Photography: Magnus Svensson for Siemens; Delmi Alvarez for Siemens

landfill (no household waste). In addition, Stockholm has for many years protected its green spaces, and around 85% of the population lives less than 300 metres from parks and green areas.

Initiatives: The planning strategy for the city is to build inwards, as outlined in the 1999 City Plan. This is being realised through reusing already developed land, redeveloping semi-central areas, transforming industrial areas into urban areas of mixed uses, establishing focal points in the suburbs and developing public spaces.

The city's Waste Management Plan specifies that the collection and treatment of food waste should increase from the current level of around 4,500 tonnes to 18,000 tonnes during the period 2008-12. An extra 100 recycling collection points are planned, to total around 350 stations all over the city.

Air quality: Stockholm scores second in the category for air quality. The city has a long tradition of monitoring air quality and setting emission goals. The city's air quality has improved substantially over the last decade, with its particulate matter standing at 16.7 micrograms per cubic metre in 2007, the lowest in Europe. A lack of heavy industry in the city is a major contributing factor to its high air quality.

Initiatives: Traffic is the main source of emissions hazardous to health, as well as of noise, and a major source of environmentally damaging emissions. To decrease these emissions, Stockholm will pursue its Clean Vehicles in Stockholm initiative.

Construction and use of road tunnels is a way of relieving the city centre and certain suburban areas from road traffic and consequently of improving the air quality. In 2004 the Southern Link road around the city centre was opened to traffic and in 2008 construction started on the Northern Link, which will be a link in the peripheral route around the inner city area and be part of the E20 European Highway. It is set to open in 2015, at an estimated cost of Skr11.6 billion (€1.1 billion).

Quantitative Indicators: Stockholm

	Average	Stockholm	Year	Source
CO_2 emissions per capita (tonnes/inhabitant)	5.21	3.62	2007	City of Stockholm (CO_2 emissions); Statistics Sweden (population)
CO_2 emissions per unit GDP (g/€)	356.12	77.53	2007	City of Stockholm (CO_2 emissions); Eurostat (GDP)
CO_2 reduction target to 2020 (% pa, from yr in which target set)	14.48	50.00[1]	2007	City of Stockholm
Energy consumption per capita (GJ/inhabitant)	80.87	104.88	2007	Stockholm Statistics First European Green Capital (energy); Statistics Sweden (population)
Energy consumption per unit GDP (MJ/€ GDP)	5.25	2.25	2007	Stockholm Statistics First European Green Capital (energy); Eurostat (GDP)
% of renewable energy consumed by the city (%)	7.30	20.08	2007	Stockholm Statistics First European Green Capital
Energy consumption of residential buildings (MJ/m_2)	908.88	769.87	2007	Stockholm Statistics First European Green Capital
Share of people walking or cycling to work (%)	20.94	68.00	2007	Stockholm Statistics First European Green Capital
Share of people taking public transport to work (%)	41.56	25.00	2007	Stockholm Statistics First European Green Capital
Length of cycle lanes (km/km^2)	1.15	4.04	2007	Stockholm Statistics First European Green Capital
Length of public transport network (km/km^2)	2.33	0.56	2007	Stockholm Statistics First European Green Capital
Annual water consumption per capita (m^3/inhabitant)	105.43	185.75	2007	Statistical yearbook
Water system leakages (%)	22.63	17.00	2007	Stockholm Statistics First European Green Capital
Dwellings connected to the sewage system (%)	95.02	100.00	2007	Stockholm Statistics First European Green Capital
Municipal waste per capita (kg/inhabitant)	510.93	597.00	2007	Stockholm Statistics First European Green Capital
Share of waste recycled (%)	17.62	31.00	2007	Stockholm Statistics First European Green Capital
Average daily nitrogen dioxide emissions (ug/m^3)	35.18	13.32	2007	EEA airbase
Average daily ozone emissions (ug/m^3)	40.38	50.88	2007	EEA airbase
Average daily particulate matter (ug/m^3)	34.86	16.70	2007	EEA airbase
Average daily SO_2 emissions (ug/m^3)	6.96	2.45	2005	EEA airbase

1) Rebased. Stockholm targets being fossil fuel free by 2050.

European Green City Index | Stockholm_Sweden

Stockholm_Sweden

Photography: Delmi Alvarez for Siemens

Select city data

Population:	795,000
GDP per head, PPP:	€ 39,415
CO_2 emissions per head:	3.62 tonnes
Energy consumption per head:	104.88 gigajoules
Percentage of renewable energy consumed by the city:	20.08 %
Total percentage of citizens walking, cycling or taking public transport to work:	93 %
Annual water consumption per head:	185.75 m^3
Share of waste recycled:	31 %

Stockholm, the capital of Sweden, is the hub of the country's economic, financial and political activity. With a population of around 800,000, nearly one-tenth of the country's total population, Stockholm's economy is dominated by the services sector, with a particularly high concentration of jobs in information technology, the healthcare industry and research. It is almost completely devoid of heavy industry, which has helped to make it one of the world's cleanest cities. Around 15% of Stockholm is covered by water.

Stockholm is ranked second in the European Green City Index, with a score of 86.65 out of 100. The city does particularly well in the areas of carbon dioxide (CO_2) emissions, buildings, transport, air quality and green governance. It shares similar characteristics with its Nordic neighbours — Copenhagen, Oslo and Helsinki, all of which rank highly in the index — such as a plentiful supply of water, a lack of heavy industry and a long tradition of policies aimed at protecting the environment. Stockholm has various emission-reduction targets, including a long-term aim to continue to reduce emissions of greenhouse gases at the same rate as between 1990 and 2005. This is a step towards Stockholm's long-term target of becoming a fossil fuel-free city by 2050.

CO_2 emissions: Stockholm ranks second in the index for CO_2 emissions, behind Oslo, which, like Stockholm, has a heavily services-centric economy. Stockholm also benefits heavily from having practically no heavy industry in the city. Its CO_2 emissions, at 3.6 tonnes per head in 2007, are among the lowest in Europe, and have decreased from their 1990 levels (5.4 tonnes per head). Emissions in the city are largely the result of transport, electricity and energy used for heating.

Photography: Mikael Ullen / Vägverket, Delmi Alvarez for Siemens

Environmental governance

Stockholm ranks joint first in the environmental governance category, along with Brussels, Copenhagen and Helsinki, because environmental issues have long been taken seriously and addressed. The city is currently on its sixth consecutive Stockholm Environment Programme (2008-11), which covers all the main environmental issues. The city has an integrated management system that ensures that environmental issues are included in the city's budget, operational planning, reporting and monitoring. In the short term, the latest Stockholm Environment Programme has six high-priority areas: environmentally efficient transport; goods and buildings free from dangerous substances; sustainable energy use; sustainable use of land and water; waste treatment with minimal environmental impact; and a healthy indoor environment.

Initiatives: Stockholm plans to reduce greenhouse gas emissions to a maximum of three tonnes of CO_2 per head by the end of 2015.

Energy: Stockholm ranks fourth in the category for energy, lower than its overall position in the index. Oil, hydroelectricity and nuclear power are now the principal sources of energy in Sweden, with hydropower (43%) and nuclear power (47%) accounting for 90% of domestic electricity production. Stockholm's ranking is mainly the result of its high energy consumption per head, which has to do with the city's cold climate and high standard of living (it scores lowest of all the cities located in cold climates). Yet Stockholm has a strong green energy profile: over 60% of electricity consumed by the city and 20% of its overall energy consumption come, from renewable sources. Around 80% of the population has access to district heating (combined heat/ power), of which renewables account for about 80%.
Initiatives: Stockholm's long-term plan is to be fossil fuel-free by 2050. This means that emissions from energy use related to the heating of houses and premises, traffic works and total electricity use within the city will be reduced to a level near zero by 2050. In addition, in early 2009 the government abandoned the country's ban on new nuclear power plants, arguing that the move was necessary to avoid energy sources that produce vast quantities of greenhouse gases. Construction of new reactors will take place as the old ones are taken out of service.

An increased reliance on nuclear power is likely to have an effect on Stockholm's energy supply, although the government is also planning on a significant expansion of wind power to meet demand. The measures include continued efforts to facilitate grid connections for renewable electricity and a planning framework for wind power of 30 twh.

The city and a Finnish energy company, Fortum, which together own the district heating system, continue to connect new areas to district heating in Stockholm. The heating system expands by about 200-300 gwh per year.

Buildings: Stockholm ranks joint first in the category for buildings, along with Berlin. In line with its Nordic neighbours, Sweden has been at the forefront of energy-efficient building standards, giving it a top score in both building standards and incentives. All newly built houses in Sweden have to pass a standard efficiency rating of 110 kwh per square metre, including hot water. Nevertheless, Stockholm scores relatively poorly for its energy consumption in residential buildings, at about 770 megajoules per square metre in 2007, although it remains better than the average of 909 megajoules.
Initiatives: Work has begun on the Stockholm Royal Seaport, a new city district being built in Stockholm's harbour area at a cost of US$2.5bn, located on former brownfield areas. Building started in 2009 and is due to be completed in 2025. The seaport project has three main environmental targets: by 2020 carbon emissions will be lower than 1.5 tonnes per person; by 2030 the seaport will be free of fossil fuels; and the seaport will be adaptable to future changes in climate.

Stockholm's Energy Centre is part of a research and development project (Cerbof) addressing buildings from the 1960s and 1970s. The city is now planning to improve energy efficiency in social housing units built during the 1960s, including improved façade insulation.

Transport: Stockholm ranks first overall in the transport category. A high proportion of people walk or cycle to work and the cycle network is well developed. The public transport system is highly established, with commuter trains, subway trains, light rail and buses, but its length and take-up remain under average, although this is gradually being improved. Stockholm has the highest percentage of clean vehicles in Europe, and 75% of the public transport network in the city runs on renewable energy. Stockholm introduced a permanent congestion tax in August 2007. The tax has reduced car traffic to and from the inner city by around 20%. Moreover, the reduction in emissions from the congestion tax has been calculated to be around 30,000 tonnes of CO_2 in 2006.
Initiatives: Construction is underway to build new infrastructure to increase the capacity of the public transport system. Citybanan is a double-track railway running through a tunnel. When complete, it will double the capacity of rail services through Stockholm. It will also have an impact on rail traffic to the rest of Sweden. The estimated cost for Citybanan is €1.7 billion.

To decrease emissions, the Clean Vehicles in Stockholm initiative, which promotes hybrid and biofuel-powered vehicles, has the objective of reaching a market breakthrough (5%) for clean vehicles. The total turnover for the project is approximately €1.5 million per year. The initiative's goals are that by the end of 2010 all the municipality's own vehicles will be clean and that 35% of new-car sales will be of clean vehicles. The initiative is part of Stockholm's long-term plan to be fossil fuel-free by 2050.

Water: Stockholm ranks in joint 16th place in the category for water, on account of its high water consumption and poor water-efficiency policies. Stockholm's residents consume almost 186 cubic metres of water per year, well above the 30-city average of 105 cubic metres. Lower water consumption is not actively encouraged, partly because Stockholm has water in abundance and it is cheap to produce. Yet water is of a high quality, produced by treating water from nearby Lake Malaren. Water system leakages are below the European average and 100% of the city's inhabitants are connected to a wastewater treatment plant. The wastewater from Stockholm and some neighbouring municipalities is treated in two wastewater plants. Biogas is produced and then used in fuel for local transportation and the excess heat in the sewage water is recovered for domestic heating.
Initiatives: A strategic programme of water management was adopted by Stockholm City Council in June 2006, setting standards for cleaner water and outlining methods by which this could be achieved. The Stockholm Water Programme 2006-15 has two main objectives: one being that the city will meet the requirements stipulated by the EU's directive on water by 2015, and the second that its lakes and watercourses shall be attractive recreational areas for all. This means that waterways and recreational areas will be retained and developed.

Between 2006 and 2015 the Stockholm Water Company (municipally owned) will improve the sewer system in order to reduce the risk of surface water overflowing into the system. The budget for this measure is Skr49.7 million (€4.7 million).

Waste and land use: Stockholm ranks eighth in the category for waste and land use. Its score is attributable to its sizeable municipal waste production, which is above the European average, at 597 kg per inhabitant per year. Nevertheless, Stockholm has had a sophisticated green waste policy for many years; in 2007 some 31% of municipal waste was recycled, 59% was incinerated for energy recovery and 10% was sent to

Stockholm's urban development showcase

Hammarby Sjostad has been Stockholm's largest environmental project to date and a high-profile case study in sustainable urban development. Started in 1990, the aim was to redevelop an old and run-down industrial area into a highly energy efficient and environmentally conscious neighbourhood. Once completed in 2016, over 10,000 residential units will house some 25,000 people. It has a wide range of environmental goals and aspirations. Its buildings are about twice as efficient as others in Stockholm. It makes good use of wind, solar and hydro power, as well as other efficient technologies, including district heating and cooling. One of its goals is to base its entire heating energy supply on either waste energy or renewables. From a transport perspective, it aims for 80% of all passenger journeys to be via public transport, walking or cycling. The area also features clean and efficient water and sewage systems; its water consumption target is 100 litres per head per day. Waste is collected by a vacuum suction system, which carries refuse to a central collection station. It reuses local combustible waste in a combined heat and power plant, while biogas from a local wastewater facility is used for transport fuel.