A340, which will replace our considerably smaller Boeing 767s as of 2001. The new aircraft's higher load factor reduces emissions per seat by 10–20% compared with the current Boeing 767.

During negotiations with engine and aircraft manufacturers, SAS has ensured that the best available environmental technology will be available on delivery. Thanks to lower NO<sub>x</sub> emissions, the aircraft can also be placed a better charge category than the 767 in the Swedish charge system.

In February 2000, SAS's Board of Directors decided to also procure twelve Airbus A321s for use on heavily trafficked European routes starting in autumn 2001. This phase-in will also reduce relative environmental impact.

### **When the customers are allowed to choose**

Customer demand is increasingly shifting from business to economy class. In order to improve profitability and optimize utilization of our fleet we are modifying the existing aircraft, to raise the passenger load factor by 8–9%. This will reduce the relative environmental impact and, despite lower ticket prices, also increase total revenue. In other words, it is both environmentally and financially advantageous.

Our environmental program is closely tied to the SAS 2000+ program that we launched last year. The program is based on a detailed study of our passengers' needs and preferences. In the future, environmental issues will have greater influence on customer agreements and passenger choices.

In recent years a commitment to environment has become an integral part of the Scandinavian tradition and a role model for many other countries. It is therefore logical



that environmental work is a central element of the Scandinavian profile that distinguishes SAS 2000+.

This applies not least to cabin operations. In early 1999 SAS won the 1998 Mercury Award for overall service. Our environmental program in cabin operations was one of six components in our winning concept.

#### **The regulatory framework shapes the future**

One aim of the European Union is to integrate Europe and improve the general quality of life, an undertaking in which efficient transportation is a vital component. But whereas all available data indicate continued growth in demand for air travel, there have been remarkably few EU initiatives to develop this sector and an unproportionately large share of the transportation budget has instead been allocated to road and rail traffic.

More efficient air traffic management offers potential for major environmental benefits. In 1999, more than every third departure was delayed by over 15 minutes. The EU's air traffic management system ATM is outdated and modernization must be given top priority. The European Commission is aware of this, and equates this matter with the EMU in terms of importance. This very unsatisfactory situation threatens both safety and the environment and costs the airlines and passengers substantial sums every year. Delays and inefficiency lead to around 10% extra fuel consumption and emissions per year.

At the same time, the new commission's transportation directorate seems more preoccupied with tightening the requirements on the aircraft that are already in traffic and meet the existing criteria. This will generate higher costs, ultimately to be paid by the passengers, while the environmental benefits are uncertain. We welcome new rules designed to yield environmental improvements, but argue that they should be implemented globally, not only in Europe, and should apply not retroactively but in a forward perspective. Otherwise, European airlines risk disadvantages in competition with airlines from other parts of the world.

The same applies to noise measures. The ICAO is drawing up new certification rules. It is imperative to effect binding international agreements for a new classification system and set a viable transitional period for use of the noisiest Chapter III aircraft. SAS works via the IATA and AEA and has an ongoing dialogue with the Scandinavian civil aviation authorities in order to air our views in the ICAO's work.

#### **Environmental work on many fronts**

SAS is continuing to develop its environmental management systems. The Technical Division is leading the way with its target for all of its operations to have fully integrated environmental management systems by 2003, on par with the criteria for ISO 14001 certification. SAS Cargo has started work to qualify for certification to ISO 9000 worldwide and ISO 14001 in Scandinavia. This goal stands firm. However, the business situation in 1999 delayed this process, and not until the end of 1999 were the first ISO 9001 certifications obtained at the American line stations.

Star Alliance's principal task is to increase customer benefit, but it also acts as a forum for collaboration in other key areas like the environment. In May, the member airlines agreed on a joint Environmental Commitment Statement describing our environmental objectives. The full document is available on our web site ([www.scandinavian.net](http://www.scandinavian.net)).

In October 1999 SAS Airlines withdrew the last Chapter II aircraft from its own traffic, as planned, and now only uses Chapter III aircraft. A few Chapter II aircraft are on lease to an affiliated company which will phase them out by autumn 2001. With the Board decision to procure new longhaul aircraft, we were able to cross off another important TQM goal for 1999.

Our supplementary quantitative goals for 2001 have already been met in ground operations, and I believe that those in cabin operations are within reach. With the help of SAS's dedicated employees, we will continue our efforts to lead environmental work in the airline industry.

Jan Stenberg  
*President and Chief Executive Officer*

# Board of Directors' environmental report

## New aircraft offset traffic growth

### Flight operations

Through their emissions, SAS's flight operations affect the global climate and the ozone layer. Aircraft noise is local in nature. Flight operations account for the bulk of SAS Airline's environmental impact.

In 1999, SAS's production measured in ATK was fairly stable, but with a decrease of 0.2% to 4,636 (4,647) MATK, while RTK rose by 6.5% to 2,938 (2,760) MRTK, including the cargo capacity SAS Cargo leases from Lufthansa Cargo. At the same time, fuel consumption was largely unchanged.

This meant that SAS's relative fuel consumption, and therefore also CO<sub>2</sub> emissions relative to production in RTK, fell in 1999. This trend is mainly due to dramatic efficiency improvements in cargo operations and the phase-in of new aircraft.

### Fuel consumption and emissions

SAS's total fuel consumption decreased by 0.1% to 1,673,265 (1,674,692) m<sup>3</sup>. In relation to the number of

tonnes transported and distance flown, this means that fuel efficiency improved to 46.7 (47.9) kg/100 RTK, corresponding to 59.1 (60.7) l/100 RTK. (As of May 1999, leasing of the cargo carrier Boeing 747 was concluded and cargo capacity is instead leased from Lufthansa through a so-called *wet lease*. The aircraft used, McDonnell Douglas MD-11, is one of the market's most eco-compliant cargo carriers. This new arrangement will further improve SAS's fuel-efficiency. Due to the changes in cargo operations, the figures for 1999 are not directly comparable to earlier years. The error resulting from a standard comparison is nonetheless within acceptable limits.) SAS Cargo increased its production measured in tonnes by 2.0%.

In relation to the number of passengers transported and distance flown, fuel efficiency was largely unchanged at 6.1 (6.2) kg/100 RPK, corresponding to 7.7 (7.8) l/100 RPK, even though the cabin factor fell from 65.7 to 64.0%.

SAS's fuel consumption and distance flown in 1999 correspond to emissions of 4,164 (4,167) ktonnes of CO<sub>2</sub>, 14.52 (15.32) ktonnes of NO<sub>x</sub> and 1.84 (2.14)



1999 was the first full year with a number of SAS's new Boeing 737s in operation, with DAC engines that dramatically reduce NO<sub>x</sub> emissions.

tonnes of hydrocarbons. The reduction in nitrogen oxide and hydrocarbon emissions is due to the fact that the phase-in of new aircraft that started in autumn 1998 is now visible in the statistics for 1999.

#### **Development of the aircraft fleet**

In October 1999, SAS Airlines withdrew the last Chapter II aircraft from its own traffic, and thereafter uses only Chapter III aircraft. SAS Airlines has thus fulfilled the EU traffic requirements well ahead of the deadline on April 1, 2002.

At year-end, SAS's fleet contained 11 Chapter II aircraft (6%), of which six are leased to Air Botnia and five have been withdrawn from traffic while awaiting sale.

The total number of aircraft in the SAS fleet at year-end 1999 amounted to 190, owned, leased and on hire. SAS itself operated 176 aircraft. 22 aircraft were phased in during the year, all Boeing 737s. 17 aircraft were phased out.

The average age of the aircraft operated by SAS in 1999 was 10 years and 3 months, while the average age of the aircraft owned by SAS was 8 years. The procurement of new aircraft has lowered the average age in the operated fleet by 9% compared with 1998, and it is expected to fall further in 2000.

24 of the aircraft in the fleet are hushkitted, 20 DC-9-41s and four DC-9-21. All of these aircraft are operated under sale and leaseback agreements.

Delivery of the first 8 Boeing 737-600s in autumn 1998 was followed by an additional 22 aircraft in 1999, 21 737-600s and one 737-700. The order, for a total of 55 aircraft, will be completed in 2001 and represents an investment of around 12,000 MSEK. Aside from those on order, SAS has an option for a further 40 aircraft. The new aircraft will primarily replace Fokker F-28s and McDonnell Douglas DC-9s. This model consumes 20% less fuel and subsequently also produces 20% lower emissions of CO<sub>2</sub> than the DC-9s being replaced. Furthermore, its NO<sub>x</sub> emissions are 40% lower. The engines in SAS's Boeing 737s give the aircraft a favorable position at airports with nitrogen oxide-based environmental charges, in Sweden and Zurich.

Delivery of SAS Commuter's ordered turboprop aircraft Bombardier de Havilland Q400 was delayed and started in January 2000. The order is for a total of 22 aircraft, an investment of 3,500 MSEK. Deliveries will be completed in the second half of 2000. SAS also has an option for a further 15 aircraft and so-called purchase rights for another 16. "Purchase right" means that the commercial terms have been established but not the delivery date. The Q400 is the fastest propeller aircraft after the Saab 2000, and therefore offers high productivity. Its fuel consumption is 0.036 kg/ASK, or 0.045 l/ASK, and the noise contour (85 db(A) on takeoff) is 0.5 km<sup>2</sup>, which are low values compared with similar aircraft.

In late 1999, the Board of SAS made a decision in principle to purchase 10 new longhaul aircraft, an investment of around 10,000 MSEK. The existing Boeing 767s will be replaced with Airbus A330s and A340s. SAS also has

an option for an additional seven aircraft. The new aircraft consume less fuel per seat than the Boeing 767 and have a substantially higher load factor that reduces relative emissions by 10–20%. This purchase is consistent with SAS's policy of utilizing the best available environmental technology within commercially viable limits. The Airbus Consortium meets SAS criteria for eco-compliant manufacturing. SAS has a dialogue with possible engine manufacturers to ensure access to the best available environmental technology on delivery.

In February 2000, the Board of Directors decided to also procure twelve Airbus A321s for a value of 4,500 MSEK for use on heavily trafficked European routes starting in autumn 2001. These aircraft are considered environmentally advanced in their class and their phase-in will further reduce relative environmental impact.

In order to increase financial and operational flexibility, SAS sold 38 aircraft through leaseback during the year. These include 10 MD-81s, 15 MD-82s, 5 MD-87s and 8 Boeing 737-600s. Through this transaction, SAS partially insures against risks in the form of lower resale values and operating restrictions on the MD-80 fleet.

#### **Cabin operations**

In 1999 SAS continued to launch environmental projects together with the more than 100 suppliers/subcontractors that have signed SAS's environmental agreement. Since 1996 this collaboration has generated some 600 projects covering the entire spectrum from food and beverages to equipment, packaging, water consumption, energy and transports. The SAS 2000+ renewal program also incorporates a number of environmental components.

SAS's trials of gate-side meal service (Gatebuffet and SAS Express) were discontinued at the airports in Copenhagen, Stockholm and Oslo for infrastructural reasons. This increased the number of meals served on board.

SAS's goal in cabin operations is to reduce energy and water consumption by 20% and waste volumes by 30% per meal served by 2001 compared with 1997. Energy and water consumption in cabin operations rose in absolute terms as a result of increased production. On the other hand, consumption per meal served decreased, reflecting more effective environmental work. SAS believes that its long-term goals for 2001 are within reach.

#### **Ground operations**

The volume of pre-sorted paper and cardboard decreased by 16.4% to 835 (998) tonnes. The total waste volume in ground operations fell by 26.7% to 3,281 (4,791) tonnes (not including hazardous waste). The decrease is explained by higher than normal waste volumes in 1998 in connection with the move to Gardermoen.

During 1999 the ongoing efficiency program reduced SAS's energy consumption in ground operations to 349 (354) kWh/m<sup>2</sup>, a decrease of 1.4%. The total reduction

since 1997 is thus 15%, which means that the 10% target has been met.

SAS's water consumption in ground operations during 1999 was 215,476 (238,871) m<sup>3</sup>, a decrease of 9.8% mainly attributable to correction of the problems with recirculation of cooling water at the electroplating workshop at Fornebu during 1998. Since 1995, consumption has decreased by close to 11%.

A treatment plant for process water went into operation at Arlanda Airport in the spring. Read more about this project on p. 27.

In September 1999, SAS Commuter decided to build a purification plant for waste water at the new hangar in Copenhagen. It will be a distillation facility, the most effective method for treating heavy metal-containing waste water. The plant is scheduled for completion in May 2000.

In 2000, all operators at Copenhagen airport must find a solution for heavy metals in water from aircraft washing. SAS has decided that washing water from hangars 4 and 5 will be collected and purified. The project started at the end of 1999 and is expected to be completed by next winter.

Trials at Arlanda to replace diesel in ground vehicles were discontinued for work environment reasons.

In 1999 a prototype was developed for a joint Scandinavian database for chemical products. This information will be accessible to all SAS employees via the intranet. It will facilitate updates and opportunities to replace environmentally harmful products. In a longer perspective, financial gains are expected through better control of purchasing, stock, etc.

### **Concessions, infringements, incidents and disputes**

In relation to the size of the SAS Group, the total number of infringements of environmental permits (and similar), incidents, disputes and complaints, as earlier, has been low and of minor environmental and financial significance.

### **Concessions, permits and reporting**

Flight operations as such are not regulated by concessions, but must comply with the concession terms for the various airport operators.

Environmental approval of aircraft is carried out in stages. Each aircraft model must be specifically approved by the FAA or JAA. Before being used in traffic in a Scandinavian country, each individual aircraft must then be registered by the respective civil aviation authority, including environmental approval. Despite this, local or national regulations, often environmentally-related, can restrict a certain aircraft model's right to take off and land.

Cabin operations are also free from concession requirements of their own, but collaborate with suppliers that are subject to permits and veterinary regulations.

Ground operations are expected to receive final concession conditions for operations at the technical base in Stockholm in early 2001. Observations from the trial period will be reported to the environmental magistrate

of the Stockholm district court by April 1, 2000.

With effect from July 1, 1999, all potentially polluting operations at Copenhagen airport must submit environmental-technical reports. The department for vehicle and tool maintenance was given a respite until early 2000.

SAS in Norway and Sweden have permits to use solvents containing halogens when necessary.

### **Infringements**

In 1999, SAS complied with all applicable concessions in its operations.

### **Incidents**

On two occasions in 1999, SAS aircraft jettisoned fuel for safety reasons, 26 tonnes in January and 17 tonnes in September, both times in the Copenhagen area.

During a storm in December, 20 m<sup>3</sup> of glycol leaked from a tank at Landvetter airport, and the extent of environmental damage is under investigation. The financial consequences for SAS can not yet be foreseen.

SAS is investigating a suspected overfilling of glycol at a Swedish line station in January 2000.

Ground contamination at SAS's administration building in Copenhagen is under investigation. The extent is not yet known. The source may be the severely contaminated neighboring property.

In 1999 Oslo Lufthavn, as the airport operator, was fined 2.1 MSEK for infringement of deicing regulations at Gardermoen. In connection with this, SAS was criticized by the National Pollution Authority (SFT) for glycol spillage in the refueling area. Corrective measures have been taken and stricter routines have been implemented.

SAS has no knowledge of any other significant incidents.

### **Disputes**

Legal proceedings launched by the Danish Civil Aviation Authority in 1997 against SAS for suspected infringement of local regulations on the use of jet engines for braking are expected to begin during spring 2000.

Reports and complaints against SAS from local residents disturbed by noise, mainly from MD-80s, are under investigation at several airports.

In 1999, the Swedish government revoked the ban on landing Chapter II aircraft in Karlstad, at the request of the EU.

SAS's opponent has appealed to the Danish Supreme Court in a dispute over a land cleanup at Copenhagen airport, where SAS has built a new component workshop. The dispute between SAS and the previous owner concerns responsibility for the necessary decontamination measures. SAS's opponent was defeated in national court during the spring.

Apart from the above, no environmental disputes related to SAS's operations are underway.

### **Changes in environmental regulations**

See the sections on pp. 14–15 and 30–31. At present,

## What happened in 1999?

Priority areas	The year's progress	Economic consequences for SAS
Development of an aircraft fleet with lower environmental impact through replacement and modification of older aircraft.	The ongoing phase-in of the new Boeing 737s meant that the last Chapter II aircraft were removed from SAS Airlines' own traffic. A decision was made to purchase ten new longhaul aircraft from Airbus. A decision was made to modify the existing aircraft to seat more passengers, which will also reduce fuel consumption and emissions per passenger kilometer.	<ul style="list-style-type: none"> <li>Charges for use of Chapter II aircraft fell by approx. 10 MSEK.</li> <li>The new Boeing 737s now in traffic have been placed in a low NOx charge category in Sweden.</li> <li>Each percentage point of improved fuel-efficiency reduces fuel costs by around 25 MSEK.</li> </ul>
Lower consumption of resources, reduced emissions and waste volumes and improved waste management in cabin operations.	New environmental projects were initiated together with SAS's subcontractors. The total number of environmental projects since 1996 is now around 600. The SAS 2000+ program that was started in 1998 entailed a general changeover from disposable to non-disposable articles.	<ul style="list-style-type: none"> <li>Collection of aluminum cans on Norwegian domestic flights reduced charges by around 7.7 MSEK.</li> <li>A 31% share of returned magazines/newspapers in lounges and on board aircraft on Swedish and Norwegian domestic routes resulted in a cost reduction of approx. 0.5 MSEK.</li> <li>The collaboration with suppliers/subcontractors led to reduced environmental impact and lower costs for SAS.</li> </ul>
Lower consumption of resources, reduced emissions and waste volumes and improved waste management in ground operations.	Further improvement in energy-efficiency and waste management.	<ul style="list-style-type: none"> <li>The 1.4% relative decrease in energy consumption during 1999 led to a cost reduction of around 1.5 MSEK.</li> </ul>
Involvement in the process for development of the environmental regulations for civil aviation.	SAS took part in developing the airline industry's regulatory framework through Star Alliance, and forums such as the IATA, ICAO, AEA and N-ALM. SAS was also represented in the Norwegian government's study on the airline industry's regulatory framework. SAS was involved in environmental classification of new aircraft models together with the Swedish Civil Aviation Authority in the joint work group EKOSTYR.	<ul style="list-style-type: none"> <li>For SAS, the total volume of environmental levies (taxes and charges) included in the regulatory framework for the airline industry during 2000–2001 is expected to amount to more than 1,000 MSEK per year.</li> </ul>
Enhancement of SAS's environmental image so that it corresponds to the actual environmental data.	SAS helped to spread knowledge about the IPCC's report on aviation and the global atmosphere and arranged conferences based on the COWI study on the regulatory framework for the airline industry. SAS Inflight won the coveted Mercury Award. SAS was commissioned to draft an environmental program for the IFCA. The new position of Environmental Communications Coordinator was introduced in the central marketing department. Environmental information to the customers was further integrated into channels such as Scanorama, EuroBonus and Business and Pleasure. Continued emphasis on environmental consideration as a vital component of SAS's new corporate identity.	<ul style="list-style-type: none"> <li>SAS's brand name is strengthened as our environmental image steadily improves from a weak starting point.</li> <li>A better environmental image creates greater scope for SAS to take action in issues related to development of the airline industry's regulatory framework (see above).</li> </ul>
Further adaptation of environmental information to market demand.	Continued development of environmental information on the Internet. Efforts to make internal information more effective. The formal environmental report was supplemented with a condensed summary that was distributed internally together with a cover letter from the President and to SAS's customers. A database was built to facilitate collection of environmental data and improve the opportunities for audits.	<ul style="list-style-type: none"> <li>Quality-assured environmental data is a prerequisite for involvement in discussions about the airline industry's regulatory framework (see above).</li> <li>An environmental policy and environmental report are required for most major customer agreements.</li> <li>SAS's environmental image (see above) is dependent on high quality market communication about environmental issues.</li> </ul>
Development of environmental management systems to meet the market's requirements.	Continued development of SAS's quality and environmental management systems, mainly in the Technical Division and SAS International Hotels. The business situation delayed this process for SAS centrally. SAS Cargo was also delayed.	<ul style="list-style-type: none"> <li>Well functioning quality and environmental management systems that are seamlessly integrated with day-to-day operations create scope for optimal utilization of resources and enhance SAS's environmental image (see above).</li> </ul>

SAS knows of no other changes in environmental regulations such as concessions, permits and dispensations with significance for SAS's operations.

#### **Insurance, preparedness, preventive measures**

Due to the nature of SAS's operations, the possibility of accidents with a negative impact on the environment can't be ruled out. SAS's insurance covers the company's liability for environmental damage in the event of accidents and sudden occurrences. For more information, see [www.scandinavian.net](http://www.scandinavian.net).

#### **Other environmental issues**

During the winter of 1998–1999, Oslo's new Gardermoen Airport had serious problems with deicing capacity, icy runways and inadequate snow clearance. The airport operator took measures during summer 1999, but had severe ice problems also during the winter of 1999–2000. SAS is conducting a constructive dialogue with the airport operator to find solutions.

In 1999 a land cleanup project was started in the area surrounding Oslo's old airport Fornebu. An oil separator was excavated for reuse and the site was decontaminated at a cost of around 0.1 MSEK. The site is now free from pollutants related to SAS's operations. Treatment of chemical residues, etc., from SAS's electroplating workshop is being prepared, and is expected to cost less than 1 MSEK.

#### **Environment and economy**

There is an ongoing trend towards rising environmental taxes, at the same time that environmental restrictions are being tightened. SAS is active in both national and international forums to establish a regulatory framework of predictable long-term and internationally competitively neutral conditions. SAS's fundamental attitude is that all transport types should bear their share of costs for infrastructure, environmental impact and other costs to society based on the "polluter pays principle", and that these costs should be charged to the right cost unit.

SAS's total environmental charges and taxes rose by 26% to 1,096 (872) MSEK, or from 2.3% to 2.8% in relation to turnover (see p. 15). The increase is explained by the Norwegian CO<sub>2</sub> charge and a substantial production increase in Norway.

On January 1, 1999, Norway was the first country to levy a combined charge on emissions of CO<sub>2</sub> and sulfur of 0.30 SEK plus VAT per liter of aviation fuel. The Norwegian parliament later changed the decision to apply only to domestic routes. After revoking the charge on international routes as of June 1, 1999, the Norwegian government raised passenger charges on both international and domestic traffic in order to compensate for the lost revenue.

In Norway, SAS and the two government authorities SFT (the National Pollution Authority) and TAD (the Customs and Tariffs Directorate) are currently discussing reduction

of SAS's 15% charge for aluminum cans. TAD demands that full charge be paid for the first 6 months of 1999.

On pp. 14–15 we provide an account of other increases and charges to be imposed in 2000, and on pp. 30–31 other ongoing efforts to change the airline industry's regulatory framework with conceivable economic consequences for SAS.

#### **TQM and environmental management**

SAS's environmental activities are a natural part of overall work on *Total Quality Management* (TQM). In 1999 these activities proceeded according to the plan that was established by the SAS Management Team in 1995 and has been regularly updated since then.

SAS is engaged in a pilot project to adapt the company's environmental management system to ISO 14001. The Technical Division is leading the way with its target for all of its operations to have fully integrated environmental management systems by 2003 which fulfill the requirements for ISO 14001. The business situation in 1999 delayed this process for SAS Cargo, where the goal is to qualify for certification to ISO 14001 in Scandinavia.

For a more detailed account of SAS's environmental management system see pp. 32–36 or visit [www.scandinavian.net](http://www.scandinavian.net).

#### **Ethics and social issues**

SAS has conducted a pilot study on ethics and values in the company. As earlier, SAS will treat ethical and social issues as integral parts of its overall work with goals and strategies.

#### **Internal information**

In 1999 SAS tested several methods for development of environmental information to the employees. Among other things, the formal environmental report was supplemented with a condensed version that was distributed internally together with a cover letter from the President.

As in earlier years, other internal information channels were the formal environmental report and articles in the staff magazine *Inside*. In order to make the information more easily accessible, SAS's total information is being broken down into several target group-specific units, for example via the intranet.

For an account of ongoing internal training activities, see p. 33 and SAS's web site [www.scandinavian.net](http://www.scandinavian.net).

#### **Profile/image**

In 1999, SAS's environmental image among the customers improved by more than three percentage points, according to SAS own regular surveys.

In 1999 SAS's central marketing department was reinforced with an environmental communications coordinator whose task is to integrate environmental aspects into all market communication when appropriate. In 1999 this communication was directed to contract customers,

individual travelers (such as EuroBonus customers) and travel agents, among others.

A condensed version of the environmental report was distributed on board the aircraft during the summer of 1999.

In 1999 SAS was presented with the 1998 Mercury Award, the most prestigious distinction in the airline catering industry. The environmental program in cabin operations was one of the components in SAS's concept, which was selected by the IFCA in competition with 250 airlines and catering companies. The three criteria for the award are innovation, quality and feasibility.

SAS's environmental director has participated in the debate about the environment and the airline industry's role and conditions, and has held lectures on aviation and the environment at universities and colleges.

SAS's choice of engines with improved environmental performance in its new Boeing 737s has been highlighted in advertisements and SAS's environmental work has received press coverage in both Scandinavia and the rest of Europe. A British-produced video about SAS, in which environmental themes were an integral part, has been aired in 40 countries. SAS also guested the Norwegian and Swedish television programs with the environment as the main topic.

Like several of its predecessors, SAS's environmental report for 1998 received the year's top points in the accounting firm Deloitte & Touche's ranking of Swedish companies' environmental reports. The report was also given honorable mention in "Environmental Report of the Year" in Norway and Sweden.

For a description of SAS's sponsorship commitments, see SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

### **Collaborations**

During the year SAS collaborated within the Star Alliance, for example in the Environment Advisory Group, and with other partner companies. SAS was also active in various international forums and engaged in dialogues with authorities, suppliers and other stakeholders.

One significant step from an environmental standpoint was the signing of Star Alliance's joint Environmental Commitment Statement in May.

In 1999 SAS was commissioned by the IFCA to draft the organization's first environmental program.

SAS has initiated a collaboration with DSB in Denmark and SJ in Sweden to reduce the environmental impact of airline passengers' transports to and from the airports in Copenhagen and Stockholm. SAS in Denmark also collaborates with DSB and HT for better transport arrangements between SAS's many different addresses at Copenhagen airport.

For more information about SAS's collaborations, see SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

### **Health and safety**

Development of a safe and healthy workplace is carried out within the framework of SAS's business strategies and national regulations in the countries where SAS operates. This work is governed by a special work environment strategy and is integrated with the line manager's responsibilities. For a more detailed account of SAS's health, work environment and safety activities, see the financial annual report.

### **Subsidiaries and affiliated companies**

Flight Academy and SMART are computer and office operations with no appreciable environmental impact in relation to SAS's other operations. Certain operations are conducted in premises managed by SAS, for which reason a share of resource consumption and waste are included in SAS's other data in this environmental report.

Air Botnia is a wholly owned subsidiary that conducts scheduled traffic in Scandinavia and the Baltic region from a base in Finland. The company's fleet consists of 11 aircraft (6 jet and 5 turboprop), of which 6 are Chapter II and will be phased out starting in autumn 2001. In 1999 fuel consumption amounted to 17,400 m<sup>3</sup>, and CO<sub>2</sub> emissions to 43,300 tonnes. Total NO<sub>x</sub> emissions amounted to around 160 tonnes. Air Botnia had no environmental incidents that require reporting or otherwise during 1999. Likewise, the company has no knowledge of any environmental damage to land or other property which could give rise to costs, or any environmental disputes or complaints that could affect Air Botnia. (For further information, see Air Botnia's own annual report.)

SAS International Hotels (SIH) conducts hotel operations under the name Radisson SAS Hotels & Resorts. The business concept is to manage and license hotels, not to own and manage properties. In December 1999 SIH operated 125 hotels on a management or franchise basis, of which 29 leased and 4 owned. The significant impact factors are energy and water consumption and waste. SIH is implementing a 24-point environmental program in all hotels. The program contains specific demands on energy conservation, reduced water consumption, pre-sorting of packages and other waste, eco-adapted purchasing policies, etc. SIH reports yearly on the program's progress. SIH has also developed and is implementing a triple bottom line concept for reporting, that includes ethical principles for relationships with suppliers and business partners.

SIH complies with national laws, rules and regulations, and had no significant environmental incidents that required reporting. SIH has no knowledge of any environmental damage to land or property that could have financial consequences for the company.

No significant environmental incidents occurred during 1999. The company has no knowledge of any environmental disputes or complaints related to the company. (For more information, see SIH's own annual report.)



## SAS's environmental work in numbers

### Lower relative environmental impact

Despite growth in production during 1999, SAS's fuel consumption and CO<sub>2</sub> emissions were limited to the 1998 level. NO<sub>x</sub> emissions were even reduced to below the 1998 level thanks to the accelerating phase-in of new aircraft.

# Environment and economy

## How will future development affect SAS's results?

There is an ongoing trend in the airline industry towards a rising share of environmental charges and taxes, and for SAS these increased by 26% to 1,096 (872) MSEK in 1999, corresponding to 2.8 (2.3)% of turnover.

Emissions trading is undergoing rapid international development. This process is being closely monitored by SAS, which believes that parts of a system of this type could be a useful tool for the industry. Depending on how the system is structured, it could be in line with SAS's "polluter pays" policy.

### New EU report

The trend in Europe outside Scandinavia is difficult to assess. In the European Commission's report "Air Transport and the Environment" that was presented at the end of November 1999, it is expressly stated that the Commission will be forced to take the initiative due to the lack of international advances in environmental work.

The report discusses measures such as:

- New rules within Chapter III in order to phase out the noisiest aircraft. The ICAO works continuously to revise the certification criteria.
- Implementation of stricter regional rules, particularly at noise-sensitive airports.
- Tighter controls on NOx emissions, mainly the ICAO's responsibility.
- Introduction of a fuel tax. The report doesn't dismiss this idea, but points out that it is complex.
- Further investigation and development of emissions trading.
- Implementation of a new classification system, independent of the ICAO, as a basis for airport charges, operating restrictions and allocation of slots.

The ECAC has drafted a new model for differentiated noise categories to be used in a future charge system. Rather than the current division into Chapters II and III, this model is based more on the individual noise characteristics of each aircraft and the various airports' sensitivity to noise. The Swedish Civil Aviation Authority plans to introduce a new charge system based on the ECAC model during 2000.

The European Commission has considered permitting CO<sub>2</sub> charges on domestic routes and on international routes between two countries with a bilateral agreement, though this requires consensus between the member states.

In 1999 the EU stopped all new registration of hushkitted aircraft and prohibits traffic after April 1, 2002. For

SAS Airlines this will have no immediate consequences since all hushkitted McDonnell Douglas DC-9s were sold through leaseback transactions in 1998 and will be phased out of the fleet by spring 2002. However, the future outlook is uncertain since the U.S. views this ordinance as a trade barrier and demands that it be revoked. For the time being, the positions appear to be locked.

As part of its negotiations with the U.S. the European Commission has put forward the proposal in the ECAC report, namely that Chapter III be divided into two several subgroups based on their noise characteristics. For SAS this could have far-reaching repercussions, since around half of the fleet consists of McDonnell Douglas MD-80s with narrow margins for meeting Chapter III criteria. Operating restrictions on these aircraft before the end of their economic lives would be costly for SAS. The average age in the MD-80 fleet is 10 years and 6 months and the book value is 2,723 MSEK.

In the short term, other environmental levies and regulations could also impair flexibility in utilization of SAS's aircraft fleet and increase costs in the traffic system, and there a risk for lower resale values in parts of the fleet. In December, SAS sold 30 of its 67 MD-80s through leaseback transactions as a means for increasing financial freedom of action and flexibility in utilization of the aircraft fleet, and as a precaution against future noise classifications.

### National charges

In Scandinavia, environmental charges and taxes in 2000 are expected to be somewhat higher than in 1999.

EFTA's supervisory agency ESA decided in December 1999 that Norway's differentiated passenger charge is contrary to EU law. It is not permissible to impose different charges on international and domestic traffic. The ESA ordered Norway to introduce uniform passenger charges on domestic and international traffic within three months. However, the decision does not clarify whether certain domestic routes will be exempted from charges, as is the case today. It is difficult to assess the economic consequences of this decision for SAS.

Sweden's 3% discount on the noise charge for Chapter III aircraft still applies but will be revoked by 2002, increasing SAS's costs by 10 MSEK per year.

Emissions classification of the new Boeing 737 and Bombardier de Havilland Q400, both of which SAS feels have been unfairly categorized due to deficient methods, was under negotiation between SAS and the Swedish Civil Aviation Authority within the EKOSTYR work group.

At the beginning of 2000, these aircraft were placed in a charge category that SAS considers more justified by its environmental performance. With the current number of Boeing 737s with DAC engines in Swedish traffic, the annual reduction in the NOx-based charge system will be around 6 MSEK. When the 56 now ordered aircraft have been phased in, the reduction will be around 11 MSEK per year.

The binding environmental goals being formulated by the AEA may be incorporated into negotiatory agreements with the authorities. Through ongoing replace-

ment of the aircraft fleet, SAS will have already met the goals in question.

Based on SAS's knowledge at publication of this *Environmental Report*, no other changes in environmental regulations other than those mentioned here or on pp. 30–31 among environmental regulations such as concessions, dispensations or permits are expected to have any material effect on the company's operations and results.

#### Environmental effects on income statement and balance sheet in 1999

Key items

##### Items affecting the income statement

[MSEK]	1997	1998	1999
<i>Environmentally related earnings and cost reductions<sup>1</sup></i>			
Decrease in landing charges due to phase-out of Chapter II aircraft	25	11	10
Decrease in costs due to reduction in waste volumes, improved pre-sorting and increased recycling <sup>2</sup>	15	8	7.7
Discount on landing charge (Sweden)	–	–	41.5
<i>Environmentally related costs</i>			
Extra costs in the form of noise charges for use of remaining Chapter II aircraft	50	39	33
Management of waste and hazardous waste, operation of purification plants, oil separators, etc. – environmentally-related share	17	19	23.5
Environmental reporting, profiling and sponsorship	3	3	4.5
<i>Environmentally related charges and taxes<sup>1</sup></i>			
Passenger charge (Denmark)	–	215	208
Passenger charge (Norway)	475	601 <sup>3</sup>	768 <sup>4</sup>
Environmental tax on emissions (Sweden) <sup>5</sup>	–	49	50.5
CO <sub>2</sub> charge (Norway)	–	–	48 <sup>6</sup>
Noise charges <sup>10</sup>	6.5	7	14 <sup>7</sup>
Environmental energy charge (Denmark)	–	–	4
Charge on aluminum cans (Norway)	–	–	1.4
Extra charge for night flights (Norway)	–	–	1.7

##### Items affecting the balance sheet

[MSEK]	1997	1998	1999
<i>Environmentally related investments and costs<sup>1</sup></i>			
Boeing 737 <sup>8</sup>	–	40	65
Investments and costs in construction and ground operations – environmentally related share	25 <sup>9</sup>	72 <sup>9</sup>	26.9
<i>Environmentally related contingent liabilities<sup>1</sup></i>			
	–	–	–

<sup>1</sup> For definition, see p. 39.

<sup>2</sup> The full agreed charge reduction was made in 1995–98 despite the fact that SAS failed to meet the Norwegian authorities' required 90% return rate for aluminum. In 1999 this requirement was lowered to 85% and a 15% environmental charge is paid.

<sup>3</sup> In 1998 the passenger charge was replaced with a differentiated seat charge.

<sup>4</sup> In 1999 the seat charge was raised in order to compensate the government for revenue lost when the CO<sub>2</sub> charge was removed from international traffic. With effect from July 1, the fiscally environmentally related seat charge was changed to a fiscal environmentally related passenger charge.

<sup>5</sup> Since the Swedish environmental tax on domestic air traffic was found to conflict with EU Community Law, SAS filed a legal claim in 1996 for recompensation of the tax paid in 1995 (102 MSEK) and 1996 (116 MSEK). This matter was essentially resolved on June 10, 1999, in the EU court, which established that the Swedish legislation contravened EU Community Law. However, this case has not yet been tried in a Swedish county administrative court and no recompensation has taken place.

<sup>6</sup> As of January 1, 1999, Norway is the only country to impose a CO<sub>2</sub> charge on airline traffic. The charge originally applied to both domestic and international flights, but in May 1999 the Norwegian parliament decided that it would apply only to domestic traffic.

<sup>7</sup> The figures for 1999 are not directly comparable to those for preceding years.

<sup>8</sup> In 1999, 22 of SAS's ordered Boeing 737s were delivered. The environmentally related extra investment for their DAC engines is approx. MSEK 5 per aircraft.

<sup>9</sup> 1997 refers only to Oslo's new Gardermoen Airport and environmentally related investments in ground operations. 1998 includes half of the environmentally related investments in SAS's own construction projects at Gardermoen, since these were divided between two years, and other environmental investments in ground operations.

# More accurate environmental indexes

## How we measure our ecoefficiency

In 1999 we extensively revised the grounds for calculation of our environmental indexes so that they better describe changes in our ecoefficiency. The new indexes use only data also available for earlier years and those indexes have been recalculated according to the new grounds in order to allow retroactive comparability.

Obviously, it is not possible to achieve 100% correlation between an environmental index and actual ecoefficiency. Any formula for calculating environmental impact and ecoefficiency must rely partly on approximations and value judgements, which are somewhat uncertain by definition. Are global air emissions more or less serious than local noise impact? Who should be the judge of that – people who live close to an airport today or the victims of a flood caused by the greenhouse effect in 20 years? How much of the environmental impact from flight operations consists of emissions – 87%, 92%, 98%? What's the best way to measure the production volume? And so on.

In our view, the decisive factor is that these value judgements are as objective as possible, are based on scientific grounds when such exist and are reported with full transparency so that others can see how they have been made. The weightings used for various environmental factors correspond to our assessment of their relative impact. Those who believe another assessment to be more accurate are free to use it in their own calculations. The general trend is more important than the exact figures.

### Differentiates between impact and efficiency

As in earlier years, we have chosen to report environmental indexes for total SAS and for each of our three areas of operation (Flight, Cabin and Ground).

These indexes are calculated in two stages. First we compute how our absolute environmental impact has changed compared with the base year. Then we calculate our relative environmental impact – our ecoefficiency – by placing the first figure against a factor that describes the production volume in the respective area of operation. By doing so, we partly offset the influence of the production volume and instead focus on the actual effects of the environmental work. For example, lower emissions per flight should be visible even though emissions have increased due to growth in operations.

The year's trend is shown on the next two pages. For a more detailed description of the new environmental indexes with precise definitions of, and formulas for, the various input factors, see the environmental section of SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

## Total SAS

The index for total SAS is a weighted average of the indexes for the three areas of operation.

	Weighting
• Flight operations	80%
• Cabin operations	10%
• Ground operations	10%

The bulk of SAS's environmental impact arises in flight operations, which have therefore been given the highest weighting.

## SAS's areas of operation

Ecoefficiency in the areas of operation is calculated in two stages:

$$\textcircled{1} \quad \text{Environmental impact} = a \times \frac{\text{Variable 1}_{\text{current year}}}{\text{Variable 1}_{\text{base year}}} \dots + n \times \frac{\text{Variable 2}_{\text{current year}}}{\text{Variable 2}_{\text{base year}}}$$

where  $a \dots n$  are the assigned weightings (see below).

$$\textcircled{2} \quad \text{Ecoefficiency} = \frac{\text{Environmental impact}}{\text{Production}_{\text{current year}}} \times \frac{\text{Production}_{\text{base year}}}{\text{Production}_{\text{current year}}}$$

A lower value = lower environmental impact per unit produced.

Flight operations	Weighting	Production factor
• Carbon dioxide	50%	Revenue tonne km
• Nitrogen oxides	40%	(RTK)
• Noise <sup>1</sup>	10%	

The high weightings for carbon dioxide and nitrogen oxides are based on the scientific findings summarized in the IPCC's report on aviation and the global climate.

<sup>1</sup> Weighted noise contour – see calculation formula and graph on p. 19.

Cabin operations	Weighting	Production factor
• Unsorted waste	50%	Number of meals produced
• Energy consumption	30%	
• Water consumption	20%	

The weighting for unsorted waste is motivated by the fact that part of this, waste on board, affects the overall load weight of a flight, and therefore also fuel consumption. The weighting for energy consumption is based on an average electricity mix in Scandinavia, with a high proportion of hydropower relative to the rest of Europe. The weighting for water consumption is also based on conditions in Scandinavia, where the water supply is comparatively good.

Ground operations	Weighting	Production factor
• Energy consumption	40%	Weighted landings <sup>2</sup>
• Fuel for ground vehicles	20%	
• Glycol consumption	20%	
• Unsorted waste	10%	
• Hazardous waste	5%	
• Water consumption	5%	

Energy consumption has been given the highest weighting, since SAS is a major consumer of electricity. Consumption of ground vehicle fuel and glycol also have relatively high weightings since they give rise to direct emissions into the environment.

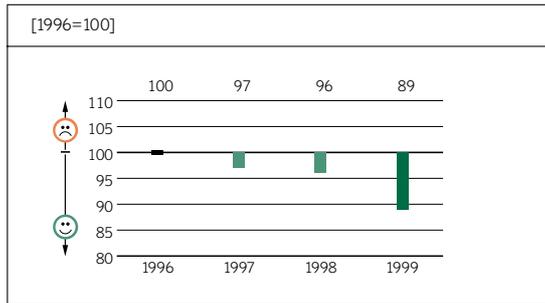
<sup>2</sup> Taking into account resource consumption for the various aircraft types at the gate.

# Environmental data

The year's key statistics

## Environmental index

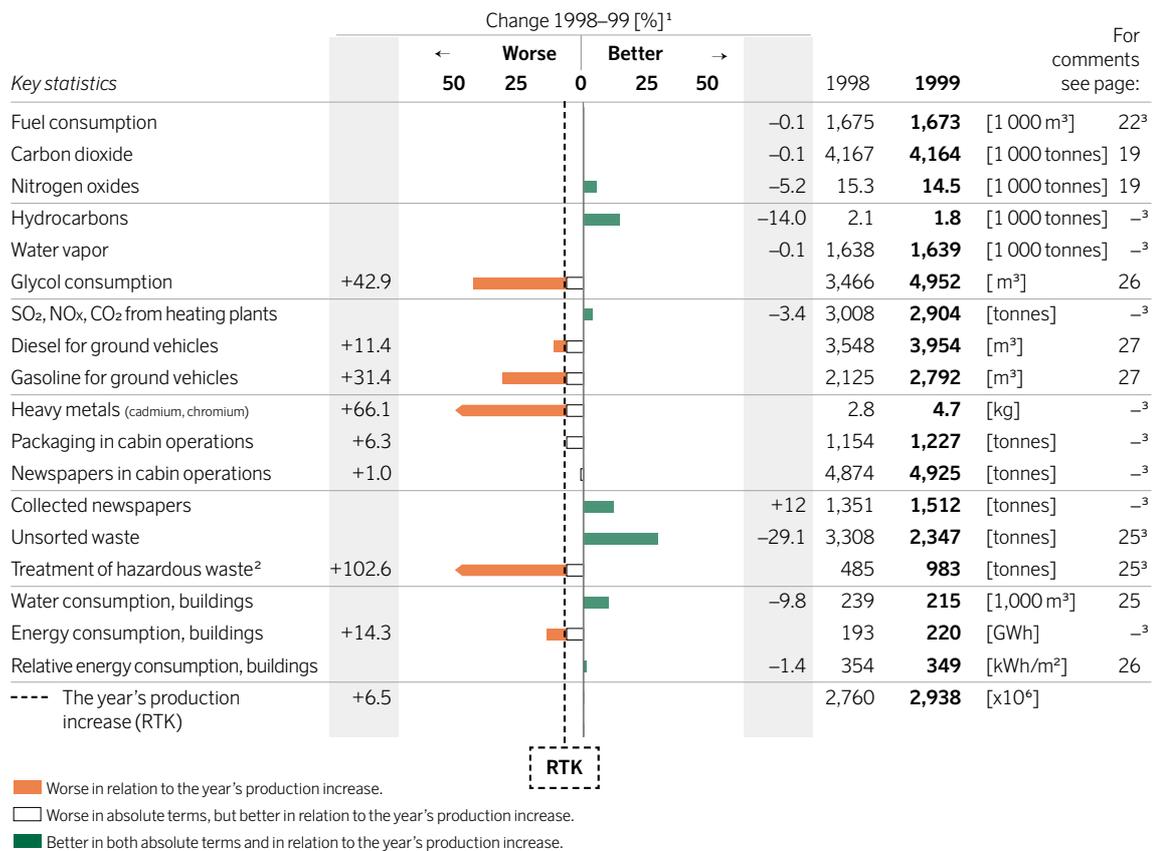
### Total SAS



For weighting of the input factors and calculation formula, see p. 16.

**SAS's development:** SAS's revised ecoefficiency index uses 1996 as the base year. The total index essentially reflects the environmental index for flight operations since they have the highest weighting, 80%. The marked improvement in 1999 is partly attributable to higher efficiency in cargo operations and partly to a higher share of eco-compliant aircraft (30 Boeing 737s with DAC engines) and reduced NOx emissions. The total environmental index developed favourably despite a slight negative trend in the index for ground operations.

### Emissions and resource consumption

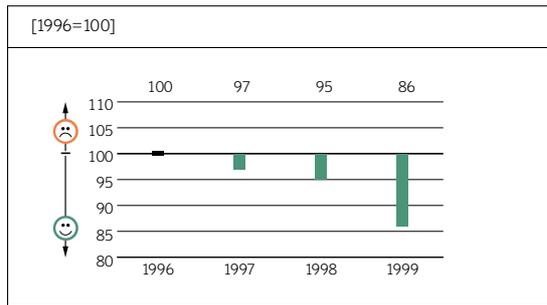


<sup>1</sup> The percentage change is not calculated on round figures.

<sup>2</sup> Aggregate of the many fractions included.

<sup>3</sup> Data presented on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

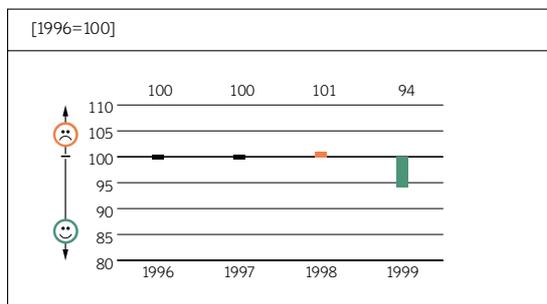
## Flight operations



For weighting of the input factors and calculation formula, see p. 16.

**SAS's development:** The base year used is 1996, with an index of 100. The relative improvements up to and including 1998 are the result of efficiency improvements, while the sharp improvement in 1999 is due partly to higher efficiency in cargo operations and partly to the phase-in of new eco-compliant aircraft. 30 Boeing 737s with DAC engines have led to a reduction in NOx emissions, which have a weighting of 40% in the index. Generally better efficiency and noise levels resulting from a newer aircraft fleet also played a part (see noise index on SAS's web site [www.scandinavian.net](http://www.scandinavian.net)).

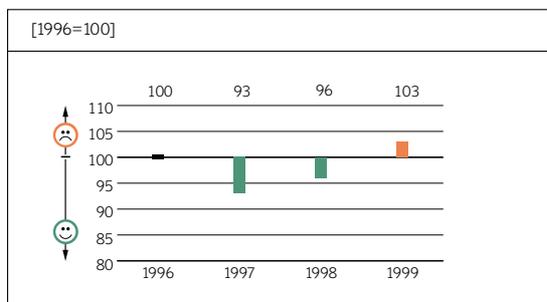
## Cabin operations



For weighting of the input factors and calculation formula, see p. 16.

**SAS's development:** The base year used is 1996, with an index of 100. Production was stable up to and including 1998 but rose sharply in 1999, partly due to the removal of gate buffet service in Copenhagen, Oslo and Stockholm. But since energy and water consumption and waste volumes have not decreased proportionately, relative environmental impact has been reduced. This is attributable to continuous environmental work by SAS's catering supplier Gate Gourmet and environmental improvements in the SAS 2000+ concept.

## Ground operations



For weighting of the input factors and calculation formula, see p. 16.

**SAS's development:** The base year used is 1996, with an index of 100. The negative trend in 1999 is explained by:

- Higher energy consumption due to larger premises at Oslo's new Gardermoen airport (consumption per m<sup>2</sup> has decreased).
- Increased glycol consumption due to a season with weather conditions that required more deicing in both Norway and Sweden and harsh local weather conditions at the new airport.
- Destruction of a large volume of polluted water (a non-recurring phenomenon).

# Flight operations

Flight operations are where the absolute bulk of SAS's environmental impact arises. For example, flight operations alone account for more than 90% of SAS's total emissions into the air.

The significant environmental impact factors in flight operations are consumption of non-renewable fuel, emissions of carbon dioxide

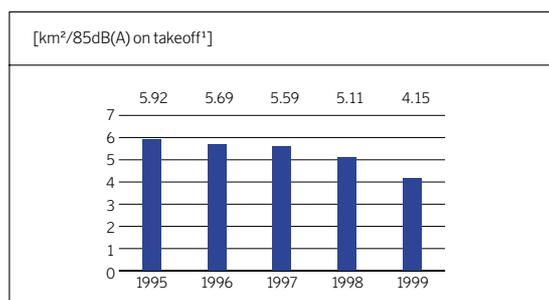
and nitrogen oxides and noise.

All quantitative data used in SAS's environmental index for flight operations is presented on the following pages. Supplementary data is found on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

## Noise, air emissions

More data at [www.scandinavian.net](http://www.scandinavian.net)

### Noise impact



**SAS's development:** SAS's aggregate noise impact is decreasing through the ongoing phase-in of new, quieter aircraft. At year-end 1999 SAS Airlines had withdrawn all aircraft with the old noise certification and used only low-noise Chapter III aircraft. • SAS predicts that noise impact will be more than halved by the year 2003 relative to 1995.

<sup>1</sup> Weighted noise contour taking into account the number of takeoffs per day using each aircraft type in SAS's traffic system.

### Development of SAS Airlines' aircraft fleet

Aircraft type	Fuel consumption [l/ASK]	Max. values under ICAO's certification requirements [g/kN]			Noise contour [km²/85 dB(A)] <sup>1</sup>	Number of aircraft in own service in 1999	Planned development			
		Nitrogen oxides	Hydro-carbons	Carbon monoxide			2000	2001	2002	2003
<i>Longhaul and cargo</i>										
Boeing 747-200BC	0.103 <sup>4</sup>	64.3	37.3	99.0	— <sup>2</sup>	— <sup>5</sup>				
Boeing 767-300ER	0.038	61.1	3.4	33.3	3.9	14				
<b>Total</b>						14	12	12	13	13
<i>Short and mediumhaul</i>										
Boeing 737-300-QC	0.045	40.3	4.7	72.9	— <sup>2</sup>	— <sup>6</sup>				
Boeing 737-600	0.045	32.4	14.6	117.5	1.2	29				
Boeing 737-700	0.042	32.4				1				
Douglas DC-9-21	0.068	57.6	39.5	139.8	— <sup>2</sup>	4				
Douglas DC-9-41	0.054	57.6	39.5	139.8	— <sup>2</sup>	20				
Douglas DC-9-81	0.047	73.4	15.2	41.1	4.7	8				
Douglas MD-81	0.046	73.4	15.2	41.1	4.7	19				
Douglas MD-82	0.047	73.4	15.2	41.1	5.2	28				
Douglas MD-83	0.045	73.4	15.2	41.1	7.9	2				
Douglas MD-87	0.047	73.4	15.2	41.1	4.1	18				
Douglas MD-90-30	0.039	56.2	0.4	30.6	1.7	8				
Fokker F-28	0.063	89.4	8.31	15.0	7.6	— <sup>7</sup>				
<b>Total</b>						137	137	137	138	139
<i>Commuter</i>										
de Havilland Q400-Dash 8	— <sup>3</sup>	— <sup>3</sup>	— <sup>3</sup>	— <sup>3</sup>	0.5	— <sup>8</sup>				
Fokker F-50	0.038	— <sup>3</sup>	— <sup>3</sup>	— <sup>3</sup>	0.8	20				
Saab 2000	0.049	— <sup>3</sup>	— <sup>3</sup>	— <sup>3</sup>	0.4	5				
<b>Total</b>						25	31	32	33	37
<b>Total fleet</b>						176	180	181	184	189

<sup>1</sup> Manufacturer's specification. Relates to takeoff.

<sup>2</sup> Data from manufacturer not available.

<sup>3</sup> Not subject to certification.

<sup>4</sup> Refers to ATK.

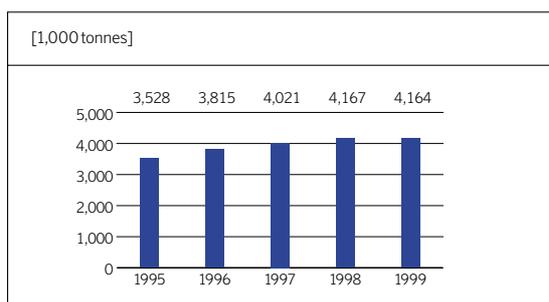
<sup>5</sup> Leasing of Boeing 747 cargo was concluded during the year.

<sup>6</sup> Leasing of two Boeing 737-300-QC concluded.

<sup>7</sup> All Fokker F-28s had been phased out of SAS Airlines utilized fleet at the end of 1999. Six aircraft were leased to Air Botnia, five were offered for sale.

<sup>8</sup> Delayed delivery.

## Carbon dioxide (CO<sub>2</sub>)



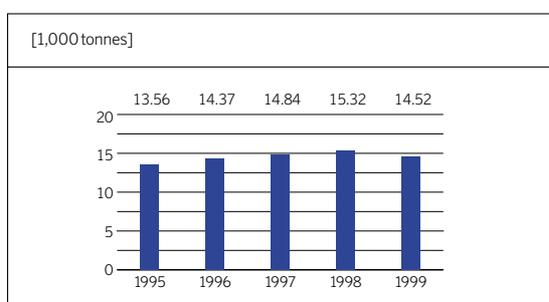
	1995	1996	1997	1998	1999
g/RPK	183	192	194	196	<b>192</b>
g/RTK	1,559	1,540	1,517	1,510	<b>1,470<sup>1</sup></b>

<sup>1</sup> Not including RTK purchased from Lufthansa Cargo.

**Background:** The airline industry's carbon dioxide emissions are estimated based on fuel consumption (3.15 kg carbon dioxide per kg of fuel burnt). Carbon dioxide emissions are subject to national targets based on the guidelines which are being revised following the climate conference in Kyoto in 1997 and Buenos Aires in 1998.

**SAS's development:** SAS works continuously to reduce relative fuel consumption, for both environmental and financial reasons. Fuel is a significant cost item and CO<sub>2</sub> emissions are directly proportionate to fuel consumption. In 1999 they were largely unchanged, at the same time that production increased both per RPK and RTK. The subsequent decrease in CO<sub>2</sub> emissions relative to production is explained by increasing efficiency and a rising share of new aircraft. • See below for a comparison between SAS and other airlines).

## Nitrogen oxides (NO<sub>x</sub>)



	1995	1996	1997	1998	1999
g/RPK	0.71	0.73	0.72	0.72	<b>0.67</b>
g/RTK	6.0	5.8	5.6	5.6	<b>5.1<sup>1</sup></b>

<sup>1</sup> Not including RTK purchased from Lufthansa Cargo.

**Background:** The aircraft engines' nitrogen oxide emissions are restricted through the ICAO's certification requirements, which are expected to be tightened during 2000, and are calculated based on distance flown. **SAS's development:** SAS's nitrogen oxide emissions are calculated based on the distance flown with a coefficient of 0.0545 kg/km. This factor is specific to SAS based on the composition of the aircraft fleet and patterns of operation. • The NO<sub>x</sub> factor for 1999 is 8.4% lower than in 1998, due to renewal of the aircraft fleet and the new engines for the Boeing 737s, with double annual combustors that reduce emissions by 40% compared with the older aircraft. • The phase-in of new aircraft is now having a visible impact on emissions statistics. Emissions of NO<sub>x</sub> have decreased despite an increase in the distance flown of more than 3.3% to GDC 266 (258) Mkm. • See below for a comparison between SAS and other airlines.

## Fuel consumption and emissions in relation to production

Comparison with other airlines

[g]	British Airways	Lufthansa <sup>1</sup>	KLM	Swissair	Finnair	SAS
<b>Fuel consumption</b>						
Per ATK	248	- <sup>2</sup>	226	227	- <sup>2</sup>	<b>294<sup>3</sup></b>
Per RPK	49	53	- <sup>2</sup>	- <sup>2</sup>	43	<b>61</b>
Per RTK	335	- <sup>2</sup>	298	320	382	<b>467<sup>3</sup></b>
<b>Carbon dioxide</b>						
Per ATK	708	- <sup>2</sup>	713	721	- <sup>2</sup>	<b>925<sup>3</sup></b>
Per RPK	- <sup>2</sup>	168	- <sup>2</sup>	- <sup>2</sup>	135	<b>192</b>
Per RTK	1,057	- <sup>2</sup>	1,057	1,015	1,200	<b>1,470<sup>3</sup></b>
<b>Nitrogen oxides</b>						
Per ATK	3.5	- <sup>2</sup>	2.6	3.53	- <sup>2</sup>	<b>3.,23<sup>3</sup></b>
Per RPK	0.69	0.78	- <sup>2</sup>	- <sup>2</sup>	0.57	<b>0.67</b>
Per RTK	4.72	- <sup>2</sup>	3.43	4.98	5.1	<b>5.13<sup>3</sup></b>

<sup>1</sup> Refers to all of Lufthansa AG 1998.

<sup>2</sup> Not reported.

<sup>3</sup> Excluding RTK/ATK purchased from Lufthansa Cargo.

**Background:** The comparative figures come from the airlines' most recent available environmental reports – for British Airways and KLM from 1998/99, for Finnair, Lufthansa and Swissair from 1998. Consequently, SAS can not vouch for the quality of this data with the same degree of certainty as for its own data. We also know that their data may be based on different calculation methods and documentation. • A large share of the differences between these airlines' key statistics are explained by the varying ages and compositions of the aircraft fleets and patterns of operation, as well as the configuration of the aircraft. A high proportion of longhaul flights provides particularly favorable figures.

### Compounded interest on today's environmental decisions

The decision of SAS's Board of Directors on December 15, 1999, to purchase ten longhaul aircraft was a milestone in the lengthy process that started with ideas and suggestions in one of the company's smallest but most important departments, Fleet Development at the head office in Stockholm.

Flight operations account for the absolute bulk of SAS's environmental impact, and since the aircraft have a technical life of 30 years or more, decisions affecting development of the fleet are highly significant. Fleet Development's Bengt Olov Näs, with responsibility for environmental planning of the aircraft fleet, plays a central role in this process.

"Evaluation of environmental performance has become increasingly important, and is today one of the key parameters when purchasing aircraft. When I started out 18 years ago, there wasn't much of a focus on global environmental issues, only noise."

As a newcomer, Bengt Olov's first task was to negotiate the purchase of six McDonnell Douglas MD-80s in the summer of 1984.

"At that time the MD-80 was considered pretty good from an environmental standpoint. It was the first Chapter III aircraft in its class, much better than the DC-9 and Boeing's older 737."

Today the MD-80 is one of the least favorable in Chapter III and is threatened by tighter restrictions if the regulatory framework is altered. This illustrates how important it is for an airline to be proactive and find aircraft with the potential to meet environmental criteria in a longer perspective.

In its negotiations with Airbus Industries, SAS initially only requested an offer for the A340 model, a heavy four-engine airliner suitable for longhaul flights, such as to the Far East. The engines are made by CFM, which also manufactured the engines for SAS's new Boeing 737s.

"We realized that a combination was most advantageous for SAS", explains Bengt Olov Näs. "The more lightweight dual-engine A330 is better suited to the North Atlantic."

During the negotiations SAS made rigorous demands on environmental performance to ensure that the best possible environmental technology would be available on delivery. The engine first offered by a subcontractor to the A330 was rejected by SAS because of its high NOx emissions.

"We explained to the engine manufacturer that we have to continuously improve environmental performance throughout the fleet. Every change we make has to be in the right direction. And they understood that."



*Bengt Olov Näs has special responsibility for monitoring environmental aspects when SAS purchases new aircraft.*

The continued dialogue with Airbus Industries and this engine manufacturer ensured that the best available environmental technology will be available on delivery 2001.

The normal procedure is for SAS to contact the manufacturer when the offer contains items that need to be improved. Negotiations then begin and a new offer is drawn up.

"My guess is that we normally see three or four versions of the offer", says Bengt Olov Näs. "For the engines I think we've seen five versions in this negotiation; some of the improvements we requested have referred to the environmental specifications."

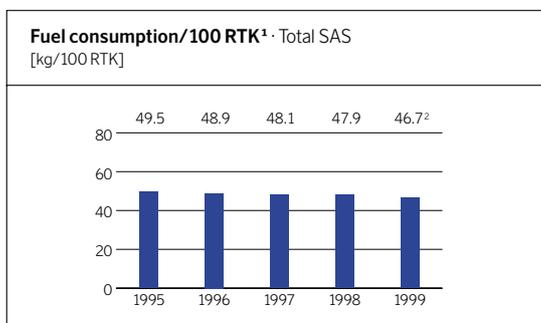
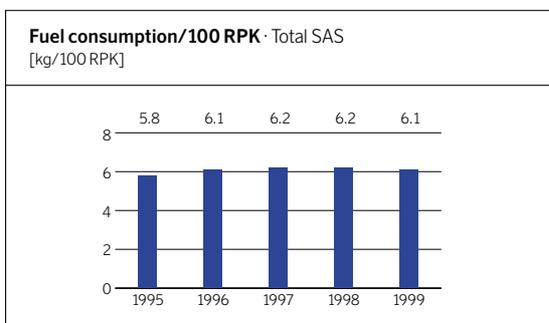
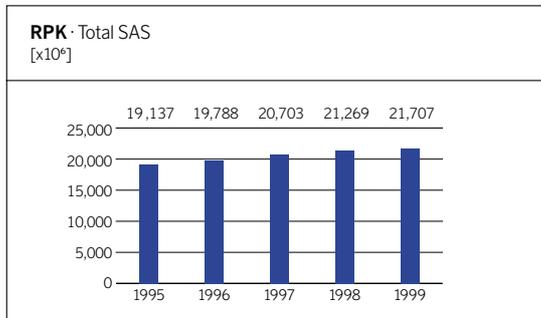
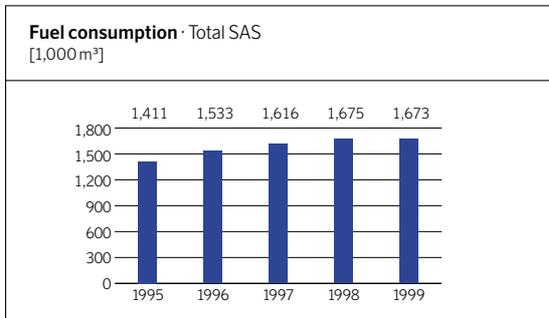
By ensuring the best possible environmental technology, SAS minimizes the risk for future emissions-related restrictions. This is a key motive, according Bengt Olov Näs.

"If things go the way they have for noise, that airports are restricting the number of takeoffs and landings due to emissions, this will have enormous consequences. The Civil Aviation Authority has announced that we are nearing the concession limit at Arlanda, and ceilings for various emissions are under discussion in both Zurich and California."

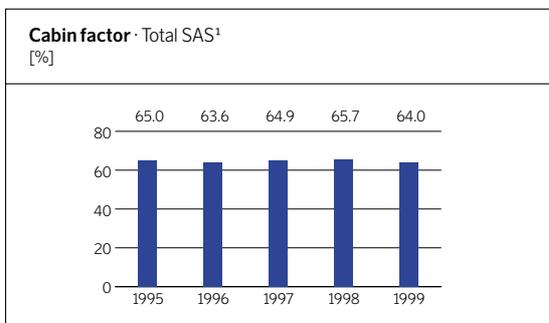
Since no one can predict these types of changes in the regulatory framework, the most effective insurance is to utilize the best available environmental technology in every replacement of the aircraft fleet.

Fuel efficiency

**SAS's development:** Despite an increase in production during 1999, fuel consumption decreased by 0.1%. This indicates a significant improvement in fuel-efficiency. The phase-in of new aircraft in SAS's fleet has also been influential. (See p. 20 for a comparison between SAS and other airlines.)



<sup>1</sup> SAS' total RTK for 1999 was 2,938×10<sup>6</sup> tonnekm.  
<sup>2</sup> SAS Cargo's leasing from Lufthansa Cargo not included.



<sup>1</sup> The figure includes paying passengers over a certain limit ("revenue passengers"). The total number of passengers is approximately 9% higher. Including all passengers, SAS's cabin factor for 1999 was 70.1%.

# Cabin operations

Although cabin operations are generally less significant for SAS's total environmental impact than flight operations, this is the aspect our customers and cabin staff have the most tangible contact with.

The significant environmental impact factors in cabin operations consist of waste in the form of paper, aluminum, glass, plastic and organic waste. Furthermore, the weight of the items served and sold

on board leads to increased fuel consumption and therefore also emissions of carbon dioxide, hydrocarbons and nitrogen oxides.

All quantitative data used in SAS's environmental index for cabin operations is presented on the following pages. Supplementary data is found on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

## Water emissions

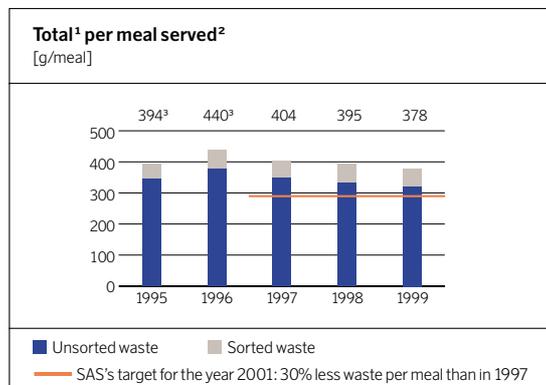
### Air emissions

More data at [www.scandinavian.net](http://www.scandinavian.net) 

## Waste

More data at [www.scandinavian.net](http://www.scandinavian.net) 

### Catering<sup>1</sup>



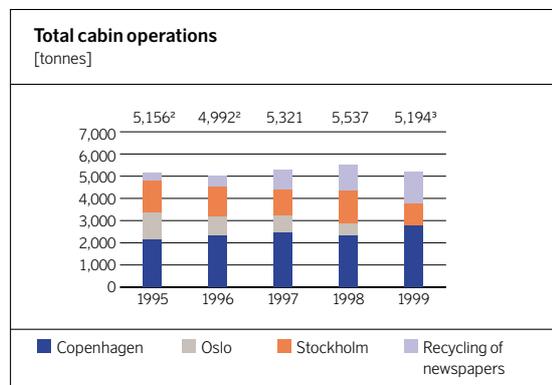
<sup>1</sup> Excluding newspapers and magazines.

<sup>2</sup> The meals SAS's receives from its suppliers in Copenhagen, Oslo and Stockholm.

<sup>3</sup> New grounds for calculation were used as of 1997, which means that the figures for the different years are not directly comparable.

**SAS's development:** Total waste volumes have increased by 12% while production of meals has risen by 15%. Relative environmental impact has thus decreased, due to increased ecoefficiency in SAS's catering supplier Gate Gourmet and environmental improvements in the SAS 2000+ concept.

### Aircraft cleaning<sup>1</sup>



<sup>1</sup> Refers to waste collected by SAS or SAS's subcontractor when cleaning the aircraft.

<sup>2</sup> As of 1997, the statistics include data from the Scandinavian line stations. The figures are therefore not directly comparable with earlier years.

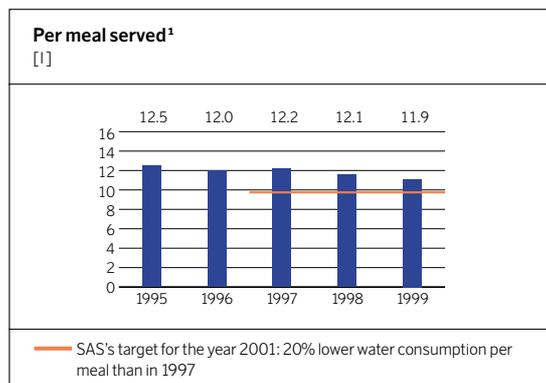
<sup>3</sup> Due to the new system for waste management in Oslo, it is no longer possible to quantify cabin waste separately.

**SAS's development:** The decrease from 1998 is mainly attributable to the fact that Oslo is not included in the data for 1999. In the new waste concept at Gardermoen, cabin and terminal waste is collected at the same time, so it is no longer possible to quantify cabin waste separately. The waste is then pre-sorted by the airport's waste management contractor.

## Consumption of raw materials

More data at [www.scandinavian.net](http://www.scandinavian.net) 

### Water



**SAS's development:** Aggregate water consumption rose by 13% at the same time that production increased by 15%. • Water consumption per meal thus decreased compared with 1998. SAS's goal to achieve a 20% reduction from the 1997 level by 2001 nonetheless stands firm. Attainment of this goal will probably be accelerated by Lufthansa Catering's new facilities at all three main airports before taking over catering operations in August 2000.

<sup>1</sup> The meals SAS receives from its suppliers in Copenhagen, Oslo and Stockholm; as of 1997 also including Gothenburg and Malmö.

**Over one hundred partners multiply environmental savings**

What does Gate Gourmet in Zurich have in common with Lous-savaara Take-Away Pizza and Beijing Air Catering?

All three are suppliers to SAS. And what's more, by December 15 every year all three report to SAS on their environmental activities during the year.

In the first two weeks of December some 400 reports pour in to the Products & Services department at the head office in Frösundavik, where the information is fed into a computer. At the same time, the foundation has been laid for a web site that may eventually make this huge influx of letter superfluous. The goal is to enable all suppliers to report electronically, but also to visit the web site for concrete tips on how others have shouldered this task.

Even manufacturers who have never been suppliers to SAS would then be able to go to their own product category, such as beverages, to see both what is required and how other suppliers have tackled their challenges.

A lot has happened since the mid-1990s when Anders Westerholm and Kjell Brolin from Products & Services first hatched this idea. Every supplier that wanted to do business with SAS would bind itself to take concrete measures towards improved environmental work, reduced consumption of electricity and water, reduced waste volumes, etc. And every year by December 15, the year's activities would be reported.

"Many signed the agreement and then immediately forgot what it said", says Kjell Brolin. "But we remind them at the end of October every year!"

In 1996 these activities got underway. The requirements were incorporated into all new agreements and all old agreements were supplemented with an additional paragraph that the suppliers must sign in order to keep SAS as a customer.

The year before, there were only two (2) supplier environmental projects registered, but this number had grown to 50 in 1996, 300 in 1997 and so on. The number for 1999 is around 600 completed or ongoing environmental projects.



*Kjell Brolin helps to environmentally adapt thousands of articles used in cabin service to passengers on board.*

It would be misleading to say that this initiative was well received by all. One respected wine merchant refused to sell goods to SAS on these conditions, but then recanted. Later that year, in 1997, the company won SAS's environmental award for suppliers.

In 1997, a hotel in Tallinn explained that there were more urgent problems to solve before attending to the environment. Today this hotel has installed tripled-glazed windows in order to conserve energy.

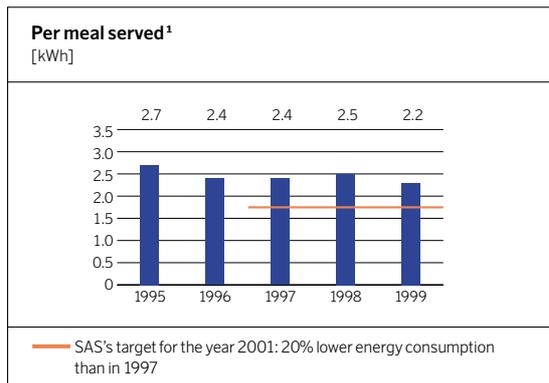
Beijing Air Catering's forward-looking environmental work was also honored with SAS's supplier award for 1997. Although the company suffered the full impact of the Asian crisis, it was nonetheless able to report to SAS on environmental activities such as offering the staff a less environmentally damaging alternative than driving private cars to work.

"Over time this also helps us to lower our costs", adds Kjell Brolin. "When a catering kitchen cuts its fixed costs by 10–20% it becomes more profitable, which can ultimately benefit us and the customers. There are no losers when it comes to environmental work."

**Energy consumption**

More data at [www.scandinavian.net](http://www.scandinavian.net)

**Electricity, gas and heating**



**SAS's development:** Total energy consumption rose by 5%. At the same time, production increased by more than 16%. Relative environmental impact per meal shows a distinct falling trend. This is explained by the environmental features of SAS 2000+ and SAS's catering supplier Gate Gourmet's ecoefficiency program. • Several ongoing environmental projects are aimed at further reducing energy consumption despite an increased need for washing of non-disposable articles. The goal for the year 2001, to reduce consumption per meal served by 20% compared with 1997, stands firm.

<sup>1</sup> The meals SAS receives from its suppliers in Copenhagen, Oslo and Stockholm; as of 1997 also including Gothenburg and Malmö.

# Ground operations

Like cabin operations, ground operations are less significant than flight operations for SAS's aggregate environmental impact. However, they are of major importance for the airports' local environment, the local community and the work environment for SAS's employees.

The main impact in ground operations is caused by emissions in the form of carbon dioxide, nitrogen oxides and hydrocarbons from the vehicles SAS uses for transportation both within and to/from the airports, as well as the related consumption of non-renewable fuel.

Other significant impact factors in ground operations are consumption of glycol in deicing of the aircraft, hazardous waste and consumption of chemicals in the maintenance workshops, emissions of sulfur dioxide, carbon dioxide and nitrogen oxides from the heating plants, water and energy consumption and office waste.

All quantitative data used in SAS's environmental index for ground operations is presented on the following pages. Supplementary data is found on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

**Noise**  
Ground emissions

**Air emissions**  
Water emissions

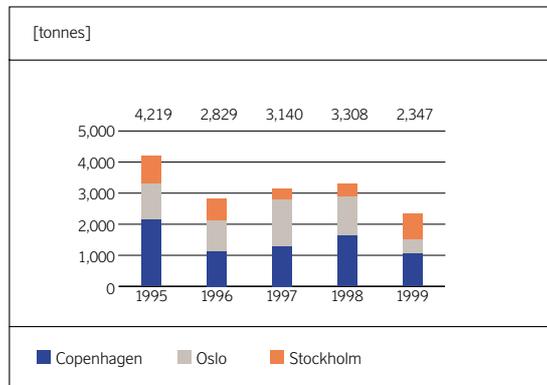
**Waste**  
Other information

[More data at www.scandinavian.net](http://www.scandinavian.net)

## Waste

[More data at www.scandinavian.net](http://www.scandinavian.net)

### Unsorted waste



**Background:** All waste is collected by approved subcontractors for sorting and partial recycling. **SAS's development:** The reduction compared with 1998 is partly explained by the unusually large waste volumes in connection with the move from Fornebu to Gardermoen.

### Hazardous waste

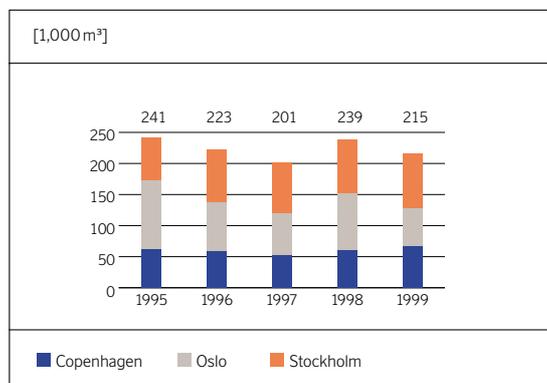
[tonnes]	1995	1996	1997	1998	1999
	523.6	513.9	445.9	485.0	982.6

special manner. SAS delivers all of its hazardous waste in Denmark, Norway and Sweden to approved subcontractors for processing, recycling or destruction, and reports this to the authorities. **SAS's development:** Most of the increase is explained by the destruction of 285 m<sup>3</sup> of polluted water from Gardermoen. This was a non-recurring phenomenon. The rest of the increase is due to rising production and treatment of certain fractions stored from previous years.

**Background:** Hazardous waste is generated mainly in the workshops and consists of waste from chemicals that may not be deposited in municipal garbage dumps, but must be disposed of in a

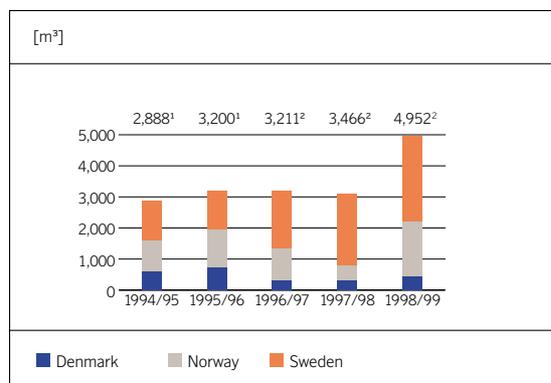
### Consumption of raw materials

#### Water



**SAS's development:** Aggregate water consumption has decreased at all of the three main airports. This is mainly attributable to a sharp decrease in Oslo (Gardermoen) due to correction of problems in 1998 with recirculation of cooling water at SAS's electroplating workshop at Fornebu, which led to abnormally high water consumption. In Copenhagen and Stockholm, water consumption is on par with 1998. • Even though production is rising, a further reduction in water consumption is needed to sustain the declining trend.

Glycol



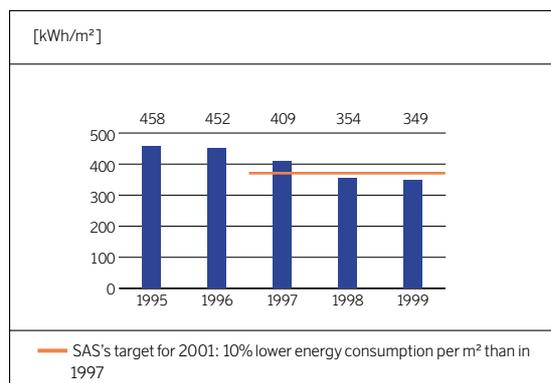
**Background:** Glycol is sprayed on the wings of aircraft to prevent ice formation in cold weather. Two mixtures are used, with varying glycol concentrations for different temperatures. Here, these have been calculated as 100% glycol. **SAS's development:** The large increase from the winter of 1997/98 to 1998/99 is attributable to a season with weather conditions that required more deicing in both Norway and Sweden, as well as the relocation of Oslo's airport from Fornebu to Gardermoen, which has a much harsher local climate. The winter season is longer and the need for deicing significantly greater. (For more information about problems with deicing at Gardermoen, see p. 11.)

<sup>1</sup> Until 1995/96, domestic line stations were reported only in Norway, while the figures for Denmark and Sweden referred only to Copenhagen and Stockholm.

<sup>2</sup> As of 1996/97, domestic line stations are reported in all of the Scandinavian countries.

Energy consumption

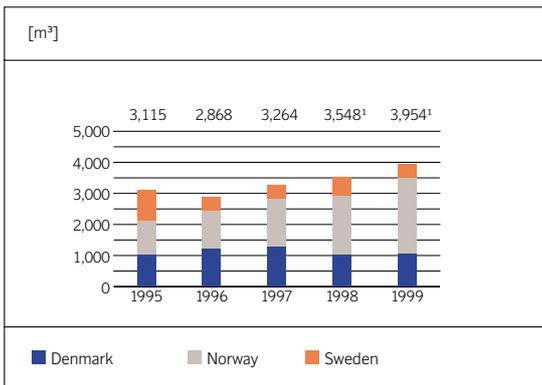
Relative energy consumption



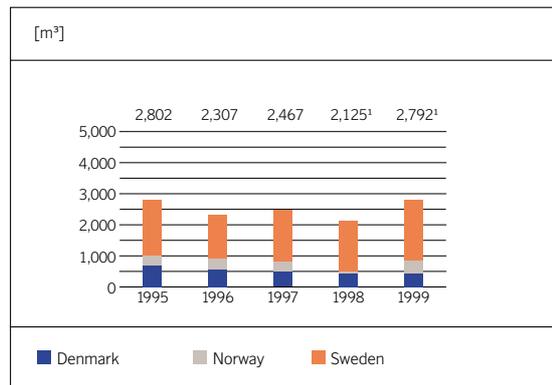
**Background:** In order to indicate SAS's ecoefficiency, registered resource consumption is compared with the total SAS-owned floor space where resource consumption takes place. 1999 was the first year with SAS's large new buildings from 1998 in use – the cargo terminal in Copenhagen and the facilities at Gardermoen. The latter have now been included in the relative data for the first time. **SAS's development:** SAS's target for the year 2001, to reduce energy use relative to the total area with registered resource consumption by 10% compared with 1997, was achieved already after one year with a reduction of around 15%. This level was sustained in 1999, and is now considered fulfilled. An additional comparative figure for use in 1999 is SAS's energy consumption in ground operations excluding catering of 9.9 (8.9) kWh per passenger.

[number]	1995	1996	1997	1998	1999
Electricity and heating [MWh]	197	215	194	193	220
Area used [1,000 m²]	431	475	475	545	631
Energy efficiency [kWh/m²]	458	452	409	354	349

## Diesel



## Gasoline



<sup>1</sup>Starting in 1998, all values are reported including the line stations. Consumption in Denmark and Sweden is therefore not comparable to the preceding years<sup>1</sup>, while Norway already included the line stations.

**Background:** SAS strives to use only diesel of the highest environmental quality in each respective country. **SAS's development:** The higher consumption in 1999 is mainly attributable to significantly longer driving distances between Olso and Gardermoen compared

with Fornebu. • Aside from the reported volumes, SAS used 1,960 m<sup>3</sup> diesel in catamarans between Malmö and Copenhagen. The catamarans will be withdrawn from traffic in August 2000 when the Öresund Bridge is opened.

### Airlines need to clean up, even on the ground

Not all water is the same. The 15 m<sup>3</sup> that flow into the new purification plant at Arlanda every day from SAS's hangars have radically different qualities and treatment requirements, depending on which process the water comes from. For that reason, it is vital to keep the pipes apart.

Just inside the purification plant is a container for the facility's end-product – dry lumps of heavy metal-saturated metal hydroxide – to be deposited at Sakab, a special company for management of hazardous waste, while awaiting future methods for recycling.

A room to the right hums with the sound of vacuum evaporation. Here, water from the component workshops is treated to remove detergents, solvents and paint strippers that would otherwise disrupt the sedimentation process. At this low pressure the water boils at 40°C and can be removed at a low energy cost whereas the chemicals, which have a higher boiling point, are separated and sent to Sakab for destruction.

Together with water from aircraft washing, etc., the water passes an oil skimmer, a simple but effective process. After this, it is treated through flocculation, chemical evaporation, sedimentation and sand and coal filtration. The resulting sludge is then dewatered before ending up in the container at the entrance. The treated water continues to the Käppala waste water treatment plant.

The purification plant is mainly the work of Bengt Noreskog, administrative environmental manager at the technical base in Stockholm. Just over a year ago he looked out on the forest from his office in Hangar 2. Now Arlanda's third runway is rapidly taking form in the landscape.

Traffic is growing, and to meet the anticipated future environmental requirements SAS is investing in advanced environmental technology at all three of its main airports.

SAS's approx. 170 aircraft are washed during maintenance, among other things in the hangars at Arlanda. The component workshop overhauls and cleans aircraft components. A new automated high-pressure facility washes the large vehicle fleet in ground operations. Together, these operations at Arlanda discharge a waste water laden with oil, heavy metals and chemicals. The latter have become fewer and more eco-compliant over the years, but still represent an environmental burden.

In connection with the plans for a third runway, SAS's Stockholm workshops came to the attention of Sweden's environmental



Bengt Noreskog has headed SAS's project to implement eco-compliant treatment of all waste water at the technical base in Stockholm.

court. The court wanted to get a collective grip on all permit-requiring activities at Arlanda, which had previously been operating without formal authorization.

In 1990 SAS filed an application for environmental review, setting in motion a lengthy process of correspondence and meetings. Bengt Noreskog has been involved almost from the start.

In 1995 came the environmental court's decision to impose rigid and detailed requirements and emissions criteria. The choice of purification methods was left to SAS.

"The question was what technique to use", says Bengt Noreskog. "We had to either seal the facility, which was difficult given the structure of the hangars, or use fresh water and then purify it so that it could be discharged into the municipal sewer system. We chose the latter."

The facility, which has cost 12.5 MSEK, has operated under provisional conditions during the running-in period pending the final decision of the environmental court based on feedback from SAS. This is expected to take place in the first half of 2001.

In 1990 the process water from SAS's technical operations at the base, which then went directly into the municipal sewage system, contained around one kg of cadmium per year. Today the content is a fraction of this and Bengt Noreskog is satisfied:

"Now we're keeping our house in order at the Arlanda base!"

# Environmental Auditors' Statement

To the readers of SAS's environmental report for the financial year 1999:

We have examined the contents of SAS's environmental report for the 1999 financial year.

The environmental report was presented to SAS's Board of Directors in March 2000. The Group's executive management (SAS Management Team, SMT) is responsible for organizing and integrating environmental work with the day-to-day operations of the Group. Our task has been to examine the reporting of environmental activities.

The audit was conducted during the period January – March 2000 and was carried out parallel to production of the environmental report. Since there are no generally accepted standards for the contents and structure of an environmental report, neither in Scandinavia nor internationally, SAS has continuously discussed with us which information should be disclosed. As a basis for making this selection we have used Deloitte & Touche's "Checklist for preparation and evaluation of environmental reports", October 1999 edition.

Our audit has included:

- Discussions with SMT on the environmentally related operational risks, and disclosure thereof.
- Discussions with SMT on the contents of the environmental report and the results of our review.
- A review and examination of the company's accounting principles.
- A review of the report on completed, ongoing and planned environmental projects.
- A review of the report on environmentally related taxes, charges and investments.
- A review of the report on goal fulfillment relative to the established action plans.

- A review of the Group's systems and routines for registration, accounting and reporting of environmental data.
- A review of the existing documentation to ensure that the information in the environmental report is based on this.
- A review on the report on compliance with laws, permits and conditions.
- A review of the report on the scope and limitations of the content of the environmental report.
- A control of the supplementary data on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)) referred to in the environmental report.
- A review to ensure that the contents of the environmental report do not contradict the information in SAS's audited financial annual report for the 1999 financial year.
- A control to ensure that SAS's annual report and this environmental report, with supplementary data on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)), together satisfy the requirements for environmental disclosure in the administration report according to Norwegian, Swedish and Danish law.

Based on the above reviews, it is our opinion that the data and information in the environmental report is supported by data obtained with due care from the operating units, and that the reports on environmental conditions and goal fulfillment relative to the established action plans provide an in all material aspects true and fair view of the reported parts of the Company's operations.

Stockholm, March 13, 2000  
Deloitte & Touche AB

Svante Forsberg  
*Authorized Public Accountant*

Elisabeth Werneman  
*Master of Economics*



## SAS's environmental work in practice

Society and business working towards the same goal. Intensive research is underway to increase knowledge about how aviation and other types of transport affect the environment. One central document in 1999 was the UN Intergovernmental Panel on Climate Change, IPCC, report on airline industry emissions of greenhouse gases.

Based on this and other research findings, the regulatory framework is developed internationally, in the EU and in the Scandinavian countries. In order to satisfy external requirements of this type, SAS continuously refines its environmental management system.

# The future regulatory framework

## Scandinavian, European and international trends

In 1996, the ICAO requested that the UN's Intergovernmental Panel on Climate Change (IPCC) assess the effects of greenhouse gas emissions from aircraft engines. The "IPCC Special Report on Aviation and the Global Atmosphere", the IPCC's first report to consider a particular industrial subsector, was presented in the spring of 1999.

The report projects that global passenger air travel will grow by 5% per year to the year 2015, while CO<sub>2</sub> emissions are expected to increase by 3% per year. This forecast is supported by SAS. More information about this report is found on the IPCC's web site ([www.unep.ch/ipcc](http://www.unep.ch/ipcc)).

### Charges or emissions rights?

The 1944 Chicago Convention on International Civil Aviation hinders the implementation of environmental taxes such as a CO<sub>2</sub> charge on aviation fuel in international traffic. Based on this, the ICAO has issued norms under which national separate taxation of international civil aviation may not exist without the consent of the other member states.

Norway has taken an initiative urging the ICAO to open the possibility of environmental tax on fuel, but has so far only won the support of Germany and the Netherlands. However, this matter will be investigated further by the ICAO with the goal of drafting a proposal to the general assembly in 2001. The Swedish Minister of the Environment has publicly announced that he intends to push for a CO<sub>2</sub> charge on aviation fuel.

The Kyoto Protocol opens the door for market-based alternatives to legislation and environmental taxes. The conditions for emissions trading will be a key issue for the Conference of the Parties in The Hague during autumn 2000. SAS believes that quotas can be an effective

system for attaining environmental goals from a cost-benefit standpoint.

The ICAO has appointed a work group under the CAEP environmental committee to study the potential role of market-based solutions, including emissions trading. The work group focusing on CO<sub>2</sub> emissions will present its report so that the ICAO member states can decide on a policy at the next general assembly in autumn 2001.

### Towards equal terms in Scandinavia

At SAS's request, the consulting firm COWI, in collaboration with the Institute of Transport Economics and Inregia, has conducted a study on the conditions, infrastructural costs, costs to society and environmental impact of passenger transportation by air, rail, road and sea on selected routes in Scandinavia. In its report "The Conditions for Civil Aviation in Scandinavia", the study comes to the same conclusion as several earlier analyses:

The Scandinavian airlines bear their own costs for infrastructure, impact on society and environmental impact.

For more details about the IPCC and COWI reports, see SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

In Norway, the work group for investigation of competitive terms in the aviation industry, set up jointly by several departments of state, has studied the effects of taxes and charges. The final report was presented in September 1999. One of the group's conclusions is that the investment and CO<sub>2</sub> charges, two surcharges that are particular to Norway, create competitive disadvantages for airlines with most of their operations in Norway.

The airlines with international traffic can refuel their aircraft before returning to Norway and then use the charge-exempt fuel on Norwegian domestic flights. This practice of "economy fueling" leads to increased fuel consumption and therefore also higher CO<sub>2</sub> emissions. Consequently, this charge may be working against itself. However, most members of the group do not feel that the current tax and charge levels give the Norwegian airlines sufficient incentive to move their operations abroad.

The introduction of charges based on NO<sub>x</sub>, places SAS's new Boeing 737s in favorable categories. In general, emissions-based charge systems of this type are expected to increase.

### Key considerations for the EU

In December 1999 the European Commission presented its report "Air Transport and the Environment", in which the Commission explicitly states that it will be compelled to



Scientists predict that the civil aviation's contribution to the greenhouse effect will increase.

take the initiative, for lack of international advances in environmental work. The report discusses measures such as:

- New certification rules within Chapter III in order to phase out the noisiest aircraft (ICAO).
- Implementation of stricter regional rules, particularly at noise-sensitive airports.
- Tighter controls on NOx emissions (ICAO).
- Introduction of a fuel tax. The report doesn't dismiss this idea, but recognizes its complexity.
- Further investigation of emissions trading.
- Implementation of a new system, independent of the ICAO, that can form a basis for airport charges, operating restrictions and allocation of slots.

Taxation is one of the areas in the EU that demands consensus, and few concrete decisions have been made.

In June 1999, the EU court ruled that a CO<sub>2</sub> charge on civil aviation contravenes the mineral oil directive on harmonization of taxes and charges on mineral oil. Consequently, no CO<sub>2</sub> charge can be imposed without first amending the directive.

The EU has passed an ordinance that hinders registration of hushkitted aircraft after April 1, 1999, and prohibits traffic after April 1, 2002. This has no immediate

consequences for SAS, since all hushkitted DC-9s were sold through leaseback transactions in 1998 and will be phased out of the fleet by spring 2002.

The U.S. views this ordinance as a trade barrier and demands that it be revoked, since the hushkitting industry is found only in the U.S. In discussions with the U.S., the European Commission has presented a proposal in which Chapter III aircraft are divided into subgroups based on noise characteristics. This could have far-reaching repercussions for SAS, since half of the fleet consists of MD-80s with narrow margins for meeting Chapter III criteria. The introduction of higher charges or special restrictions on aircraft that lie close to the certification limit would reduce flexibility in utilization of the fleet and therefore also the competitiveness of these aircraft. It would also have a negative effect on their economic lives and resale values.

The European Commission is working to implement uniform guidelines for noise regulations at the airports in order to avoid individual solutions. The ECAC is also pursuing this issue, and in 1999 took an important step towards a universal model for noise charges.

## How SAS takes action

SAS backs the IPCC's forecast for traffic growth and fuel consumption to the year 2015.

One way to limit emissions is through improved technology. SAS intends to continue using the best available environmental technology, within commercially feasible limits. One example was in the procurement of new longhaul aircraft, when SAS's demands spurred the manufacturer to launch a new engine with lower NOx emissions ahead of schedule.

Another approach is the introduction of alternative fuels, though the IPCC notes that candidates like hydrogen gas will not be viable until some time in the distant future. SAS takes part in airline industry discussions about alternative fuels and the possible admixture of fossil fuels.

Two systems currently under discussion are CO<sub>2</sub> charges and emissions trading. SAS's fundamental standpoint, which we express in all of the forums where the company is active, is that charges can be acceptable if all polluters pay for their pollution in equal measure.

The market-based solutions for emissions trading, for which the Kyoto Protocol paves the way, are a conceivable alternative for bearing our environmental impact according to the "polluter pays principle". SAS is active both directly and indirectly in organizations such as the CAEP.

SAS feels that the COWI report's in-depth analysis of the different transport types' social and environmental impact should be discussed at length. A summary of the report has been published in Danish and Swedish, and a Norwegian version is planned. These can be ordered from SAS (see p. iii for contact information).

SAS is following up the report of the Norwegian work group for investigation of competitive conditions in the avia-

tion industry report in contacts with the Norwegian parliament and licensing authorities, as well as our customers. Consideration of the report by the concerned parties will also be an important phase during which SAS can air its views.

In Sweden, SAS worked intensively to reclassify both of its aircraft models Boeing 737 (with DAC engines) and Bombardier de Havilland Q400 with regard to emissions levies. Discussions were conducted with the Civil Aviation Authority in the joint work group EKOSTYR and resulted in a more justified classification with effect from 2000.

SAS supports the efforts of the AEA and the IATA to draft new binding environmental goals, which is in line with the aim to achieve equal terms for all transport types and remove features that distort competition. Due to ongoing replacement of the aircraft fleet, SAS will have already met the goals in question.

SAS has set up a cross-divisional group, the government affairs committee, to coordinate work with agencies like the ICAO, EU and national authorities. The group consists of the Environmental Director and representatives from finance, legal affairs and government affairs. The group has formulated SAS's internal policy for environmental regulations and charges.

SAS has taken an initiative for harmonization of the rules for management of waste from cabin operations in Europe. This work is conducted by a committee within the AEA that is chaired by SAS.

SAS is working with the Norwegian authorities and suppliers of deicing fluid to find more eco-compliant preparations and certification methods. This effort is being closely monitored by the other European countries.

# Environmental work in practice

## SAS's management system for continuous environmental improvements

SAS's operational control is based on integrated management systems. Every manager with decision-making authority and budget responsibility is required to include an environmental impact assessment in the decision data, as stated in SAS's environmental strategy. The members of SAS's environmental forum (see p. 33), all from the line organization, monitor SAS's environmental work to ensure that integration of environmental management into operational control is more than an expressed ambition.

SAS has conducted a pilot project to adapt the company's environmental management system to ISO 14001. The Technical Division is leading the way with the goal for all of its operations to have fully integrated environmental management systems by 2003 that meet certification requirements for ISO 14001. This goal applies to all of the three technical bases in Copenhagen, Oslo and Stockholm. Although the business situation in 1999 delayed the start of SAS Cargo's work to qualify for ISO 9000 certification worldwide in addition to ISO 14001 in Scandinavia, this goal stands firm. SAS's quality management work follows the model developed by the European Foundation for Quality Management (EFQM), consisting of modules for nine areas that are central to business development. Environmental work falls under "Social impact and environmental consideration", but is also included in the other modules. EFQM bases its system on a philosophy shared by SAS – that to be effective, environmental work must be integrated with all other operations.

Regular self-assessments highlight the areas where responsible management groups in SAS have gaps to close between their current status and their targets according to the established goals. These assessments are supervised by Group Staff Quality Performance at the head office in Stockholm. In 1999, 25 such assessments were carried out. Identification of gaps between goals and results alerts managers and their units to possible shortcomings in operational control and gives them a platform for development of action programs to ensure that the established goals are met, at the same time that it helps them to reinforce their strongpoints.

Improvements are targeted and followed up within the respective EFQM areas, and in the business planning process these goals are broken down to the local level (e.g. division or department). The main objective is to enhance commercial activities by better satisfying the needs of customers and employees without compromis-

ing profitability targets. Environmental work is an integral part of this process.

In 1999 SAS began developing a method for a Social Trust Index that provides a reliable overall view of how the outside world and our own employees see the company.

### National systems

Denmark, Norway and Sweden have partially differing regulations for internal control and environmental reporting. In the Norwegian law, "internal control" incorporates not only rules for the work environment but also much of the external environment. In Sweden and Denmark, work related to the latter is normally followed up and audited via the environmental management systems. By conducting audits as part of internal control according to the Norwegian definition and evaluation of environmental work within the framework of the TQM process, SAS ensures that a large share of its operations undergo an extensive yearly environmental audit even though the SAS Group has not yet implemented a formal environmental management system in compliance with ISO 14001. Internal control according to the Norwegian model in combination with evaluations and audits via TQM guarantee effective feedback of results to managers in the line organization. These systems are described in more detail on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

The information required by the three countries is handled in a joint reporting system and a joint training system for SAS's managers.

### Environmental management

The SAS Management Team establishes the vision, goals and strategies for environmental work (see p. 35) every year as part of the Total Quality Management process, based on the business plans and environmental aspects defined as "significant" according to ISO 14001 and EMAS. The environmental projects spawned by these goals are then evaluated as part of the TQM process. (See pp. 21, 24 and 27 for examples of this continuous improvement process.)

In following up systematic environmental activities, compilation of data for the environmental report plays an important role. Starting in 1999, this is done with the help of a database that facilitates both collection of data and comparisons between years. Furthermore, it assures a high level of quality in the material, since the information source and underlying calculations are easy to track. The database also creates scope for further effi-

ciency gains in the examination process.

In the partly-owned companies where SAS has board representation, SAS instructs its members to ensure that the respective company's environmental work is conducted and documented in accordance with SAS's environmental philosophy and strategy.

#### Environmental organization

SAS's environmental activities are led by the SAS Management Team. The *Information Director*, who reports to the CEO and is a member of the management team, has special responsibility for environmental issues.

The *Environmental Director*, who reports to the Information Director, supervises the activities of the environmental department – a staff function that coordinates SAS's environmental activities. He ensures that the environmental strategy is communicated throughout the company and is responsible for production and publication of SAS's environmental report. The Environmental Director also directs the work of the *SAS Environmental Forum*, a cross-divisional group with advisory and follow-up functions, particularly to ensure the integration of environmental work in the line organization and that SAS lives up to internal and external environmental require-

ments. The Environmental Director coordinates SAS's involvement in international environmental forums.

The *National Environmental Coordinators* in Denmark, Norway and Sweden organize environmental work at the national level and provide the respective national organizations with advice. The *Divisional Environmental Coordinators* organize environmental activities in their divisions.

For more detailed information, see SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)), which also provides a link to SAS's new forum for dialogue with external stakeholders, SAS Electronic Channel. See also on p. 37.

#### Environmental permits

The organization must comply with the applicable laws and granted permits. Compliance is ensured through proactive measures and continuous, periodic or random inspections and reports to public authorities and other licensing agencies. For a description of the current environmental permits, see SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

#### Internal information and expertise development

SAS has chosen to carry out environmental training of the employees in stages. In the initial stage, primarily for managers and key persons, flexible environmental mod-



SAS Environmental Forum: From left, Maria Tandberg, Martin Porsgaard, Joakim Eriksson, Kristin Haaland, Bengt Noreskog, Niels Eirik Nertun, Ingolf Jørgensen, Bengt Olov Näs and Reidar Pettersson.

The following members of SAS Environmental Forum are not pictured: Susanne Ganning, Britta Hjelt and Morten Kongstad.

ules are integrated with the programs for expertise development. A training program for all employees is planned for the future, probably via the intranet.

The environmental report serves as a valuable reference for SAS's own employees. Continuous environmental information is provided through a number of channels, both by word of mouth and via the intranet, the staff magazine Inside and other printed material.

Information and initiatives from the organization are assimilated through the TQM process, the national health,

safety and environment units and suggestion routines.

In 1999, SAS's intranet has also evolved into an electronic suggestion box for the employees. SAS Idea Network is a new, IT-based means for internal suggestions. It will undergo full-scale trials in 2000. The goal is to bring in one suggestion per year from every other employee, which would mean a hundredfold increase in frequency. The 100–200 suggestions per year in recent years have generated total annual savings of around 0.5 MSEK. In order to stimulate this activity, SAS Idea Network will be

### SAS's TQM work – the environmental area

#### Excerpt from the area "Social impact and environmental consideration" <sup>1</sup>

Goals/programs 1999	Achieved	Goals/programs 2000 (revised)	Goals/programs 2001 (new)
<ul style="list-style-type: none"> <li>SAS develops its environmental management system towards ISO 14001 and evaluates seeking environmental certification of prioritized parts of operations.</li> <li>SAS further develops its communication about resource consumption, environmental impact and examination of environmental data.</li> <li>Environmental modification of SAS's aircraft fleet continues with the phase-in of Boeing 737-600/700/800s and Bombardier de Havilland Q400s. SAS thus has 100% Chapter III aircraft.</li> <li>SAS decides whether or not to replace the aircraft in the longhaul fleet.</li> <li>SAS continues to work on the regulatory framework for the airline industry.</li> <li>SAS takes active measures to enhance its environmental image.</li> <li>SAS develops the environmental elements that are integrated in the Group's other training programs.</li> <li>In the airline industry, SAS is perceived as one of the sector's environmental leaders.</li> <li>SAS collaborates with its partners to increase environmental benchmarking.</li> <li>SAS develops environmental aspects as a natural element of its market communication.</li> </ul>	<p>2</p> <p>✓</p> <p>3</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>4</p> <p>✓</p> <p>5</p>	<ul style="list-style-type: none"> <li>SAS further develops its environmental management system towards ISO 14001.</li> <li>SAS directs its communication about resource consumption and environmental impact to various target groups with the help of additional media and channels.</li> <li>Environmental modification of SAS's aircraft fleet continues.</li> <li>SAS further develops its examination of environmental data towards more conclusive verification and validation.</li> <li>SAS continues to work on the regulatory framework of the airline industry.</li> <li>SAS achieves a significant improvement in its environmental image compared with 1997 and is perceived as one of the leading airlines also by the general public.</li> <li>SAS conducts planned and systematic market communication about environmental aspects.</li> <li>SAS further develops the environmental elements that are integrated with the Group's other management training programs.</li> <li>Environmental elements are integrated with training of SAS's employees as a separate computer-based course.</li> <li>SAS draws up an environmental training plan for operations.</li> <li>SAS further develops environmental benchmarking with its partners.</li> </ul>	<ul style="list-style-type: none"> <li>SAS evaluates and possibly seeks environmental certification of prioritized parts of its operations.</li> <li>SAS further develops its communication about resource consumption and environmental impact to various target groups with the help of additional media and channels.</li> <li>SAS develops the environmental report to include ethical/social issues. At the same time, environmental information is effectively integrated into the annual report. Distribution of environmental information via the Internet is also developed.</li> <li>SAS continues to phase in aircraft that reduce relative environmental impact.</li> <li>SAS conducts a dialogue with engine and aircraft manufacturers about environmental modification of new aircraft models.</li> <li>SAS increases its work on the regulatory framework for the airline industry.</li> <li>25% of SAS's employees have received environmental training that meets the criteria for ISO 14001.</li> <li>Further enhancement of SAS's environmental image.</li> <li>SAS is perceived by the general public as an environmental leader in the airline industry.</li> <li>Further development of planned and systematic market communication about environmental aspects.</li> <li>SAS works with selected partners to improve environmental performance and facilitate environmental benchmarking in the airline industry.</li> </ul>

<sup>1</sup> Due to lack of space, the part of the strategic area relating to social impact has been omitted.

<sup>2</sup> Only partially attained. The Technical Division has come far in its preparations for certification. At the Group level there is less to report. No evaluation has been carried out. This goal has been moved forward to 2000–2001.

<sup>3</sup> The first Q400s were delivered in January 2000. The goal to use no Chapter II aircraft has been attained, but the total aircraft fleet still contained 6% Chapter II aircraft at the end of 1999. Six of the eleven Fokker F-28s still owned by SAS are on lease to Air Botnia. The other five have been withdrawn from traffic while awaiting sale.

<sup>4</sup> Not fully attained, but there are clear indications that this goal will soon be met.

<sup>5</sup> SAS developed in this direction in 1999, for example by hiring a full-time environmental communications coordinator. Nonetheless, this goal has not been fully attained and has therefore been moved forward to 2000–2001.

In 1999 the established goals were fulfilled in all areas except environmental certification, the environmental image in the airline industry and environmental aspects in market communication (see notes 2, 4 and 5 above).

made easily accessible to all employees. All managers and administrators should be able to use the system.

## Collaboration

### Partners

In 1999 the world's largest airline network, Star Alliance, in which SAS is a member, was joined by All Nippon Airways, Air New Zealand and Ansett Australia and now includes nine airlines. During the year, these agreed on and signed an Environmental Commitment Statement in connection with a presidential meeting in Australia on May 3. The member airlines have pledged to carry out continuous environmental improvements based on their respective circumstances, for example by contributing to eco-friendly technological development in their purchasing. SAS is part of the Environmental Advisory Group, one of several committees that coordinate activities in the Star Alliance.

### Suppliers

Environmental consideration is an integral part of the demands SAS's places on all of its suppliers. SAS's purchasing manual stipulates that all suppliers must comply with SAS's environmental requirements in both negotiation of new agreements and renegotiation of existing ones. In general, SAS demands that its suppliers have an environmental policy and action program for environmental work, that they document environmental data for the goods and services SAS buys and that their own suppliers meet the same criteria.

In cabin operations the purchasing policy also states

that suppliers, within the framework of cooperation with SAS, must start at least one environmental project and report on it every year. Preparations for reporting via the Internet are underway. The goal is to create a web site where existing and presumptive suppliers can share their own and study others' environmental solutions.

The greatest environmental benefits are attained in connection with orders for new aircraft. SAS's policy is to always employ the best available environmental technology within commercially viable limits. During the negotiation process, SAS has a real opportunity to influence the environmental attributes of equipment and services.

### Other stakeholders

The potential for successful environmental work is enhanced by a constructive dialogue with a variety of stakeholders other than the company's own partners and suppliers. SAS maintains continuous dialogues of this type. For a closer description of these, see [www.scandinavian.net](http://www.scandinavian.net).

### Industry organizations

SAS participates in the activities of national industry organizations. A more detailed description of these is found at [www.scandinavian.net](http://www.scandinavian.net).

### National and international authorities, agencies, etc.

SAS conducts an ongoing dialogue about environmental issues with the respective environmental and communications departments in the three Scandinavian countries. SAS also works closely with the airport operators,

#### SAS's eco-political vision

All four transport types (road, rail, sea and air) should bear the costs for investments in, and operation of, their infrastructures, other costs to society (e.g. accidents) and environmental impact

according to the "polluter pays principle", after which they should be allowed to compete in a competitively neutral transport system based on an overall approach.

#### Environmental vision, goals and strategy

##### SAS's environmental vision

• SAS will develop profitably in free competition, with optimal utilization of resources and minimum environmental impact, in order to promote environmentally sustainable development of society. ("Sustainable development" means that when humanity satisfies its needs today, it does so without limiting the opportunities for future generations to satisfy theirs.)

operations shall be conducted so as to cause the least possible environmental impact.

- SAS shall evolve into one of the airline industry's leading companies in the environmental sphere.
- Environmental work shall be conducted at all levels and within all units, thus increasing environmental awareness throughout the organization.
- Environmental aspects shall be included in the grounds for all decisions in the line organization.
- SAS shall utilize methods that give rise to the lowest possible environmental impact in production, characterized by low energy consumption, recycling potential and minimal emissions.
- SAS shall report on its environmental activities in a separate environmental report.
- SAS shall promote an understanding of the role and environmental impact of air transportation among external stakeholders.

##### SAS's environmental goals

- SAS shall have one of the airline industry's most ambitious environmental programs.
- SAS shall have an environmental standard equivalent to the leading competitors in the industry.
- SAS's environmental goals and measures shall be coordinated and harmonized with other goals for production, quality and economy.

##### SAS's environmental strategy

- Within the framework of SAS's financial and qualitative goals, all

Vision, goals and strategy were originally adopted by the SAS Management Team in June 1995 and are revised annually according to plan. The eco-political vision was adopted in 1998. The Board of SAS last reviewed the environmental strategy and eco-political vision at a board meeting in March 2000.



During 2000, SAS is testing a new routine for internal suggestions. Via the intranet it will be easy for all employees to submit their ideas for improvements that affect customer service, economy, the environment, etc.

above all at the three main airports in Copenhagen, Oslo and Stockholm. For more detailed information about these collaborations, see [www.scandinavian.net](http://www.scandinavian.net).

Aside from these, SAS reports to the relevant authorities in the event of emissions, accidents, etc., according to the applicable regulations (see pp. 9–11).

In the international arena, SAS is active in the central agencies ICAO, IATA, IFCA and AEA. For more detailed information about these activities, see [www.scandinavian.net](http://www.scandinavian.net).

Within the Nordic Working Group for Environmental Issues in Aviation (N-ALM) SAS can promote Nordic coordination, increasing the members' scope to influence organizations such as the ICAO and EU.

Furthermore, SAS has been represented in the Norwegian departmental work group for investigation of competitive terms in the aviation industry, which presented its report in September 1999 (for a more in-depth account, see p. 30).

In 1999 SAS took part in the EKOSTYR work group under the direction of the Swedish Civil Aviation Authority to investigate which category, and therefore also which environmental charges, the various aircraft should be assigned to.

### Research and development

The SAS Group is engaged in basic research and studies on the airline industry's environmental impact via agencies such as the ICAO, IATA and AEA.

SAS also contributes to research and development in the EU project AEROCERT, which studies how the actual

emissions from operational activities correlate with the data used for aircraft certification.

At SAS's request, the Danish consulting company COWI, in association with Swedish Inregia and the Norwegian Institute of Transport Economics, has prepared a report on the conditions for civil aviation in Scandinavia.

SAS has also collaborated with several university and college students who have written their theses on topics such as SAS's waste management.

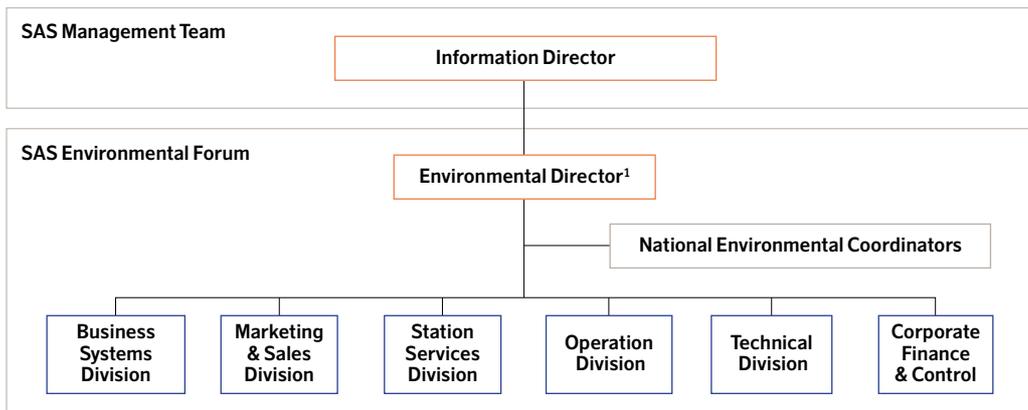
Involvement in applied development work takes place for example when SAS makes specific demands on environmental performance and takes part in discussions of various technical solutions in purchasing of aircraft and engines. On its own and together with suppliers, SAS devotes extensive effort to development of services, for example in catering.

### Environmental profiling and sponsorship

A well considered and developed environmental dimension in a corporate brand strengthens its commercial position and opens new opportunities for business development. Strategic target groups for SAS's environmental communication include customers, suppliers, the general public, the mass media and public authorities. SAS has been able to influence the regulatory framework, air its views and achieve a more positive environmental image. SAS regularly measures the effects of these activities on the company's environmental image – see p. 12.

For an in-depth of SAS's environmental profiling and sponsorship, see [www.scandinavian.net](http://www.scandinavian.net).

## SAS's environmental organization



<sup>1</sup> Also coordinates SAS's representation in international environmental forums.

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<sup>2</sup> With effect from February 4, 2000. In 1999 handled by Janne Sødning, then Joakim Eriksson.

<sup>3</sup> On maternity leave as of November 1999.

## Scope, accounting principles

### Accounting principles

The financial data included in the SAS Group's environmental information is reported according to the same accounting principles used in SAS's annual report. The SAS Group consists of the SAS and SAS Commuter consortia and their wholly and partly-owned subsidiaries (see below). "SAS's environmental report for 1999" below refers to the environmental information in this report and supplementary data on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

The SAS Group's annual report for 1999 provides general information about environmental conditions, activities, permits, taxes and charges in accordance with Norwegian and Swedish laws on environmental disclosure in the administration report. No corresponding Danish law exists at present. Supplementary and more detailed information can be found in this environmental report

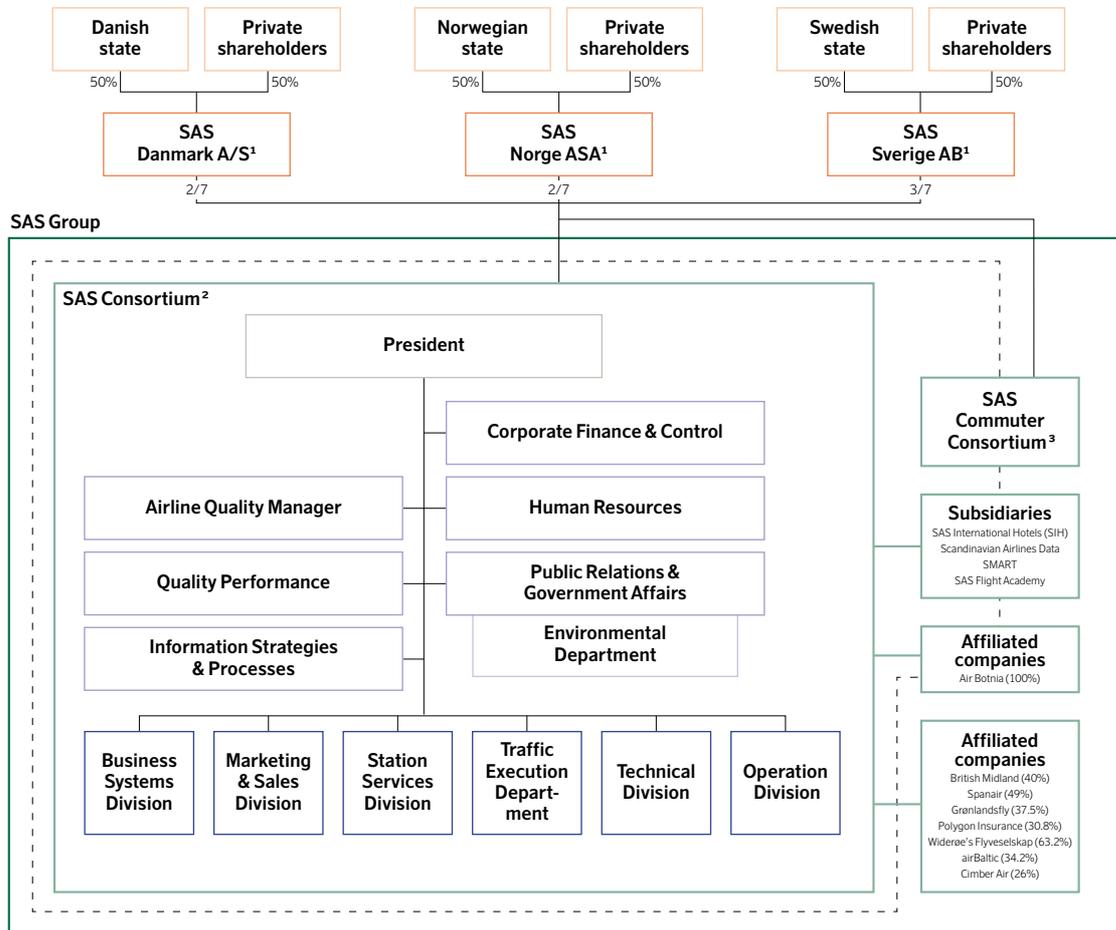
with related data on SAS's web site ([www.scandinavian.net](http://www.scandinavian.net)).

### Scope of the Environmental Report

SAS's ambition is for the environmental report to include all conditions of reasonable relevance for SAS's environmental impact. Deloitte & Touche's "Checklist for preparation and evaluation of environmental reports", October 1999 edition, has been used as a guideline for structuring the contents.

As in earlier years, SAS's environmental report for 1999 includes the SAS Consortium's own operations as well as the part of SAS Commuter's operations in which the SAS Consortium carries out ground services and technical maintenance through SAS Airlines. SAS's environmental report for 1999 also includes data on environmental impact in the affiliated company Air Botnia and com-

### Ownership and organization



<sup>1</sup> Listed companies.

<sup>2</sup> The SAS Consortium comprises SAS Airlines and SAS Trading, and is owned by the three national parent companies SAS Danmark A/S, SAS Norge ASA and SAS Sverige AB.

<sup>3</sup> Incl. subsidiaries. SAS Commuter is strictly a production company that supports SAS Airlines with feeder traffic in competition with other regional companies.

*Scope of SAS's environmental report for 1999 (see also the information in this section).*

ments on environmental work and impact in the SAS Group's subsidiaries. Environmental impact in the latter is minor compared with that arising in flight, cabin and ground operations in SAS Airlines, and is therefore reported only as an overview. Detailed information about environmental impact in the SAS Consortium's subsidiaries including SAS Radisson Hotels and in SAS Commuter is provided in the respective annual reports for these operations, when applicable.

In the cases where data for flight operations deviates somewhat from this definition of scope, information about the deviation is provided in direct connection with the affected data, table or chart.

The data for flight operations in this environmental report and on the Internet may differ somewhat from the corresponding statistics in the annual report, since the environmental report focuses primarily on information with financial significance for SAS.

#### **New methods**

In the 1999 environmental report, the following calculation methods have been changed compared with previous years:

- The grounds for calculating SAS's environmental indexes (for total SAS and for Flight, Cabin and Ground operations) have been further developed. To facilitate interpretation of the reported data, the corresponding indexes for earlier years have been recalculated according to the new method.
- Calculation of fuel efficiency in cargo operations (SAS Cargo) has changed, since leasing of Boeing 747s has been concluded and cargo capacity is now purchased on MD-11s in Lufthansa Cargo (so-called "wet lease").

Detailed information is provided in connection with reporting of the affected data.

#### **Recalculation factors and calculation principles**

The following recalculation factors have been used in the environmental report.

- The distance flown that is used to calculate ATK, RTK, ASK, APK and RSK equals the sum of the distance between SAS's destinations, calculated as GCD, multiplied by the number of flights between them.
- Calculation of RTK is based on the weight of paid cargo, the number of passengers and the average passenger weight including baggage. The weight of passengers and baggage is designated "standard weight".

Otherwise, the following factors have been used:

- Standard weight (intercontinental): 99 kg
- Standard weight (Europe): 97 kg
- Standard weight (domestic): 95 kg
- Weight of 1 liter aviation fuel: 0.79 kg
- Emissions of CO<sub>2</sub>: 3.15 kg per kg aviation fuel burned
- Emissions of NO<sub>x</sub>: 54.5 g per km flown<sup>1</sup>
- Emissions of hydrocarbons, excl. VOCs: 6.9 g per km flown<sup>1</sup>
- Emissions of water vapor: 1.238 kg per kg aviation fuel burned
- 1 kg LPG: 12.8 kWh
- 1 kg fuel oil: 12.0 kWh, 3.17 kg CO<sub>2</sub>, 5 g NO<sub>x</sub> (an average of 0.09% sulfur)

<sup>1</sup> Factors that are specific to each airline depending on the composition of the aircraft fleet and patterns of operation.

#### **Terms and definitions**

**Paying passengers** (revenue passengers) Passengers who pay more than 25% of the regular ticket price.

**Environmentally related earnings and costs** Nonrecurring income and expenses related to measures to prevent, diminish or remediate environmental damage arising from operations.

**Environmentally related costs** Those arising from operations.

**Environmentally related taxes and charges** Costs for environmentally related charges and taxes associated with operations – both extra costs for charges and taxes imposed on operations because the environmentally best available process or equipment has not been used, and costs incurred despite the fact that the best available environmental technology has been used.

**Environmentally related investments** Investments in assets to prevent, diminish or remediate environmental damage arising from operations that are not profitable as such or that are conducted with the aim of meeting more stringent future environmental requirements.

**Environmentally related provisions** Provisions for liabilities and estimated costs for known commitments and requisite measures to prevent, diminish or remediate environmental damage arising from operations.

**Environmentally related contingent liabilities** Contingent liabilities related to possible costs for measures to prevent, diminish or remediate environmental damage arising from operations.

SAS's environmental report is published in Danish, Norwegian, Swedish and English. The Swedish version is designated the official original.

# Words, expressions and abbreviations

Flight related definitions – others are found on SAS's web site.

**AEA** Association of European Airlines, cooperative body for European airlines.

**ASK** Available Seat Kilometers, the available number of passenger seats multiplied by the distance flown (see also *ATK, RPK, RTK*).

**ATK** Available Tonne Kilometers, available capacity for passengers and cargo expressed in tonnes (metric tonnes), multiplied by the distance flown (see also *ASK, RPK, RTK*).

**Cabin factor** Percentage of available passenger capacity that is utilized during a flight.

**CAEP** Civil Aviation Environmental Protection, technical committee in the ICAO (see definition) charged with developing and establishing rules and recommending measures to reduce the environmental impact of aviation.

**Carbon dioxide (CO<sub>2</sub>)** Carbon dioxide emissions from civil aviation are reduced through a changeover to more fuel-efficient aircraft, which is also economically advantageous since lower fuel consumption automatically leads to lower emissions.

**Catering** Production and delivery of food and beverages for cabin service.

**Certification** of aircraft models, ICAO's (see definition) requirements regarding noise and emissions of carbon monoxide, nitrogen oxides and hydrocarbons (see *Chapter II, III*).

**Chapter II, III** ICAO's (see definition) noise certification requirements.

**DAC** Double Annular Combuster, technology used to reduce emissions of nitrogen oxides from aircraft engines.

**Depletion of the ozone layer** Like other industries, airlines are working to replace ozone-depleting chemicals with less harmful alternatives. This mainly applies to Freon, used in air conditioning equipment, and Halons, used to extinguish fires. SAS has replaced a more hazardous type of Freon with one that has considerably less impact on the ozone, invested in a Halon recycling plant in Copenhagen and entirely phased out Halons in Stockholm.

**ECAC** European Civil Aviation Conference, a forum for cooperation between and coordination of European national authorities in issues related to civil aviation.

**ENTAF** Environmental Task Force, working group within the IATA that deals particularly with environmental issues.

**EPNdB** Equivalent Perceived Noise level, a unit commonly used in the aviation context to express the average perceived noise level. (See also *Noise*).

**GCD** Great Circle Distance, definition of the shortest flight distance between two points, taking the curve of the earth's surface into account.

**Germicides** Added to the sanitizing liquid in aircraft lavatories to reduce the risk of infection.

**Glycol** Sprayed on aircraft in cold weather to prevent ice formation. Nowadays non-toxic propylene glycol is used. Approximately 80% of the glycol runs off the aircraft when it is applied, and seeps into the ground unless collected. A further 15% is emitted into the air and spreads in the vicinity of the airport. Airports use vacuum trucks and flushing sites with drainage facilities to collect glycol run-off for reuse. SAS is also working to minimize consumption through more effective application techniques.

**IATA** International Air Transport Association, the UN cooperative body for 256 of the world's airlines.

**ICAO** International Civil Aviation Organization, the UN's specialized agency for international civil aviation. One of its functions is to develop binding norms for commercial aviation.

**IFCA** Inflight Catering Association, organization in which more than 250 airlines collaborate with catering companies and other suppliers to the airline industry's cabin operations.

**IPCC** Intergovernmental Panel on Climate Change, a scientific panel appointed by the UN environmental program UNEP and the World Meteorological Organization, WMO, to evaluate effects on the global climate and the consequences of climate change.

**k** Abbreviation for kilo (as in kWh), i.e. thousand (1,000).

**M** Million (as in MSEK) or mega (as in Mtonne, i.e. one megatonne = 1,000,000 tonnes).

**N-ALM** The Nordic Working Group for Environmental Issues in Aviation, composed of civil aviation, environmental and communication authorities, and airlines.

**Nitrogen oxides (NOx)** Formed in all combustion – in aircraft engines since the high temperatures and pressure cause the atmospheric nitrogen and oxygen to react with each other, mainly during takeoff and ascent when the engine temperature is at a maximum.

With effect from 1996, the ICAO introduced more stringent requirements for nitrogen oxide emissions and by around 2000 these are expected to be further tightened. New engines with double annular combustors (DACs), for example, reduce emissions by up to 40% compared with the previous generation of engines. In 1998 SAS began the phase-in of new Boeing 737s with DAC engines into its aircraft fleet.

**Noise** Environmentally detrimental, often undesirable and disruptive noise. The airline industry's environmental impact in the form of noise is primarily of a local nature. (See also *EPNdB, Chapter II, III*.)

**Oil aerosols** Oil sprayed from the aircraft engines during operation under high pressure. Upon contact with air it forms a fine mist which is then broken down primarily into carbon dioxide.

**Passenger kilometers** The number of passengers transported multiplied by the distance flown.

**RPK** Revenue Passenger Kilometers, utilized (sold) capacity for passengers expressed as the number of seats multiplied by the distance flown (see also *ASK, ATK, RTK*).

**RTK** Revenue Tonne Kilometers, utilized (sold) passenger and cargo capacity expressed in tonnes (metric tons), multiplied by the distance flown (see also *ASK, ATK, RPK*).

**SEK** International currency designation for Swedish kronor.

**Star Alliance** Commercial alliance between Air Canada, Air New Zealand, All Nippon Airways, Ansett Australia, Lufthansa, SAS, Thai Airways, United Airlines and Varig.

**Sulfur dioxide (SO<sub>2</sub>)** Aviation fuel contains a minute proportion of sulfur, and accordingly causes only minor emissions. The same applies to the "green" diesel now used in ground vehicles. In the airline industry, as in many others, sulfur dioxide emissions come mainly from oil-fired heating. In the past few years SAS has reduced its sulfur emissions by switching to oils with a lower sulfur content in its oil-fired heating plants and by replacing oil-firing with other types of heating systems and energy carriers where cost-effective.

**Tonne kilometers** The number of transported tonnes of passengers and cargo multiplied by the distance flown.

**TQM** Total Quality Management, a management philosophy in which a company or organization strives to exceed customer expectations by improving its competitiveness through the efforts of the employees. See also p. 32.

**Volatile organic compounds (VOCs)** Emitted during incomplete combustion of fossil fuels – in aviation mainly when the engine is at low speed and the temperature in the combustion chamber is low. This category also includes all types of solvents that evaporate from e.g. detergents and paints.

As of April 1, 2002, only aircraft with low VOC emissions will be permitted in the EU. The modern aircraft that SAS is now phasing in will have 90% lower hydrocarbon emissions than their predecessors. As in other industries, a changeover to non-solvent chemicals is taking place in aircraft maintenance. Where this is not feasible, SAS is first phasing out all chlorinated substances.

**Weighted landings** A term used to express resource consumption at the gate. Based on SAS's most common aircraft type (MD-81), which has been given a weighted landing value of 1.0. A smaller aircraft that requires a smaller input of resources will have a lower value, and a larger aircraft will have a higher value.

## Contact SAS

We would like to know what you think of our environmental work and this environmental report. Send your comments by letter, fax or the environmental section of our web site. You can also order copies of current or previous environmental reports, the current annual report and other material from SAS's environmental information program.

### For comments:

Internet: [www.scandinavian.net/company/contact/environment/environment.asp](http://www.scandinavian.net/company/contact/environment/environment.asp)

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