to a relatively well engrained culture among residents of sorting waste.

Initiatives: A federal strategy paper dating back to 1999 envisages that all municipal solid waste should be completely recycled and recovered by 2020 at the latest. Berlin is planning to help meet that target by constructing a fermentation plant to recover organic waste, and by further extending of its Yellow Bin Plus scheme whereby metal, plastic and wooden objects and small electrical appliances can all be collected for recycling.

A waste-treatment plant in the Reinickendorf district converts domestic waste into pellets that can be used as high-quality fuel at conventional district heating or coal-fired power plants. This reduces the waste sent to landfills and cuts disposal costs.

The city Landscape Programme envisages 16 new parks and 450 km of grass links. Under the General Urban Mitigation Plan of 2004, any impairment of nature and landscape from development must be compensated for by ecological interventions elsewhere.

Air quality: Berlin ranks in eighth place in the category for air quality, which is closely monitored by the city. Quality has benefited from the shift away from industry, but also from the lacklustre economy, which has restricted car use. However, the health of Berlin's woods, which is an excellent indicator of air quality, does not seem to have been moving in a sustainable direction. The overall percentage of undamaged trees fell from 21% in 2000 to just 10% in 2007, while the percentage of moderately and severely damaged or dead trees rose from 24% in 2000 to 32% in 2007.

Initiatives: Berlin's environmental zone, introduced in 2008 (see highlight project) aims to improve air quality by substantially cutting the nitrogen oxide emissions and particles attributable to traffic.

Environmental governance: Berlin ranks ninth in the category for environmental governance, reflecting the openness of its plans and strategies, but also its underlying problems. Environmental issues are taken seriously throughout the German political system and environmental protection is an objective under the 1995 Berlin constitution. Berlin also benefits from the clear allocation of responsibilities between the Senate and district administrations. Land use planning issues have since been co-ordinated by a Berlin-Brandenburg land planning conference (PLAKO) and a regional planning council (RPR).

Initiatives: In October 2008 the Berlin Climate Alliance, a joint initiative between the city and local companies, was launched with an aim of stimulating co-operation on climate change projects.

Quantitative Indicators: Berlin

	Average	Berlin	Year	Source
CO_2 emissions per capita (tonnes/inhabitant)	5.21	6.57	2006	Berlin energy report (CO_2 emissions); Berlin statistical yearbook (population)
CO_2 emissions per unit GDP (g/€)	356.12	295.95	2006	Berlin energy report (CO_2 emissions); Berlin statistical yearbook (GDP)
CO_2 reduction target to 2020 (% pa, from yr in which target set)	14.48	40.00	2008	City of Berlin
Energy consumption per capita (GJ/inhabitant)	80.87	77.70	2006	Berlin energy report (energy); Berlin statistical yearbook (population)
Energy consumption per unit GDP (MJ/€ GDP)	5.25	3.50	2006	Berlin energy report (energy); Berlin statistical yearbook (GDP)
% of renewable energy consumed by the city (%)	7.30	1.84	2006	Berlin energy report
Energy consumption of residential buildings (MJ/m²)	908.88	556.88	2006	Berlin energy report (energy); estimate based on census from 2002 (floor space)
Share of people walking or cycling to work (%)	20.94	15.10	2004	Urban Audit
Share of people taking public transport to work (%)	41.56	39.70	2004	Urban Audit
Length of cycle lanes (km/km²)	1.15	0.70	2006	Berlin city administration
Length of public transport network (km/km²)	2.33	1.02	2006	Berlin city administration
Annual water consumption per capita (m³/inhabitant)	105.43	55.55	2007	Berlin statistical yearbook
Water system leakages (%)	22.63	5.16	2007	Calculation on the basis of data from Berlin statistical yearbook
Dwellings connected to the sewage system (%)	95.02	98.50	2004	Urban Audit
Municipal waste per capita (kg/inhabitant)	510.93	474.82	2007	City of Berlin - waste balance
Share of waste recycled (%)	17.62	35.00[1]	2004	City of Berlin - waste balance
Average daily nitrogen dioxide emissions (ug/m³)	35.18	28.53	2005	EEA airbase
Average daily ozone emissions (ug/m³)	40.38	42.73	2005	EEA airbase
Average daily particulate matter (ug/m³)	34.86	25.32	2005	EEA airbase
Average daily SO_2 emissions (ug/m³)	6.96	5.31	2006	EEA airbase

1) More recent data do not distinguish between recycled and incinerated for energy recovery. Believed to have stayed broadly steady.

European Green City Index | Berlin_Germany

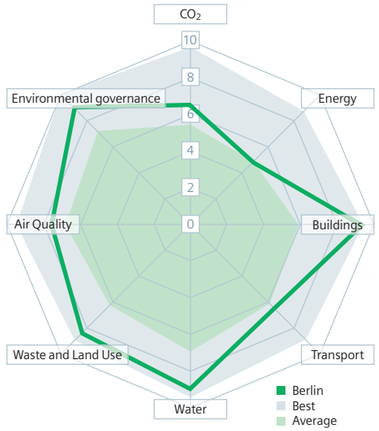
Berlin_Germany

Photography: Andreas Schoelzel for Siemens

Select city data

Population:	3.4 million
GDP per head, PPP:	€ 21,561
CO_2 emissions per head:	6.57 tonnes
Energy consumption per head:	77.7 gigajoules
Percentage of renewable energy consumed by the city:	1.84 %
Total percentage of citizens walking, cycling or taking public transport to work:	54.8 %
Annual water consumption per head:	55.55 m³
Share of waste recycled:	35 %

Berlin is Germany's capital and the country's most populous city, with some 3.4 million inhabitants within its city limits. The city was physically and politically divided by the Berlin wall until 1989, resulting in substantially different degrees of development between the Western and Eastern parts until reunification in 1990. This has had important implications for Berlin's environmental impact, with significant improvements in carbon dioxide (CO_2) and other emissions since the closure of much of East Berlin's industry, as well as upgrading of its housing stock. Today, the city's economy is primarily based on services, encompassing various media and creative industries, tourism, life sciences and pharmaceuticals and conferences, among others. Nevertheless, relative to other German cities, unemployment is high and more than 20% of its tax revenue is allocated to servicing the city's high debt levels (in excess of €60 billion). Berlin is ranked eighth overall in the European Green City Index, with a score of 79.01 out of 100, outperforming other large cities such as London and Paris. This is a creditable achievement in the light of the city's difficult history and the financial stringency under which it has to operate. The city performs exceptionally well in the categories of buildings and water. It also performs well on waste and land use, but is set back to some degree by its performance on CO_2 emissions, energy and transport. On these latter characteristics, it rates at the bottom end of the index when compared with other rich cities. This is partly because of its lower revenue base relative to other wealthy countries. Furthermore, as the city has moved decisively away from industry, which produced only 16% of GDP in 2007, to services, which produced 72% of GDP, its emissions performance could be better.



Energising alliances

In 1996 the City of Berlin instituted the Berlin Energy Saving Partnership (Energiepartnerschaft Berlin), a joint initiative by the city and the Berlin Energy Agency. The city receives a guaranteed 25% saving on its annual energy costs, while the partners provide financing and expertise to improve the energy efficiency of properties. Over 6% of these savings are delivered directly to the city budget, while the rest are used to finance the modernisation and optimisation of these buildings. In return, the partners receive any savings achieved over and above the amount guaranteed to the city, while the city retains ownership of any newly installed equipment. Once the 12-year contract period is complete, all energy savings achieved will directly benefit the city. The refurbishment of schools, day-care centres, universities, administrative buildings, and public swimming pools has amounted to annual savings of €11 million in energy costs. This initiative has made Berlin a model city for energy-saving programmes in public buildings.

CO_2 emissions: Berlin is ranked just 13th in the category for CO_2 emissions, but has performed well. It has already reached its original target of a 25% reduction in emissions by 2010, and is now setting a target of a 40% reduction, compared with 1990 levels, by 2020.The city's pattern of emissions has been dominated by the impact since unification of industrial closures, by the move away from coal-fuelled towards gas-fuelled electricity generation, but also by major efforts on improving the energy efficiency of the housing stock — particularly in former East Berlin — and by the city's lacklustre economic performance. One striking statistic is the reduction in the number of coal stoves, which fell from 400,000 in 1990 to fewer than 60,000 in 2008. The overall result has been a reduction in Berlin's CO_2 emissions from 29 million tonnes in 1990 to 23.5 million tonnes in 2004.
Initiative: The €300 million rebuilding of the Berlin-Mitte power station has resulted in nearly 90% of its primary energy being converted into electricity and district heating for more than 60,000 dwellings and 500 public buildings.

Energy: Berlin ranks 13th in the category for energy. As of 2006, 58% of Berlin's electricity comes from coal, 39% from natural gas, and 1% each from oil, waste and renewables. The city benefits in part from western Europe's largest district heating network, but is suffering from the fact that 43% of that heating was still generated from coal in 2006. This network extends to 1,300 km, has a capacity of some 6,000 mw and covers more than 615,000 of Berlin's nearly 2 million households. The city's Berlin-Mitte power station is powered by natural gas. In addition, a wood-fired power station at Berlin-Rudow, burning wood chippings mainly from the city itself, has been supplying some 360,000 mwh of district heating annually to Gropiusstadt, in southern Berlin, since 2004.
Initiatives: Under a 1997 agreement between the Berlin Senate and the Berlin business community, 75% of all new buildings constructed in any given year must include solar thermal strategies in their design.

Solar energy, rather than biomass, geo-thermal or wind, is viewed as the prime potential source of renewable power for the city. Berlin's Senate has a mid-term target of raising the supply from photovoltaic sources to 10 mw. The city does not, however, have the money for direct investment, and the chosen approach is "energy partnerships" with partners including the Bezirke (communes), enterprises and universities.

Buildings: Berlin ranks first in the category for buildings, largely because of its progress in improving the energy efficiency of the housing stock over the past two decades. Although the second world war resulted in the total destruction of 600,000 Berlin dwellings, 50% of the current stock still predates 1950. Of this, 87% of dwellings are rented flats and 90% are in multi-storey buildings. The standard of post-war repair was variable and much of the new building in the East, notably that of the 273,000 dwellings of slab construction, was extremely energy inefficient. Its improvement was a major priority after unification. The updating of Berlin's housing blocks of slab construction is resulting in a reduction in energy consumption from 150 kWh to 80 kWh per year and per square metre. The city's energy consumption for residential buildings is far below the 30-city average, and Berlin far outperforms other large cities in this category.
Initiative: The Berlin Solar Campaign, launched in 2000 by the Berlin Senate's department of administration for urban development, offers grants for solar panel installations, financed from over €2 million set aside by Investitionsbank Berlin (IBB), within the Senate's modernisation and maintenance programme for housing construction support. The agreement has resulted in the installation of what is believed to be Europe's largest photovoltaic system on a residential building: 426 square metres on a 22-storey housing association block in Berlin-Marzahn. This was part of an overall refurbishment of the building that upgraded the building's automation systems, cutting living costs for local residents.

Transport: Berlin ranks 12th in the category for transport, scoring highly in its efforts to promote green transport, but falling behind when it comes to the size and use of non-car transport. The Berlin Land Use Plan envisages that 80% of travel needs in the inner city will be met by public transport, and there are in addition 850 km of cycle routes. However, the index data records that just 40% of people are taking public transportation to work, meaning that current uptake is at only 50% capacity. The city's financial constraints have long delayed not only the controversial U-Bahn extension under the parliamentary and government quarter, but also the extension of the East Berlin tram network back into the western part of the city, barring one short addition.
Initiatives: In partnership with energy supplier, Vattenfall, and BMW, Berlin started an electric vehicle trial this year, with 50 Mini-E electric vehicles capable of being charged via public energy dispensers. To ensure that the cars are genuinely emission free, Vattenfall guarantees that both the public recharging stations and the drivers' homes will be supplied solely with certified "green" power. The federal government envisages up to 1 million electric cars on German roads by 2020.

Berlin has implemented a traffic-management centre, which links data from traffic computers, traffic lights, infrared sensors and video cameras from all over the Berlin metropolitan area. This system provides users with up-to-date information, statistical data and traffic forecasts, via the Internet and public electronic information boards.

Water: Berlin ranks third in the category for water, largely because of the efficiency with which it is managing its resources. Water leakage from the supply system is low at 5.2%. The provision of water meters and the promotion of low-consumption appliances are the norm, and the latter, together with changes in lifestyle, are furthering a highly sustainable trend. The supply and consumption of drinking water has been falling with remarkable steadiness ever since 1991. The reductions are marked: supply has fallen from some 292 million cubic metres in 1991 to 196 million cubic metres in 2007. Domestic daily consumption per person likewise fell from 140 litres in 1991 to 111 litres in 2007.

Waste and land use: Berlin ranks fourth in the category for waste and land use, because of its success in reducing waste and promoting recycling, and because of its progressive approach to treatment. The amount of waste generated fell sharply from 2.3 million tonnes in 1992 to just 900,000 tonnes in 2007. The total amount of recycled waste similarly increased significantly between 1992 and 2001, but has fluctuated around the 2001 level of some 650,000 tonnes since. Waste management is conducted within the framework of a five-year strategy and an overall ten-year plan, by Berliner Stadtreinigungsbetriebe (BSR), a statutory body owned by the city. About 35% of waste is recycled, well above the 30-city average of 18%, in part thanks

Establishing Berlin's environmental zone

On January 1st 2008 Berlin introduced an environmental zone, banning vehicles with highly polluting emissions from the 88 square kilometre inner-city area within the suburban railway ring. The city's Senate calculated that the restriction would at first apply to fewer than 7% of the 1.2 million vehicles then registered in Berlin. It was motivated by the discovery that limit values for fine dust (PM10) and nitrogen dioxide (NO_2) were being exceeded in many major streets, and that about 40% of this was attributable to traffic. In many streets, about 80% of NO_2 pollution was directly attributable to vehicles.
The restrictions in Berlin employ the four pollutant classes recognised under the German federal government's marking ordinance, which regulates the use of windscreen stickers to indicate the level of pollution emitted by the type of vehicle. Under stage one, effective from the outset of the scheme, vehicles must bear a red, yellow or green sticker to indicate that they meet the requirements of at least pollutant class 2, based on the European Commission's "euro" standard of vehicle emissions. Under stage two, effective from January 1st 2010, vehicles must bear a green sticker to indicate that they meet the requirements of pollutant class 4, a stricter standard. The stickers are valid in any German environmental zone. Unlike London's congestion charge, there is no toll for vehicles driving into Berlin, barring the one-off €5 charge for the appropriate sticker.
Early results suggest that traffic volumes have declined as a result of the scheme, while the number of euro IV-compliant vehicles has risen. By end-2008 traffic exhaust particles had dropped sharply, by nearly one-quarter, while NO_2 emissions had also fallen.