Latin American Green City Index

Assessing the environmental performance of Latin America's major cities

A research project conducted by the Economist Intelligence Unit, sponsored by Siemens

Contents

Expert advisory panel

A panel of global experts in urban environmental sustainability advised the Economist Intelligence Unit (EIU) in developing the methodology for the Green City Index, including the Latin American Green City Index and forthcoming Indexes in other regions. The EIU would like to thank the panel for their time and valuable insight.

Brunella Boselli
Statistician, Regional Development Policy Division, Organisation for Economic Cooperation and Development (OECD)

Brunella Boselli has been with the regional development policy division of the OECD since 2003. She is responsible for regional statistics, and is one of the authors of the flagship publication "OECD Regions at a Glance". She has recently developed the OECD Metropolitan Database, which contains socio-economic data for 82 metropolitan areas, and is currently working on a new OECD territorial definition for metropolitan regions.

Gordon McGranahan
Head of Human Settlements Group, International Institute for Environment and Development

Gordon McGranahan currently directs the Human Settlements Group at the International Institute for Environment and Development. Trained as an economist, he spent the 1990s at the Stockholm Environment Institute, in charge of their Urban Environment Programme. He works on a range of urban environmental issues, with an emphasis on addressing poverty and environmental problems in and around the home, and how the critical scale of urban environmental burdens changes as cities become wealthier. Key publications include: "The Citizens at Risk: From Urban Sanitation to Sustainable Cities" and "The rising tide: Assessing the risks of climate change and human settlements in low-elevation coastal zones". He was the convening lead author of the urban systems chapter of the Millennium Ecosystem Assessment.

Mary Jane C. Ortega
Secretary General CITYNET

Mary Jane C. Ortega is the former mayor of the city of San Fernando, Philippines, and served the city from 1998 to 2007. She is now the secretary general of CITYNET, a network of 119 member cities and NGOs that works to improve living conditions in human settlements in Asia-Pacific. She was the charter president of the Solid Waste Management Association of the Philippines, and was recently elected back to the position of president. She was a member of the executive committee of the United Nations Advisory Council on Local Authorities (UNACLA) from 2000 to 2007. She received the UN-Habitat Scroll of Honour Award in 2000.

Hiroaki Suzuki
Lead Urban Specialist and Eco^2 Team Leader, Corporate Finance Economics and Urban Department, World Bank

Hiroaki Suzuki has more than 20 years of operational experience in the infrastructure sector and public sector at the World Bank. Having worked in the East Asia and Pacific Region, as East Asia urban sector leader and China urban sector coordinator for the last five years, he joined the Bank's Corporate Finance Economics and Urban Department in 2009 as lead urban specialist and Eco^2 team leader. He is the main author of "Eco^2 cities: Ecological Cities as Economic Cities" (www.worldbank.org/eco2).

Pablo Vaggione
Founder, Design Convergence Urbanism

Pablo Vaggione is an urban specialist with over 15 years of experience. His cross-sector and multidisciplinary approach provides cities and actors in urban development with integrated, strategic and practical plans to respond to the challenges of sustainable urbanisation. He has worked in East and South-East Asia, Western Europe, and Latin and North America, in the preparation of city development strategies, plans for the regeneration of historic urban areas, and sustainable development blueprints for new districts. He provides advice on urban issues to a number of multilateral organisations, local governments and companies. His work for Madrid received in 2007 the World Leadership Award. Between 2007 and 2010 he served as the Secretary General of the International Society of City and Regional Planners (ISOCARP), a professional organization of planners from 70 countries.

Sebastian Veit
Senior Climate Economist African Development Bank

Sebastian Veit is senior climate economist at the African Development Bank in Tunis. While at the organisation he has focused on green growth strategies in Africa and renewable energy issues. In 2007 he was a consultant to the United Nations Framework Convention on Climate Change, and from 2004 to 2007 he was a consultant with the World Bank in Washington DC. At the World Bank he specialised in energy and water.

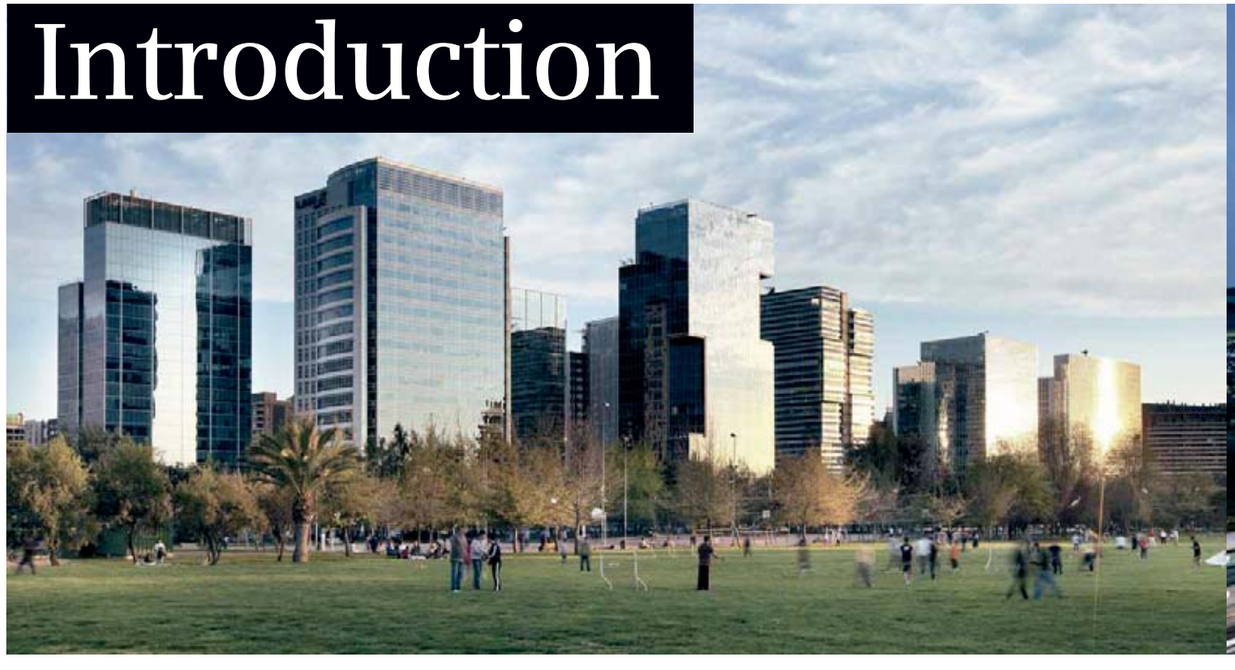
David Wilk
Climate Change Lead Specialist, Sustainable Energy and Climate Change Unit, Inter-American Development Bank

David Wilk joined the Inter-American Development Bank in early 2001 as an urban environmental senior specialist. His professional experience in Latin America and the Caribbean during the 1990s included a range of management and consulting activities with the World Bank, international organisations and consulting firms. His work with these organisations was in the area of land use and environmental planning, watershed management, sustainable urban transport and environmental assessment of development and infrastructure projects.

Nicholas You
Chairman, Steering Committee of the World Urban Campaign, UN-Habitat

Nicholas You is chairman of, amongst others, the Cities and Climate Change Commission of the World Future Council, and the Assurance Group of the Urban Infrastructure Initiative of the World Business Council for Sustainable Development. After running UN-Habitat's Best Practices and Local Leadership Programme for over a decade, he was appointed as the senior policy and strategic planning adviser of the agency. From 2007 to 2009 he led the development and roll out of UN-Habitat's strategic and institutional management plan. As part of that plan, he was asked in January 2009 to spearhead UN-Habitat's World Urban Campaign. Upon his retirement from the UN in July 2010, some 50 partners representing public, private and civil society institutions worldwide elected him as chairman of the Campaign's Steering Committee.

Introduction



The challenge of rapid urbanisation

Latin America's rural environmental challenges, such as Amazonian deforestation, often receive the most attention from the media, environmentalists and other observers around the world. Although these issues are certainly vital, urban environmental concerns such as traffic congestion, land use policies, waste disposal and air quality are more immediate to the majority of Latin America's residents, simply because 81% of the population already lives in cities. According to the United Nations Population Division, Latin America is the most urbanised region in the developing world. It is already more urbanised than some parts of the developed world. And the percentage of the population living in cities in Latin America is expected to rise further. By 2030, the figure will reach 86%, on a par with Western Europe.

The rapid rise in city populations has had economic, political and social implications, and environmental considerations are a major part of this integrated puzzle. To take one example, urban sprawl has put immense pressure on existing infrastructure, with implications for buildings, public transport, road networks, water quality and access, waste collection, and sanitation. The path of least resistance for development, meanwhile, has often been along existing highways, which encourages residents to use private cars, and contributes to deteriorating air quality. Environmental governance has also been affected, as growing cities now straddle multiple municipal jurisdictions.

The Latin American Green City Index, an Economist Intelligence Unit study, sponsored by Siemens, seeks to measure and assess the environmental performance of 17 major Latin American cities across a range of criteria. This report presents the key findings and highlights from the Index, and is intended to provide stakeholders with a unique tool to help Latin American cities learn from each other, in order to better address the common environmental challenges they face.

The report is divided into five parts. **First**, it examines the overall key findings, including an in-depth look at Curitiba, the regional leader. **Second**, it examines the key findings from the eight individual categories in the Index — energy and CO_2, land use and buildings, transport, waste, water, sanitation, air quality and environmental governance. **Third**, the report presents a variety of leading best-practice ideas from across the region. **Fourth**, it gives a detailed description of the methodology used to create the Index. **Finally**, an in-depth profile for each city outlines its particular strengths, weaknesses and ongoing environmental initiatives. These profiles rightly constitute the bulk of the report, because the aim of the study is to share valuable experience.

What the Index measures: Testing commmon perceptions

The 17 cities selected for the Latin American Green City Index include most major Latin American urban areas. They are both the capital cities of these countries as well as certain leading business capitals selected for their size and importance. The cities were picked independently rather than relying on requests from city governments to be included, in order to enhance the Index's credibility and comparability. Another decisive factor in the selection was the availability of data.

The methodology, described in detail in a separate section in this report, has been developed by the EIU in cooperation with Siemens. It relies on the expertise of both organisations, a panel of outside experts, and the experience from producing last year's European Green City Index. One of the great strengths of the Latin American Green City Index is the breadth of information it uses. There are 31 individual indicators for each city, and these indicators are often based on multiple data points. Value also comes from how the Index is presented. Each city is assessed in eight categories and placed within a performance band to indicate its relative results. The process is transparent, consistent, replicable, and reveals sources of best practice.

Some of the Index results, on first glance, may be surprising. São Paulo, for example, a city with a reputation for chronic traffic congestion and extensive urban sprawl, is ranked above average overall. Buenos Aires and Montevideo, however, two pleasant and beautiful cities, perform below average overall. Neither the Index nor these common perceptions are wrong — they rely on different information. Perceptions of cities are often based on subjective observations about quality of life, including factors such as beautiful architecture, recreation or cultural institutions. Residents' environmental perceptions, unsurprisingly, tend to focus on issues that are highly problematic and visible, such as traffic congestion, uncollected waste, or polluted air or rivers. The Index, on the other hand, measures environmental performance across eight categories — energy and CO_2, land use and buildings, transport, waste, water, sanitation, air quality and environmental governance — and gives equal weighting to each. The Index also evaluates policies, which are a reflection of cities' commitment to reducing their future environmental impact. Often it takes the public many years to recognise the effects of new policies. An example is Mexico City. The city is almost certainly better known for its air quality weaknesses than its strengths in transport policies, let alone its advanced eco-building policies; and therefore some might expect it to perform badly overall. The Index, however, because of what it is measuring, takes a different perspective.

Results

Here are the complete results for the 17 cities in the Latin American Green City Index, including the overall results and placements within the eight individual categories. The cities were placed in one of five performance bands, from well below average to well above average.

Overall Results

well below average	below average	average	above average	well above average
Guadalajara	Buenos Aires	Medellín	Belo Horizonte	Curitiba
Lima	Montevideo	Mexico City	Bogotá	
		Monterrey	Brasília	
		Porto Alegre	Rio de Janeiro	
		Puebla	São Paulo	
		Quito		
		Santiago		

Category results

Energy and CO_2

well below average	below average	average	above average	well above average
Santiago	Guadalajara	Belo Horizonte	Bogotá	São Paulo
	Medellín	Brasília	Curitiba	
	Montevideo	Buenos Aires	Mexico City	
	Porto Alegre	Lima	Rio de Janeiro	
	Puebla	Monterrey		
		Quito		

Transport

well below average	below average	average	above average	well above average
Brasília	Guadalajara	Belo Horizonte	Bogotá	Santiago
	Monterrey	Buenos Aires	Curitiba	
	Porto Alegre	Lima	Mexico City	
	Puebla	Medellín	Quito	
		Montevideo	São Paulo	
		Rio de Janeiro		

Water

well below average	below average	average	above average	well above average
Buenos Aires	Lima	Medellín	Belo Horizonte	
Guadalajara	Montevideo	Mexico City	Bogotá	
	Rio de Janeiro	Porto Alegre	Brasília	
		Puebla	Curitiba	
		Quito	Monterrey	
			Santiago	
			São Paulo	

Air Quality

well below average	below average	average	above average	well above average
	Bogotá	Guadalajara	Belo Horizonte	Curitiba
	Buenos Aires	Porto Alegre	Brasília	
	Lima	Puebla	Medellín	
	Mexico City	Rio de Janeiro	Quito	
	Monterrey	Santiago		
	Montevideo	São Paulo		

Land Use and Buildings

well below average	below average	average	above average	well above average
Lima	Medellín	Brasília	Belo Horizonte	
Montevideo	Quito	Buenos Aires	Bogotá	
		Curitiba	Mexico City	
		Guadalajara	Rio de Janeiro	
		Monterrey	São Paulo	
		Porto Alegre		
		Puebla		
		Santiago		

Waste

well below average	below average	average	above average	well above average
Brasília	Belo Horizonte	Guadalajara	Bogotá	Curitiba
	Buenos Aires	Mexico City	Monterrey	
	Lima	Rio de Janeiro	Porto Alegre	
	Medellín		Puebla	
	Montevideo		Quito	
			Santiago	
			São Paulo	

Sanitation

well below average	below average	average	above average	well above average
	Bogotá	Belo Horizonte	Brasília	Medellín
	Buenos Aires	Porto Alegre	Curitiba	
	Guadalajara	Puebla	Monterrey	
	Lima	Rio de Janeiro	Santiago	
	Mexico City		São Paulo	
	Montevideo			
	Quito			

Environmental Governance

well below average	below average	average	above average	well above average
Guadalajara	Belo Horizonte	Buenos Aires	Bogotá	Mexico City
	Lima	Medellín	Brasília	Rio de Janeiro
	Monterrey	Puebla	Curitiba	
	Porto Alegre	Quito	Montevideo	
		Santiago		
		São Paulo		

Overall key findings

Curitiba: A class apart

Curitiba, a long-time sustainability pioneer in the region, is the clear leader in the Index. The birthplace of "bus rapid transit" (BRT) and Brazil's first major pedestrian-only street, Curitiba is the only city in the Index to rank well above average overall. It achieves this unique distinction in two individual categories, air quality and waste, and places above average in five others. The city's environmental oversight is consistently strong too, and it also has, with only a few exceptions, among the best policies in each category. Since 2009, for example, the city's environmental authority has been conducting an ongoing study on the CO_2 absorption rate in Curitiba's green spaces, as well as evaluating total CO_2 emissions in the city. It is working to relocate those living in informal settlements to low-cost housing — where sanitation, waste collection, and water are easier to supply. The state water company operating in Curitiba has also extended water services and sewerage connections to all of the 1,790 households in the informal settlement, "Vila Zumbi dos Palmares", which is located along the banks of one of the city's main water sources. The key reason for Curitiba's outstanding performance is a long history of taking a holistic approach to the environment, which, as the Index demonstrates and experts confirm, is unusual in the rest of the region. As early as the 1960s, faced with rapid population growth, city officials implemented proposals to reduce urban sprawl, create pedestrian areas, and provide effective, low-cost rapid transit. The city's BRT has since become a model for a number of Latin American cities. By the 1980s, the urban plan involved integrated initiatives that addressed issues such as the creation of green areas, waste recycling and management, and sanitation. This integrated planning allows good performance in one environmental area to create benefits in others: part of the reason for Curitiba's well above average placing in air quality is successful public transport, and its performance in each category is linked to the holistic approach. The city's strategy has received praise from experts, including Nicholas You, urban environmental specialist (see interview later in this report). Furthermore, concern about environmental issues became as much a part of citizens' identities as it is in cities such as Copenhagen and Stockholm, which led the European Green City Index. Politicians in Curitiba cannot simply react to immediate environmental crises; the public expects them to look ahead.

Brazilian cities: Leading the way on policy

Five of the six cities that finish above average or well above average overall in the Index are from Brazil — Belo Horizonte, Brasília, Curitiba, Rio de Janeiro, and São Paulo. Although the cities have a very high share of hydropower, which gives them an advantage in their energy and CO_2 performance, on the surface they do not have any other particular shared strengths. The performances of the individual Brazilian cities vary widely within the categories. The best example of this is in the waste category, where Curitiba is well above average and Brasília well below.

However, there is one overriding asset that is common among the Brazilian cities, including Porto Alegre: strong environmental policies. This point comes through clearly when the quantitative indicators are removed from the analysis. Five of the six Brazilian cities perform at least as well, and often significantly better, when only the policy indicators are assessed. São Paulo, for example, has one of the most robust climate change action plans in the Index. Belo Horizonte performs well for its eco-buildings, water and air quality policies, while Rio de Janeiro stands out for its clean energy policies. The exception is Brasília, which drops from above average to average overall when only policy indicators are taken into account, largely because it scores very well on certain quantitative indicators such as the amount of wastewater treated, green spaces per person and average daily concentrations of air pollution. But even Brasília performs well for regulations on urban sprawl and protecting green spaces.

This common strength comes as no surprise to experts. Brazilian concern with environmental policy dates back several years. Article 23 of the 1988 constitution, for example, granted municipalities the power, along with the national and state governments, "to protect the environment and fight pollution in any form", and "promote ... the improvement of housing and basic sanitation conditions". Three years later, in 1991, Rio de Janeiro hosted the first Earth Summit, and the country created its national Ministry of the Environment. Since then environmental issues have received a growing policy priority in Brazilian cities. This does not mean instant, visible solutions to long-standing challenges: many environmental issues can take decades to address. Nevertheless, it is an indication of a stronger, current performance as well as an indication of likely future improvements in the situation on the ground.

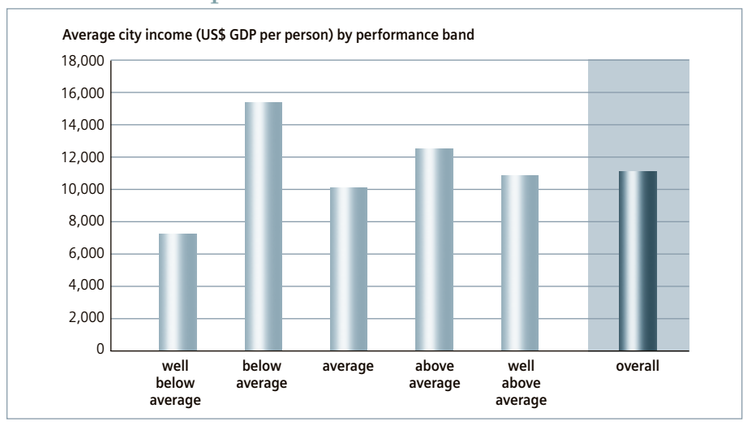
Environmental performance and income: The missing link in Latin America

One surprising finding when examining the overall results is that there is no clear relationship between overall environmental performance and city income in the Index, defined in the Index as average GDP per capita (see chart on page 12). For example, average income for Curitiba, which ranked well above average in the Index overall, is within 15% of the income figures for three other cities with widely differing performances: Rio de Janeiro, at above average; Porto Alegre, at average; and Guadalajara at well below average. This contrasts sharply with the strong link between environmental performance and GDP per person found in similar EIU studies in other regions, including the European Green City Index and initial research taking place in Asia. These studies involve cities with a wider income range than in the Latin American Index, but that does not explain the absence of a link between GDP and environmental results: in the other studies, the correlation is clear even just for those cities that fall into Latin America's smaller income range.

Latin Americans have not completely suspended the laws of economics, as Professor Roberto Sánchez-Rodríguez, professor at the University of California, and an expert on urban environmental issues, points out. "Richer cities have more resources, and with growing income there is a trend in the population to become

more aware of environmental issues and to consider them important," he says. More income can have the opposite effect in some cases too though. When richer citizens buy more cars, for example, it can diminish the city's environmental performance. In poorer cities that lack basic infrastructure, there is no doubt either that money would go a long way to solving some environmental problems. The results of the Index as a whole, however, indicate an unclear relationship between wealth and environmental performance. This suggests that something else is impeding wealthier cities from using money alone to improve their environmental results.

Environmental performance and income: no clear trend



One problem at a time: In search of the holistic approach

Much of the answer to the muted effect of income in Latin America lies in how cities have responded to rapid population growth and the resulting urban sprawl. The Mexico City metropolitan area, for example, went from roughly 11 million to 18 million people between 1975 and 2000. Similarly, between 1970 and 1990, São Paulo's metropolitan area population expanded by nearly 90% from 8.1 million to 15.4 million. Medium-sized cities are facing less growth in absolute numbers, but still very substantial percentage increases. Medellín has grown by roughly 16%, to 3.5 million, in the same period. Urban sprawl has of course followed. For example, UN Habitat reports that Guadalajara grew in area by over 65% between 1990 and 2006 — an average annual rate of 3.2%, or about 1.5 times faster than its population was increasing during the same period. As a result, officials are left playing catch-up. Even in the wealthier cities, they tend to fix the most immediate problems only when there is a strong political demand for a solution, rather than to engage in comprehensive actions or forward planning. "Until there is some kind of crisis — it could be a political one because of protests or because an agency can't provide a service or runs out of money — environmental issues are not high on the list of priorities and not much gets done," says Professor Alan Gilbert of University College London, an expert on Latin American urbanisation and the environment. This ad hoc problem-solving approach means that certain areas in particular get ignored. In practice, he says, this approach means that when it comes to issues like sanitation, for example, a sewerage system is going to come before wastewater treatment.

This ad hoc approach becomes clear in another surprising finding in the Index — the wide variety of city performances across Index categories. Twelve of the 17 cities had at least one above average and one below average category ranking. The others varied between average and well above or well below. Prof Gilbert has also observed this trend. "The difficulty is that they are all doing differently on different criteria," he says.

Urban sprawl has also put limits on policy options. As detailed below and in the city profiles, vehicle numbers are having negative effects not just on transportation but on air quality and greenhouse gas emissions. The sheer size of certain Latin American cities has made some officials very reluctant to tackle vehicle usage. In fact, the way cities are arranged has fostered economic interests and cultural attitudes highly favourable to the automobile. When Bogotá's mayor introduced a BRT system some years ago, he faced a taxi driver strike; and after he introduced further regulations restricting automobiles, he was nearly impeached. Another consequence of urban sprawl has been that many larger cities have now grown to cover several municipal jurisdictions, with the different local governments sometimes in the hands of opposing political parties. Prof Sánchez-Rodríguez explains that bringing these stakeholders together, or even getting them to agree on a common vision for the city, is difficult. As a result, not only is it harder to go beyond solving immediate, very local problems, but it is also more difficult to access the economic resources of the whole city.

Looking to the future, the environmental challenges for Latin American urban areas will grow. Experts predict that cities, especially medium-sized ones, will increase in population and area. This new urban space is already encroaching on environmentally marginal land. Infrastructure will come under increasing pressure from larger populations and the extreme weather effects of climate change, including flooding, droughts and storms. In addition, the growth of cities outside of the formal planning framework will also continue. Addressing these challenges will require a broad, long-term vision, and it is the intention of this report to provide examples of strategies and best practices that will help cities adopt a long-term broad vision for environmental sustainability.

Key findings from the ca tegories

Energy and CO_2

The energy and CO_2 category only takes into account emissions from electricity consumption, due to a lack of reliable data on the overall energy consumption per city. Because of this, Latin American cities in the Index tend to score well on CO_2 emissions, since many rely heavily on hydropower. This advantage, however, seems to reduce their focus on emissions reduction policies.

→ Nine of 17 cities derive more than 80% of their electrical energy from renewable sources. São Paulo for example relies entirely on hydropower and has no greenhouse gas emissions from electricity production at all, contributing to its well above average performance in this category.

→ Conversely, four of the cities have no climate change action plan at all. The plans of five others cover greenhouse gas emissions from only a single specific activity, such as transport, without addressing other areas such as energy, buildings, or waste.

→ Only seven of 17 environmental departments have energy issues within their environmental remit, and just ten have climate change. Sometimes overlapping jurisdiction is the reason. In Mexico, for example, the state governments guide most environmental policy at the municipal level.

→ Often those cities with the most renewable energy tend to have the weakest climate change policies. Of the nine cities with over 80% renewable energy, only three score better than average in this Index category. São Paulo's performance, on the other hand, comes from combining renewable energy with strong clean energy policies and a robust climate change action plan.

Land use and buildings

The Index suggests that Latin American cities try harder to guard existing urban green spaces rather than create new ones. They do less well, however, on creating environmentally friendly buildings. Widespread population growth may be an influence in both cases. Urban sprawl, especially informal settlements, makes protection of green spaces a political imperative, but the need to house so many makes tough building standards problematic.

→ Policies on green spaces are widespread. All 17 cities have at least some kind of protection of green spaces and environmentally sensitive areas, and all but one make some attempt to stop urban sprawl.

→ The continuing growth of these cities, including the frequent encroachment of informal settlements into environmentally sensitive areas, however, suggests that such policies, while necessary, may not always be effective.

→ Only nine cites have full or partial eco-building standards. Just five have full regulations in place to motivate households and business to lower their energy use.

→ Only four fully promote citizen awareness on ways to improve the energy-efficiency of buildings.

→ Climate change action plans address energy and emissions issues in buildings in just five cities.

Transport

Many Latin American cities have successfully set up extensive public transport systems. However, they have not performed as well on the more sensitive challenge of getting people out of their cars. But those efforts are necessary to address the region's deeply entrenched culture of individual transportation.

→ Cost considerations have shaped the region's public transport networks. Notably, Curitiba gave birth to "bus rapid transit" (BRT) systems, and most cities now either have them or are building them. In addition, cities with higher population densities, where systems are easier to establish and more cost effective, tend to have longer networks. Yet only eight cities in the Index have fully comprehensive mass transit policies or well integrated pricing.

→ Policies to reduce the number of cars on the road are rare. Just two cities have park and ride schemes. None currently has carpooling lanes. Only Santiago, rated well above average in this category, has a congestion charge.

→ Comprehensive public transport networks are only part of the solution to reducing reliance on cars. Index figures indicate that the number of vehicles per person in a city goes up with income per capita, independent of the quality or size of the public transport system.

Waste

The cities in the Index do well on the essentials of waste disposal. According to official data, fourteen cities collect and dispose over 95% of waste, and for eight cities the figure is 100%. The overall average for all 17 cities is 96%. The apparent near universality of waste collection suggests that, in at least many cases, waste generated by residents of informal settlements does not appear in these figures. Nevertheless, cities do well in collecting waste from recognised districts.

→ Waste generated per person, at an Index average of 465 kg per year, is noticeably lower than the figure in last year's European Green City Index, at 511 kg per year.

→ Once past the provision of basic waste collection, a divide opens up. Most cities have only partial industrial or hazardous waste disposal strategies or illegal waste-disposal monitoring.

→ The city portraits show wide variations when it comes to recycling. Some cities, including the category leader, Curitiba, have extensive, effective recycling systems. In some other cases, though, although programmes exist, these are basic and minimal.

Water

The region's cities generally take water quality very seriously. They pay somewhat less attention to maintaining water infrastructure, because it may be possible to overlook some problems as long as residents get clean water.

→ Ninety-eight percent of residents of cities in the Index have access to potable water. This may not include residents of informal settlements in some cases, but typically water companies have been active in extending service to such areas.

→ Adoption and monitoring of water quality policies and standards are widespread.

→ The region also does well on efficiency. Cities in the Index consume on average 264 litres per person per day, which is low compared to the European average of 288 litres per person per day. In some cities this low consumption is because of supply constraints. In others, years of encouraging conservation are bearing fruit. Such efforts are common, and every city engages in them to some degree. But beyond exhortation and water meters, which are present in 13 of 17 cities, more concrete efficiency steps are rare.

→ Leakage, on the other hand, is high, at an average of 35%. Surprisingly, city leakage rates do not correlate at all with GDP per capita and therefore, presumably, infrastructure budgets. It is possible that the high figures reflect unregulated water use by residents of informal settlements. Also, with a few notable exceptions, most Index cities do not face high levels of water stress, so leakage may not be perceived as a pressing issue.

Sanitation

The region sees a sharp division between the provision of sanitation services and what authorities do with the wastewater once collected. While lack of access to sanitation is a social and political issue, as well as an environmental one, wastewater being pumped into rivers and the ocean has less political impact than neighbourhoods without services.

→ On average 94% of residents in cities in the Index have access to sanitation, and for 13 cities the figure is over 90%. Although the high proportion may leave out some in informal settlements, it reflects concerted efforts to connect most households, often including those in recognised and unrecognised areas.

→ Wastewater treatment, on the other hand, is very poor. On average only 52% of wastewater is treated, and eight of 17 cities treat less than half their water. Two treat none.

→ Only five cities have evaluated sanitation as part of a baseline environmental review in the last five years. This means it is the environmental area in the Index that receives the least official examination.

→ Part of the problem is that wastewater treatment can be expensive. Medellín is the only city ranked well above average on sanitation, and it has invested heavily over the last 15 years.

Air quality

Latin American cities recognise their all too obvious air quality problems and have active policies to address them. Nevertheless, the car culture remains an ongoing difficulty.

→ The region does relatively well on sulphur dioxide levels — the main source of which is typically fossil fuel combustion for power stations, notably coal. The average daily mean in the Index cities, 11 micrograms per cubic metre, is about half the World Health Organisation's (WHO) guideline maximum of 20 micrograms. Nitrogen dioxide, however, more generally associated with burning fuel in internal combustion engines, notably in cars, is a very serious issue. The average level in the Index, at 38 micrograms per cubic metre, comes worryingly close to the WHO maximum of 40 micrograms. This is a figure that eight cities equal or exceed. Particulate matter — with multiple sources, including road dust and industrial processes — tells a similar story. The average daily concentrations, at 48 micrograms per cubic metre, are only just under the WHO level of 50 micrograms. Seven cities exceed this figure. Only five of the 17 cities meet all three WHO guidelines.

→ Index cities take the issue seriously through policies. All monitor their air quality, and codes and air quality promotion in some form are also universal.

→ Many Index cities face specific topographic or climatic challenges that make it more difficult to improve air quality.

→ As the city profiles show, however, the big problem for many cities is vehicle traffic. Those with strong policies on car and truck emissions testing or the promotion of public transport tend to do better. Curitiba is ranked well above average, and its BRT system is often cited as a reason for its better air quality.

Environmental governance

The cities in the Index have formal environmental governance structures in place, but for certain ones these policies may be too constrained by other departments or overlapping jurisdictions to be truly effective.

→ All cities have environmental departments and involve stakeholders at least to some extent in decision-making on projects with major environmental impacts. Most also provide access to information through a central point.

→ Only 11 of 17 of these environmental departments, though, have the full capacity to implement their own policies. Just nine monitor and publish results on environmental performance every three years, and four have not completed baseline environmental reviews.

→ Limits also exist on what certain departments can do. Just seven monitor energy consumption in their cities and only 10 have climate change in their remits.

→ The city portraits suggest that part of the problem is the fractured state of governance in many cities, with power divided among different levels of government, different municipalities, or both.

Managing the city as a 'living organism'

An interview with Nicholas You, urban environmental expert

The path to greener cities, says Nicholas You, requires rethinking how we manage them. Holistic planning too often suffers from a sector-by-sector approach across competing jurisdictions, and policymakers fail to see the city as a single entity. Mr You is chairman of the Steering Committee of UN-Habitat's World Urban Campaign, a platform for private and public organisations to share sustainable urban policies and tools. He also leads several other global sustainable development initiatives, and served on the expert panel that advised the Economist Intelligence Unit (EIU) on the methodology for the Latin American Green City Index. He spoke to the EIU about the results of the Index, the difficulty of measuring the environmental impact of informal settlements and the necessity to administer cities as "living organisms".

The Index results seem to show that most Latin American cities address environmental issues on a case-by-case basis, often in response to a crisis. The notable exception is Curitiba, which was the only one of 17 cities to place well above average overall in the Index. What is preventing other cities from comprehensively addressing environmental challenges?
There are several obstacles, including short-term politics versus long-term planning, decentralisation and the lack of empowerment of local authorities, and overlapping jurisdictions. But there is one key issue: who is responsible for doing what? This is a pervasive problem throughout much of the world. Everybody is responsible for a slice of the problem — such as water, energy and transport — but nobody controls the bigger picture. Service providers work in splendid isolation, which is inimical to the holistic approach required to make our cities more sustainable. You mention Curitiba. Many would argue that Curitiba is an example of a city that has been doing for decades what all cities are supposed to be doing: namely top-down, long-term urban planning.

Informal settlements clearly affect a city's environmental footprint. Yet by their nature, informal settlements are not well covered by statistics. For that reason the Economist Intelligence Unit could not include data about informal settlements in the Latin American Green City Index in a way that was methodologically sound. How might this affect the overall environmental picture of cities in Latin America, and how exactly do informal settlements affect the environmental performance of a city?
Informal settlements are, by definition, unsustainable. They represent a high degree of social and economic exclusion. One of Latin America's most advanced thinkers of his time, Milton Santos, said that poverty is the worst form of pollution. Informal settlements are living proof that we are not planning our cities well.

Often cities report high levels of access to basic services, such as potable water, waste collection and sanitation, when the situation on the ground may be very different because of the presence of informal settlements. What are the implications for trying to get an accurate picture through data?
If you are looking at indicators, such as water consumption per capita or waste generation per capita, and leave out informal settlements, you're leaving out part of the picture. The water company has a remit, and the sewage company has a remit, and their remits do not typically include informal settlements. They rightly say "100% coverage", while the city as a whole may drop down to 70% access. Since the Green City Index is comparative within a region, that is, comparing Latin American cities with each other, the distortion won't be that serious. If we compare across regions, we have to be a little more careful.

What are the objectives of UN-Habitat with respect to improving statistics on informal settlements?
UN-Habitat has been trying to show that the methods being used do not provide an accurate picture of what is happening when it comes to informal settlements. It will take years to change the way statistical offices work and census data is taken. The statistical issue is, how do you gradually refine techniques so these problems are not overlooked. When data is disaggregated, for example, at the household or neighbourhood level, which UN-Habitat has been doing for some time, we begin to see another picture of reality. A common syndrome, for example, is that we often confound proximity with access. People living in informal settlements may literally be living next door to water supply, sewerage and garbage collection services, or for that matter to schools and hospitals, yet not have access to these services.

Can we identify any common approaches in the way cities are addressing the challenge of informal settlements?
I believe that we are beginning to see an emerging pattern which favours upgrading informal settlements, as opposed to removal and demolition. Slums are communities with their own social, cultural and economic networks. A lot of the reason why people don't move from the informal settlement is because, in terms of location, they are ideal, with access to jobs, or services they would otherwise have to pay considerably more for. Most slums started their life located on the margins of the city. Over time, with rapid growth, the slum actually finds itself located in the middle of the city. Removal or relocation is also asking people to move from a neighbourhood where they have lived a good part of their life, if not their whole life.

What kinds of upgrades are cities undertaking?
Upgrading takes place on several fronts—hooking the settlement into the infrastructure grid, and providing waste collection, water, and sanitation. There is also an issue of tenure. Most of the time an informal settlement remains informal because it is not clear who owns or has the right to the land. The service provider, the water or sewerage company, for example, are very reluctant to put in infrastructure if tenure is not clear.

What incentives do cities have to upgrade rather than remove the settlements?
The cities that are trying to play a proactive role realise that globalisation is affecting everyone, everywhere. They can become victims of globalisation, or get some of the benefits. The proactive cities realise you can't have high percentages of your population socially excluded and expect to be a global city.

We discussed Curitiba as a good example of top-down, long-term urban planning. How can planning in other cities be improved?
For many years I headed a best practice initiative at UN-Habitat, and we found literally hundreds of examples of innovations, new models, new technologies. The single biggest question I had to ask myself all the time was, 'Why aren't these best practices becoming the norm?' The only answer I came up with is that the lessons from best practices are not being fed into policymaking at the highest level. They remain isolated initiatives that might inspire a few other cities, but they don't necessarily have an impact on public policy, and therefore don't get replicated at scale. We need to realise there is a lot of innovation out there. How can we systematically document these stories and record the lessons learned, and provide a feedback mechanism directly into policy?
The World Urban Campaign is working on an initiative to get cities to tell their stories under a new perspective of "living practices". What are you doing today to tackle tomorrow's challenges? What innovations are being tested, what new tools are being developed?

In general, what are the most important steps that cities in Latin America and the rest of the world have to take to become more environmentally sustainable?
We have to take planning seriously. I don't mean 'sectoral' planning, where each sector—water, energy, waste, sanitation—plans independently. We must look at the city or the metro region as a whole. Competing jurisdictions are one of the biggest enemies to sustainable urbanisation. You have metropolitan areas cutting across many jurisdictions, with several planning commissions and independent service providers. You could be busy trying to green your city, but half of the population that depends on your city may live in the suburbs and fall under a different governmental structure; and these governments are busy building the next shopping mall, the next golf course, the next exburb. The city is a living organism that needs to be managed as a single entity, and just like any living organism, it needs to develop holistically.

Exemplar Projects

Energy and CO_2

São Paulo: Harvesting methane to power the city

Many cities are generating electricity from the methane that arises from landfills, but São Paulo's efforts in this area stand out among Latin American cities. The city recently closed two of its largest landfills, Bandeirantes in 2007, and São João in 2009.

Rather than let methane from the decaying material add to greenhouse gas emissions, the city contracted with a private company to capture the gas at the former landfills and burn it to generate electricity. The two sites have a joint capacity of 46 megawatts, which makes it one of the largest methane harvesting initiatives in the world. The two projects are expected to cut carbon emissions by about 11 million tons through 2012.

The benefits do not stop at cutting emissions. The initiative qualifies as a "clean development mechanism" under the Kyoto Protocol, a programme which offers carbon credits for emission reduction projects. The credits are equivalent to 1 tonne of CO_2, which can be traded, sold or used to meet carbon emission reduction targets in other countries. São Paulo splits the carbon credits from the project with its partner company, and the city has been selling its share to raise money for other projects. It participated in the first-ever spot market auction on a regulated exchange in 2008, and made US$36 million in that year alone. The city is using much of the money to improve the neighbourhoods around the landfills. In 2009, for example, it opened two leisure areas, totalling 9,200 square metres, which included playgrounds, walking paths and community space.

Ideas from other cities

Belo Horizonte is a leader in solar energy in Brazil, with about 12 times the volume of solar collectors per person compared to the country as a whole, according to city officials. Its new football stadium, being built for the upcoming World Cup in 2014, will have panels that generate enough energy for its own operations. On days with no games, the power will be sold to the local electricity company.

The biggest hydroelectric project in Colombia is being built near **Medellín**. The city-owned utility, Empresas Públicas de Medellín, is leading the construction of the 2.4 gigawatt Hidroltuango project. It will have eight generators, and is scheduled to start operations in 2018. The building consortium has already begun a series of consultations with community leaders on environmental and social issues related to the project, which the contract requires.

Curitiba is studying the carbon absorption rates of its green spaces, as part of a draft plan to limit the city's overall emissions.

Land use and buildings

Buenos Aires: Setting an example with public buildings

In 2008 Buenos Aires launched a programme that aims to dramatically reduce energy consumption in 100 public buildings. The "Energy Efficiency Programme in Public Buildings" targets energy reductions of 20% from 2007 levels by the end of 2012, and is expected to eliminate 5,000 tonnes of carbon emissions. Officials started small but intend to expand rapidly. By early this year, they had thoroughly audited five buildings — two offices, two hospitals and a school — and developed individually tailored energy reduction plans for each. The first audit, for example, examined energy use in the office used by Argentina's Environmental Protection Agency, which is supporting the programme. The audit found the potential to reduce overall energy consumption by 30%, including reducing the energy consumed by computers by 55%. The audits will be used as best practice examples to extend the programme to 31 more buildings over the course of 2010. In late 2009 the city government bolstered the programme by mandating the appointment of an energy manager to monitor consumption in every government building.

Officials started with city buildings because they are often large, and can achieve substantial savings quickly. They also set an example for the private sector. The city's environmental department is starting work on legislation that will impose energy efficiency measures on private sector buildings. Another of the programme's goals is to create energy-efficiency guides for households, businesses and industry.

Quito: Any reason to plant a tree

2001 report for Quito's municipal government concluded that the city had 9,000 hectares of urban tree cover, but recommended doubling this amount in order to reap a range of environmental benefits. Studies suggest that tree cover absorbs air pollution, reduces energy consumption by providing shade, and can improve water conservation by limiting rainwater run-off. As a result, Quito created its "Forestation and Reforestation Project", and by 2008, the programme had led to the planting of about 6 million trees, mostly native species. The unique strength of the project is the diverse methods it employs. Programme officials have not imposed a single, all-encompassing plan. Rather, they have cooperated with numerous departments and institutions throughout Quito, in addition to their own direct efforts. One specific city-run initiative included lining Quito's grand avenues with trees. The latest high visibility city initiative is to employ city workers and volunteers to replant 300,000 trees lost in forest fires during summer 2009. In 2006, the city ran a tree-planting competition with neighbourhood groups in 145 districts. The "My Neighbourhood is Dressed in Trees" competition led to the planting and maintenance of 140,000 trees.

Although about one quarter of the trees died from reasons ranging from a lack of maintenance to cars crashing into them, the programme has seen steady progress. By 2008 the equivalent of 5,000 hectares had been reforested, although some of these were planted in surrounding rural areas. The programme demonstrates that encouraging a wide range of institutions and individuals to simply get trees in the ground and let nature take its course can have environmental and aesthetic benefits.

Ideas from other cities

Rio de Janeiro is creating new cycle lanes and green spaces, including developing a green corridor lined by 11,000 trees, as part of a larger US$202 million project to revitalise its port in the historic city centre. The "Marvellous Port" project will also refurbish decaying historical buildings, and improve transport access and sanitation services.

To increase its green spaces, **Santiago** plans to have private developers transform 3,900 hectares of city area into public parks and green spaces in exchange for accessing another 5,700 hectares for building development.

São Paulo passed a law in 2009 requiring that all new municipal buildings meet energy-efficiency standards and that existing buildings be retrofitted with technology to mitigate their environmental impact.

Transport

Bus Rapid Transit: From Curitiba to Bogotá

Curitiba's bus network is among the most influential in the world. Dating back to the mid-1960s, the network centerpiece is the six-line "bus rapid transit" (BRT) service, comprising long and articulated buses that run on 72 km of dedicated roads extending in spoke patterns from the city centre. The BRT is the backbone of Curitiba's transit system, which includes several thousand kilometers of routes and carries 1.8 million riders per day. The BRT operates very much like a metro system.

Passengers pay to enter one of the more than 350 stations specially designed to reduce entry and exit times. The city has also integrated its urban planning with the system so that development occurs along the BRT corridors, which means the network is easily accessible for a large percentage of residents.

Curitiba grew along with its BRT network, but Bogotá's BRT — "Transmilenio" — has shown how well the system can be adapted to an existing city. The city opened Transmilenio in 2000 and at 84 km today, it is still growing. Nine lines use dedicated lanes in the middle of some of the city's largest avenues. In 2009, the Transmilenio carried an average of 1.6 million riders per day, and it has cut journey times by a third. As part of the programme, the city replaced the previous network of smaller, more polluting buses, which allowed it to sell carbon credits under the Kyoto Protocol. This has earned the city an estimated US$100 to US$300 million, according to the "New York Times". The system is by no means perfect — it suffers from frequent over-crowding — but it is at least affordable for residents in a relatively low-income city. Similar networks have been implemented in seven other cities in the Index, and are planned in several further cities throughout Latin America.

Buenos Aires: Bringing it all together

Buenos Aires's "Plan for Sustainable Mobility" is addressing city transport through an integrated effort involving initiatives in ten areas. Several of these involve significant infrastructure improvements.

Introducing BRT lines on key routes has cut travel times by 10% to 25%, although in some cases by up to two thirds. Meanwhile, adopting articulated buses and hybrid vehicles on some routes will cut carbon consumption.

The city is also hoping to get at least 5% of the city's commuters, roughly 300,000 people, to use bicycles, about six times the current level. Safety concerns are the main challenge to this effort, however. In a survey, roughly 60% of residents said that they would use bicycle paths, but half said that safety was their top priority when riding.

As a result, the city is trying to make cycling safe. By the end of 2010, 100 km of new bicycle paths should be open in the city centre. Buenos Aires is also creating more bicycle parking places, and plans to launch a public bicycle rental system this year. The municipality is also offering its 120,000 employees subsidised loans to buy bicycles, in the hope that this will set an example for private companies.

The programme has also increased the number of pedestrian areas, and has widened footpaths to make walking easier. For those who remain in their vehicles, the city has installed more modern traffic lights that react to changing traffic conditions, and can even change the direction of lanes if necessary.

Ideas from other cities

Santiago is expanding its metro system. It is well on the way to finishing a 14 km extension to one line, and is planning a sixth line that will cover 15 km and 12 new stations. The new line is designed to improve the metro's integration with rail and bus networks.

On the weekends, **Quito** limits entry to the city centre to pedestrians and bicycles.

With Metrocable, **Medellín** has used cable cars to integrate various impoverished sections of the city and informal settlements with the main public transportation networks.

Mexico City has a compulsory transportation system for children going to school, reducing the number of trips by parents in private cars.

Waste

Puebla: Turning waste into cash

"Green Wallet" is a private initiative to promote recycling in Puebla. Members join the scheme and receive a debit card. They get one "peco", an electronic credit, for every kilogram of waste they bring to depots located throughout the city, at schools, universities, and convenience stores. Members also get more credits for electronic waste, depending on the item. Merchants who sponsor the scheme accept the credits in their shops. The goods and services available range from children's clothing and books, construction supplies, movie tickets, and mobile phone air time. Several merchants also give discounts simply for having a membership card.

The project was introduced in early 2010 and by August 2010 it had collected 22 tonnes of solid and electronic waste. This may seem small compared to the estimated 819,000 tonnes that the municipality produces annually, but is an impressive beginning for a private initiative. The organisation also looks set to grow, with plans to begin collecting organic waste in the future and to begin similar projects in the surrounding region soon. Eventually it hopes to open franchises throughout Mexico.

Belo Horizonte: A win-win solution for waste pickers

Waste pickers, people who rummage through waste looking for recyclable items, are common in many Latin American cities, and often face lifelong social marginalisation and poor health. After years of public hostility to waste pickers, Belo Horizonte took a different approach, improving their quality of life and waste collection in the city at the same time.

In 1993, the city entered a formal agreement to integrate the local waste pickers association, ASMARE, into the waste collection system. The city gave the association access to dedicated recycling points, a sorting centre, and trucks to transport material to recycling plants. The association divides the profits from bringing materials to the recycling plants between members. Since then the scheme has grown, and waste pickers now run collection services for companies and households. The association helps process about 450 tonnes of rubbish each month, bringing the city substantial savings, even after it pays a subsidy and management fees to the association.

The scheme not only has a major environmental impact but also provides substantial economic and social benefits for the waste pickers. The association now has 380 members and its activities employ some 1,500 people, almost all of whom were previously homeless. Non-governmental organizations have been brought in to give literacy training for members, and vocational training for their children. The association provides help with life and health insurance, makes agreements with local pharmacies for low-cost medicine, and organises day care places for children under 6 years old.

Ideas from other cities

To ensure proper waste disposal in informal settlements, **Curitiba** has a "Purchase of Garbage" programme. Residents receive food baskets in exchange for bringing 8-10 kg of waste to central collection points, and their neighbourhood association receives money for community services. The initiative collects about 6,800 tonnes of waste each year.

São Paulo's "Ecopoint" initiative tries to stop residents from illegally dumping large waste items on city streets. The city has established free, central collection points for waste too large to fit in residential bins, such as old furniture, tree limbs, and construction waste. In the first six months of 2010, the city says it collected 57,400 cubic metres of waste that would otherwise have been left on the streets.

Santiago is working with four charities to encourage community participation in recycling. Residents deposit materials at one of 39 central collection points. The charities earn money for collecting and transferring the materials to recycling plants.

Water

Porto Alegre: Delivering water the right way

Porto Alegre's "Right Water" programme helps people in informal settlements access water legally, reduces system leaks and encourages conservation. Without a right to residency many of those in informal settlements cannot legally connect their homes to the water system. The resulting illegal connections, in addition to losing revenue for the city, tend to be leak prone, and can lead to contamination in the legal water supply.

The city's water company, DMAE, started the programme in 2005 in cooperation with community groups in informal settlements. The city gives residents a chance to legally connect their houses to the water system, and pay a "social rate" of US$5 per month for up to 10,000 litres of water, which saves up to 40% over the standard charge. In addition, the water bill is often residents' only formal proof of residence, which helps integrate residents into the city's economy. The programme also educates residents about the importance of clean water and responsible water use. In the first three years of operation, the programme helped 15,000 families, and the rate of unpaid water bills in informal settlements dropped from 64% to 27%, leading to an overall citywide reduction from 14% to 9%.

Ideas from other cities

Buenos Aires intends to have water meters installed for all customers as part of a plan to reduce consumption by 40% by 2012.

Sabesp, the statewide water company in **São Paulo**, has a comprehensive programme to monitor leaks and illegal connections. They have increased the number of inspectors, which led to the detection of 12,000 illegal connections between January and July 2010, representing 70% of the total number of illegal connections detected the previous year. The volume of water lost through these connections was almost 2.5 billion litres. The company also has technology that helps it monitor all of the water in the system, spotting major leaks quickly and forecasting water consumption levels based on outdoor temperatures. In addition, Sabesp runs public awareness campaigns to help residents identify water leakages and water waste in their homes.

Monterrey has reduced leakages in its water system from an estimated 32% in 1998 to 21% by 2008, through a comprehensive programme including checking and replacing valves, upgrading pipes, installing pressure gauges and household meters, leak detection and eliminating illegal connections.

Air quality

Three approaches to emissions: Quito, Belo Horizonte and Porto Alegre

Vehicle exhaust is a significant air quality challenge for many Latin American cities, and they are addressing the problem in different ways, ranging from requiring annual tests to conducting random spot checks on the roadside. In 2003, Quito was one of the first cities in the region to implement a strict vehicle monitoring policy. Private vehicles must pass an annual emissions test, and buses and taxis are subject to testing every two years. If vehicles fail the tests, owners must pay for the necessary repairs or risk losing their registration permit. Driving without a permit can lead to heavy fines. The municipality estimates that levels of carbon monoxide in the city have dropped 25% to 30% since the programme was implemented.

Belo Horizonte and Porto Alegre have launched roadside inspections of diesel vehicles, which often produce the most pollution. Belo Horizonte's programme, called "Oxygen Operations", includes random checks on some of the roughly 120,000 diesel vehicles in the city. Officials fine vehicle owners who fail the tests, and they have the power to remove the vehicle from the road. Porto Alegre, on the other hand, publicly announces where it will locate checkpoints. Even with this transparency, 42% of vehicles checked in the first part of 2007 were in violation of pollution standards, and were charged an average fine of about US$70.

Mexico City: Policy pays off

It may seem strange to highlight air quality efforts in Mexico City, a city that performs below average in the Index for this category, but the Index performance only tells part of the story. There is much to learn from Mexico City's remarkable, ongoing efforts.

In 1992 the United Nations said Mexico City had the most polluted air on the planet. Everything about the city, then and now, seems to impede improvement. It has a booming population and a rising number of cars. The city's high altitude makes combustion less efficient, and the surrounding mountains create frequent atmospheric inversions, which trap smog over the city. The city's response since 1992 has been focused and comprehensive, with a series of clean air strategies that borrow from global best practice and build on the city's previous efforts. The policies have all involved various initiatives across a range of fields, recognising that air pollution is a social challenge in addition to a technological one.

The original policy, which lasted from 1990 to 1995, combined 42 individual initiatives, and the latest, PROAIRE III, which lasted from 2002 to this year, has 89. These include the reduction of industrial and automobile emissions, urban sprawl containment, policy integration, education programmes and communicating risks to the public.

While Mexico City still performs relatively poorly compared with other cities in the region for levels of the three air pollutants measured in the Index — nitrogen dioxide, sulphur dioxide and particulate matter — there have been impressive reductions of these and other pollutants in the air since the 1990s and early 2000s. By 2002, airborne lead was no longer an issue, and the average level of sulphur dioxide was one-sixth that of the early 1990s.

PROAIRE III has focussed in particular on ozone and particulate matter. Average levels of ozone, for example, have dropped by about 20% and average daily maximum levels by 28% through the 2002-10 period. For the smallest particulate matter, PM2.5, the corresponding declines are 13% and 23% since records began in 2004. Carbon monoxide is down noticeably and, even for pollutants where the average has stayed stable, maximum figures have tended to show an improvement.

Although the city has seen definite progress, it recognises there is still a long way to go. To that end, the city has launched PROAIRE IV for 2011-2020. As part of the preparation, the city has a web page inviting experts and the public to suggest strategies for improving air quality. There is no quick fix, but Mexico City's decades-long efforts are showing that comprehensive approaches, and openness to the best ideas, can make a huge difference.

Ideas from other cities

Curitiba requires emissions audits at factories every four years. Facilities that do not meet standards face fines, and the state can close down any that fail twice.

Santiago has a longstanding policy of using trees along streets and in parks specifically to reduce levels of particulate matter in the air. A 2008 study in the Journal of Environmental Management found that this strategy costs around US$8,000 for every 1 tonne reduction in suspended air particles. This was cheaper than several types of conversion to cleaner fossil fuels.

In 2008, an air quality monitoring station was set up to measure pollution in the vicinity of **Montevideo**'s La Teja refinery. It is part of a project called ARPEL/CIDA, which is supported by the regional organisation of gas and petroleum industries and the Canadian Development Agency. The goal is to evaluate refinery emissions to improve the refinery's efficiency and surrounding air quality.

Methodology

The Latin American Green City Index measures the current environmental performance of 17 major Latin American cities, as well as their commitment to reducing their future environmental impact. The selection sought to include the major Latin American metropolitan areas, but cities had to be omitted where city-specific data were significantly lacking. This was the case for Guatemala City (Guatemala), Salvador (Brazil), and Santo Domingo (Dominican Republic).

The methodology, developed by the EIU in cooperation with Siemens, builds on the work of the European Green City Index and aims to follow its structure. However, to be applicable to Latin America, the structure has been adapted to accommodate variations in data quality and availability, and environmental challenges specific to the region. An independent panel of international experts in the field of urban sustainability also provided important insights and feedback in the construction of the Latin American Green City Index. Moreover, due to concerns that the data was insufficiently reliable or comparable to justify a detailed ranking of Index results, the Latin American Green City Index results are presented in groups of cities' scores in relation to the average score.

The Index scores cities across eight categories — energy and CO_2, land use and buildings, transport, waste, water, sanitation, air quality, and environmental governance — and 31 individual indicators. Sixteen are quantitative and measure how a city currently performs — for example, a city's electricity consumption or waste production. The remaining 15 qualitative indicators assess aspirations or ambitions — for example, a city's commitment to reducing the environmental impact of energy consumption, or green standards for public building projects.

Data collection: An EIU team collected data between April and June 2010. Wherever possible, the data were taken from publicly available official sources, such as national/regional statistical offices, local city authorities, local utilities companies, municipal and regional environmental bureaux, and environmental ministries. The data are generally for the year 2008-2009, but when these were not available they were taken from earlier years.

Data quality: Compared with Europe, the availability and comparability of data across cities was far more limited in Latin America. In some cases the EIU used data from different administrative levels; from the city, for example, instead of the wider metropolitan area. As all indicators are scaled either by the corresponding area, population, or GDP, use of city or metro data does not decrease comparability significantly. In fact, what constitutes a city or metropolitan area can differ largely from city to city. Quito, for example, has an administrative area that includes large areas of non-urbanised land, whereas Buenos Aires is completely urbanised and at the centre of a larger metropolitan area. Where data gaps existed, the EIU applied robust theoretical techniques to calculate estimates. These techniques, however, did not take into account the effects that informal settlements might have on indicators, such as "access to potable water" or "access to sanitation". Informal settlements can vary both in size and definition, but data generally is lacking on their infrastructure, access to municipal utilities, and population. Therefore, the EIU has assumed that the Latin American Green City Index represents only the formal areas of each city. The EIU used international CO_2 coefficients provided by the UN Intergovernmental Panel on Climate Change to estimate the CO_2 emissions produced by each city's electricity mix. Only in very exceptional cases, notably Lima and Montevideo, did the EIU estimate CO_2 and electricity consumption based on regression analysis, referencing data of peer cities when specific city information was not available.

The EIU made every effort to obtain the most recent data, including checking quantitative data points with the cities' environmental departments. Data providers were also contacted where uncertainties arose regarding individual data points. Nevertheless, it remains possible that the EIU may have missed an alternative reliable public source or more recent figures.

Indicators: In order to compare data points across cities, and to calculate aggregate scores for each city, the data gathered from various sources had to be made comparable. For this purpose, the quantitative indicators were "normalised" on a scale of zero to ten, with the best city scoring ten points and the worst zero. Most indicators use a min-max calculation, where the best city receives ten points and the worst city zero. In some cases, reasonable benchmarks were inserted to prevent outliers from skewing the distribution of scores. In such cases, cities were scored against either an upper or a lower benchmark, or both. For example, a lower benchmark of 800 kg per person was used in scoring "waste generated per person" and all cities with more than 800 kg of waste per person received a score of zero.

Cities use varying definitions for certain indicators, notably definitions of green space, access to potable water, municipal waste generated, length of transport networks, and administrative areas. In such cases, the EIU sought as much as possible to standardise the definition used. However, it is possible that some differences still exist.

Qualitative indicators were scored by EIU analysts with expertise in the relevant city, based on objective criteria that consider cities' targets, strategies, and concrete actions. The qualitative indicators were also scored on a scale of zero to ten, with ten points assigned to cities that meet the criteria on the checklist. For the "greenhouse gas (GHG) monitoring" indicator, for example, cities were assessed according to whether they regularly monitor GHG emissions and publish their findings every one to three years.

Qualitative indicators which seek to measure the existence of policies in certain areas — for example, the containment of urban sprawl — have also been multiplied by the city's "Policy Implementation Effectiveness Rating", a mea-

sure of efficiency at implementing environmental policies. These ratings were produced by EIU analysts with thorough knowledge of the relevant city on a scale of one to five, with five being highly effective.

Index construction: The Index is composed of aggregate scores of all of the underlying indicators. These are first aggregated by category, creating a score for each. These are in turn aggregated into an overall score. To create the category scores, within each category all the underlying indicators received the same weight during aggregation. The scores were then rebased onto a scale of zero to 100. To build the overall Index scores, the EIU assigned even weightings to each category score so that no category was given greater importance than any other. The Index is essentially the sum of all category scores, rebased to 100. The equal weighting of each category reflects feedback from the expert panel.

Finally, the cities were placed in one of five bands, both within categories and overall, reflecting the relevant scores. These bands are built around the average (mean) score and the standard deviation — a statistical term which describes to what extent about two-thirds of the values differ from the mean.
The bands are defined as follows:
→ Well above average: Scores more than 1.5 times the standard deviation above the mean
→ Above average: Scores between 0.5 and 1.5 times the standard deviation above the mean
→ Average: Scores between 0.5 times the standard deviation below and 0.5 times the standard deviation above the mean
→ Below average: Scores between 0.5 and 1.5 times the standard deviation below the mean
→ Well below average: Scores more than 1.5 times the standard deviation below the mean

Clusters: In order to conduct a deeper analysis of city trends, the 17 cities in the Index were clustered into a series of groups, calculated on population, area, income, density and temperature. These included:
→ Population: "small population", with a population below 5 million; "mid population", with a population between 5 and 10 million; and "high population" with a population exceeding 10 million inhabitants.
→ Area: "small area", with an administrative area smaller than 2,000 square kilometres; "mid area", with an administrative area between 2,000 square kilometres and 7,000 square kilometres; and "large area", with an administrative area larger than 7,000 square kilometres.
→ Income: "low income", with GDP per capita of less than US$8,000; "middle income", with GDP per capita of US$8,000 to US$16,000; and "high income", with GDP per capita of more than US$16,000.
→ Density: "low density", with a population of less than 1,000 people per square kilometre; "mid density", with a population between 1,000 people per square kilometre and 5,000 people per square kilometre; and "high density", with a population of more than 5,000 people per square kilometre.
→ Temperature: "low temperature", with an average temperature of below 17 degrees Celsius; "mid temperature", with an average temperature of between 17 degrees Celsius and 20 degrees Celsius; and "high temperature", with an average temperature above 20 degrees Celsius.

List of categories, indicators and their weightings

Category	Indicator	Type	Weight	Description	Normalisation technique*
Energy and CO_2	CO_2 emissions from electricity consumption per capita	Quantitative	25%	Total annual CO_2 emissions in kilograms per capita from electricity consumption.	Min-max; upper benchmark of 10 kg per capita inserted to prevent outliers.
	Electricity consumption per unit of GDP	Quantitative	25%	Total annual electricity consumption, in megajoules per unit of GDP (in thousands of US$).	Min-max; lower benchmark of 1,250 megajoules per unit of GDP inserted to prevent outliers.
	Clean energy policy	Qualitative	25%	Measure of a city's efforts to reduce carbon emissions associated with energy consumption.	Scored by EIU analysts on a scale of 0 to 10.
	Climate change action plan	Qualitative	25%	Measure of a city's strategy to combat its contribution to climate change.	Scored by EIU analysts on a scale of 0 to 10.
Land use and buildings	Green spaces per capita	Quantitative	25%	Sum of all public parks, recreation areas, greenways, waterways and other protected areas accessible to the public, in m^2 per inhabitant.	Zero-max; upper benchmark of 100 m^2 per person inserted to prevent outliers.
	Population density	Quantitative	25%	Population density, in persons per km^2.	Zero-max; upper benchmark of 7,000 persons per km^2 inserted to prevent outliers.
	Eco buildings policy	Qualitative	25%	Measure of a city's efforts to minimise the environmental impact of buildings.	Scored by EIU analysts on a scale of 0 to 10.
	Land use policy	Qualitative	25%	Measure of a city's efforts to minimise the environmental and ecological impact of urban development.	Scored by EIU analysts on a scale of 0 to 10.
Transport	Length of mass transport network	Quantitative	25%	Composed of two sub-indicators: 1. Total length of all train, tram, subway, bus and other mass transport routes within the city's boundaries, measured in terms of the area of the city (in km/km^2); and 2. Total length of all superior modes of public transport, i.e. BRT, trolleybus, tram, light rail and subway, measured in terms of the area of the city (in km/km^2).	1. Zero-max; upper benchmark of 7 km/km^2 inserted to prevent outliers. 2. Min-max.
	Stock of cars and motorcycles	Quantitative	25%	Total stock of cars and motorcycles, with half-weighting allocated to motorcycles, measured in terms of vehicles per person.	Min-max.
	Urban mass transport policy	Qualitative	25%	Measure of a city's efforts to create a viable mass transport system as an alternative to private vehicles.	Scored by EIU analysts on a scale of 0 to 10.
	Congestion reduction policy	Qualitative	25%	Measure of a city's efforts to reduce congestion.	Scored by EIU analysts on a scale of 0 to 10.
Waste	Share of waste collected and adequately disposed	Quantitative	25%	Share of waste collected by the city and adequately disposed either in sanitary landfills, incineration sites or in regulated recycling facilities. Expressed in terms of the total volume of waste generated by the city.	Min-max.
	Waste generated per capita	Quantitative	25%	Total annual volume of waste generated by the city, including waste not officially collected and disposed, in kg per capita.	Min-max; lower benchmark of 800 kg per person inserted to prevent outliers.
	Waste collection and disposal policy	Qualitative	25%	Measure of a city's efforts to improve or sustain its waste collection and disposal system to minimise the environmental impact of waste.	Scored by EIU analysts on a scale of 0 to 10.
	Waste recycling and re-use policy	Qualitative	25%	Measure of a city's efforts to reduce, recycle and re-use waste.	Scored by EIU analysts on a scale of 0 to 10.
Water	Water consumption per capita	Quantitative	20%	Total water consumed by the city, on a daily basis, expressed in litres per person.	Min-max; lower benchmark of 500 litres per person per day inserted to prevent outliers.
	Water system leakages	Quantitative	20%	Share of water lost in transmission between supplier and end user, excluding illegally sourced water or on-site leakages, expressed in terms of total water supplied.	Zero-max; lower benchmark of 50% inserted to prevent outliers.
	Population with access to potable water	Quantitative	20%	Share of the total population with access to on-site piped water sources or protected communal sources within close proximity of living quarters.	Min-max; lower benchmark of 80% inserted to prevent outliers.
	Water quality policy	Qualitative	20%	Measure of a city's policy towards improving the quality of water used by the city.	Scored by EIU analysts on a scale of 0 to 10.
	Water sustainability policy	Qualitative	20%	Measure of a city's efforts to manage water sources efficiently.	Scored by EIU analysts on a scale of 0 to 10.
Sanitation	Population with access to improved sanitation	Quantitative	33%	Share of the total population either with direct connections to sewerage, or access to improved on-site sources such as septic tanks and improved latrines that are not accessible to the public. This figure excludes open public latrines or sewers and other shared facilities.	Min-max; lower benchmark of 50% inserted to prevent outliers.
	Share of wastewater treated	Quantitative	33%	Share of wastewater produced by the city that is collected and treated to at least a basic/primary level.	Zero-max.
	Sanitation policy	Qualitative	33%	Measure of a city's efforts to reduce pollution associated with inadequate sanitation.	Scored by EIU analysts on a scale of 0 to 10.
Air quality	Nitrogen dioxide concentration levels	Quantitative	25%	Annual daily mean of NO_2 concentrations.	Min-max; upper benchmark of 20 ug/m^3 to prevent outliers.
	Sulphur dioxide concentration levels	Quantitative	25%	Annual daily mean of SO_2 concentrations.	Min-max.
	Suspended particulate matter concentration levels	Quantitative	25%	Annual daily mean of PM_{10} concentrations.	Min-max; upper benchmark of 20 ug/m^3 to prevent outliers.
	Clean air policy	Qualitative	25%	Measure of a city's efforts to reduce air pollution.	Scored by EIU analysts on a scale of 0 to 10.
Environmental governance	Environmental management	Qualitative	33%	Measure of the extensiveness of environmental management undertaken by the city.	Scored by EIU analysts on a scale of 0 to 10.
	Environmental monitoring	Qualitative	33%	Measure of the city's efforts to monitor its environmental performance.	Scored by EIU analysts on a scale of 0 to 10.
	Public participation	Qualitative	33%	Measure of the city's efforts to involve the public in environmental decision making.	Scored by EIU analysts on a scale of 0 to 10.

*Cities score full points if they reach or exceed upper benchmarks, and zero points if they reach or exceed lower benchmarks.

Belo Horizonte_Brazil

Background indicators

Total population (million)	2.4
Administrative area (km^2)	330.9
GDP per person (current prices) (US$)	6,267.4
Population density (persons/km^2)	7,326.0
Temperature (24-hour average, annual) (°C)	23.0

Based on Belo Horizonte City

Belo Horizonte is the capital of the mineral-rich state of Minas Gerais. Located in the interior of southeastern Brazil, Belo Horizonte sits at the heart of the country's steel and mining region. The city's economy, long dominated by mining, agriculture and automotive manufacturing, is now driven primarily by services industries, although manufacturing has retained a significant presence. GDP per capita is US$ 6,300, which places it in the lower end of the Latin American Green City Index for average income, and lowest among the six Brazilian cities covered in the report. While the metropolitan area, with 6.3 million people, is the country's third most populous, the city proper is home to just 2.4 million, the 13th biggest in the Index. Data included in the Index for Belo Horizonte comes from the city level.

Belo Horizonte's relatively low average income does not appear to have harmed its environmental performance, however. The city achieves a strong result in the Latin American Green City Index, placing above average overall. The city performs particularly well in land use and buildings, where it ranks above average thanks to its high population density and well-developed eco-buildings policies. The city also ranks above average for water and air quality. Its strong performance in these categories is largely attributable to its policies regarding water quality and clean air, respectively. Belo Horizonte receives average ranks for energy and CO_2, transport and sanitation. Despite its impressive overall performance, the city could improve its result in the categories of waste and environmental governance, where it comes in below average. Belo Horizonte is the only city in the lower income range in the Index (with a GDP per person of less than US$8,000) to earn an above average overall result.

Energy and CO_2: Belo Horizonte ranks average for energy and CO_2. With 94% of its electricity generated from hydropower, the city emits an estimated 31 kg of CO_2 per person from electricity, one of the lowest rates in the Index and the lowest overall when compared to cities with similar incomes. In an effort to reduce energy consumption and drive climate change policy, the city created a Committee on Climate Change and Eco-efficiency (see "green initiatives" under "Environmental governance" below).

While the committee is playing an active role in driving policy, and the city has conducted a recent baseline review of greenhouse gases, it lacks clear CO_2-emissions reduction targets and has not joined any international covenants with binding greenhouse gas emissions reduction goals. The city's score in this category is further hindered by a comparatively high rate of electricity consumption compared to its economic output. Belo Horizonte consumes 850 megajoules of electricity per US$1,000 of GDP — above the index average of 761 megajoules.

Green initiatives: Belo Horizonte's new football stadium, being built for the upcoming World Cup in 2014, will have panels that generate enough energy for its own operations. On days with no games, the power will be sold to the local electricity company.

Land use and buildings: Belo Horizonte ranks above average in land use and buildings. As a city with a small administrative area, Belo Horizonte has one of the highest population densities in the Index. The city's score is also bolstered by its policies regarding land use and eco-buildings. Belo Horizonte has strict laws to control urban sprawl, and in 2005 the city created a municipal parks foundation to revitalise green spaces (see "green initiatives" below). In the area of eco-buildings, Belo Horizonte mandates that large buildings over 6,000 square metres meet energy-efficiency standards. The city runs public awareness campaigns and has incentives in place to encourage businesses and households to save energy. Belo Horizonte's performance in this category is constrained by its relatively poor score in green spaces. Despite the presence of many small parks in the city, Belo Horizonte still has only 18 square metres of green space per inhabitant, which is one of the lowest in the Index.

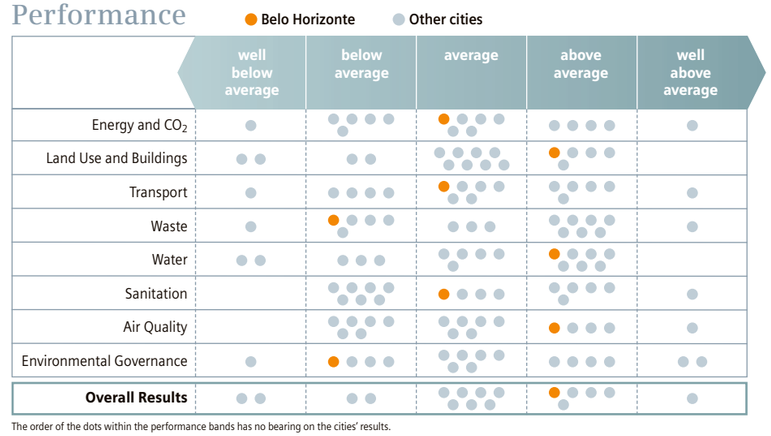
Green initiatives: In 2005 the city created a municipal parks foundation to revitalise and protect its green spaces. The institution manages and maintains the city's 69 parks, and runs educational programmes to encourage citizens to use the parks and create a sense of public ownership over the city's green spaces. In 2008 the institution ran an initiative entitled "One Life, One Tree", in which it planted one tree in the name of each child born in the city that year.

Transport: Belo Horizonte receives an average rank in the transport category. The city's metro has only one 28 km line. Therefore the superior public transport network (defined in the Index as transport that moves large numbers of passengers quickly in dedicated lanes, such as metro, bus rapid transit or trams), at just 0.08 km per square kilometre of city territory, falls below the Index average of 0.13 km. On the other hand, bus coverage is extensive. Overall the city has a slightly above average mass transport network, at an estimated 5.5 km per square kilometre of city territory. This is the second longest mass transport network when measured against the low-incomes cities in the Index. Like many Latin American cities, Belo Horizonte has experienced an explosion of private car ownership. The city has, on average, 0.39 cars per inhabitant, which is more than the Index average of 0.30, and frequently suffers from severe congestion. In many ways the city has been proactive about the challenge. It has a well-developed traffic management system, for example, which includes traffic light sequencing, information systems and dedicated delivery times for freight vehicles. While the city does not yet have any congestion reduction initiatives like São Paulo's "no-car day", officials say such a programme is planned. Other congestion reduction initiatives in the pipeline include carpooling lanes, limited vehicle zones, park and ride systems and a congestion charge or road toll.

Green initiatives: The city has been developing an "urban mobility plan" since 2005. Although the full details have not been released yet, one aspect of the plan will reportedly focus on building more bike lanes. The city also plans to add two lines to its metro system, bringing the total length to 50 km. Work on the second line has been slow and no timeline has been announced for construction of the third line.

Waste: Belo Horizonte is below average in the waste category. The city-owned waste company collects and adequately disposes of 95% of the city's waste in a managed landfill. The company also operates a fleet of small collection trucks in the city's difficult-to-navigate informal settlements. There is a well-developed recycling programme in Belo Horizonte, with dedicated bins throughout the city, and regular collections from 34 neighbourhoods. The city also scores well for its waste collection and disposal policies, including strict regulations on the city's landfill and the

Performance



The order of the dots within the performance bands has no bearing on the cities' results.




way it monitors hazardous waste disposal. Despite progressive policies, Belo Horizonte produces 921 kg of waste per person per year, almost twice the 17-city average of 465 kg and the largest amount in the Index, which weighs heavily on its performance in this category.

Green initiatives: Belo Horizonte has been a pioneer in organising waste pickers to support the city's overall recycling goals. Pastoral da Terra, a Catholic organisation, first organised the city's homeless into a cooperative of waste collectors. Since the early 1990s the city has regulated waste picker cooperatives and they have been instrumental in the city's vast recycling schemes. Waste pickers have access to collected municipal waste before it is dumped into the landfill.

That material is then processed at one of the city's three recycling centres and the cooperatives divide profits between members. Around 450 tonnes of recyclable materials are collected per month, according to Asmare, the local waste pickers association. Additionally, in 2009 Belo Horizonte opened a waste transfer facility to cut travelling times for compactor trucks that comprise the city's waste collection fleet. These trucks offload at the transfer facility, which is equipped with an exhaust system to prevent the exposure of waste to open air. High volume trucks then complete the longer journey to the landfill. The city says the facility optimises costs and reduces waste transfer time.

Water: Belo Horizonte is above average in the water category. The city has abundant water resources, which come primarily from two rivers in the region. The state water company, Copasa, supplies potable water to nearly 100% of Belo Horizonte's residents. The city consumes an average of 170 litres of water per person per day, well below the Index average of 264 litres. About a third of water is lost to network leakages, in line with the 17-city average of 35%. Belo Horizonte performs particularly well for its water quality policies, which include codes to monitor and improve surface water quality, and enforcing standards on local industry. Copasa is also vigilant in testing for key pollutants in the water supply. Regarding water sustainability policies, the city has a conservation policy in place and has implemented various efficiency measures, such as water meters and rainwater collection and banning hose-pipes. However, Belo Horizonte receives only partial marks for publicly promoting efficient water consumption. Most such campaigns are run by the state rather than on a city level.

Green initiatives: Belo Horizonte has an ambitious US$78 million plan to reduce pollution in the city's water sources. Financed by the Inter-American Development Bank, an institution that provides loans and grants throughout Latin America and the Caribbean, the project will improve drainage infrastructure, and aims to limit the dumping of untreated sanitation into the rivers and water basins. One goal is to achieve drinking-level quality in the city's major bodies of water before the 2014 World Cup.

Sanitation: Belo Horizonte is average in the sanitation category. Its middling performance comes in spite of careful monitoring by Copasa, the state waterworks company, which subjects much of the city's wastewater to two stages of treatment. In 2008 the city adopted its Municipal Sanitation Plan, which outlines policies and actions through to 2011. A key goal outlined in the sanitation plan is "universalisation", or expansion of sanitation services to 100% of the city's residents. The plan calls for the improvement of connections to the sanitation system in the city's informal settlements. In 2007 an estimated 95% of the city's residents had access to sanitation, narrowly above the 17-city average of 94%. The city's sanitation performance is weighed down by a wastewater treatment rate of 62%. While above the Index average of 52%, the city still has significant room for improvement in this area.

Green initiatives: In 2006 Belo Horizonte secured US$80 million in financing from the federal government's "Sanitation for All" programme. The city is investing in 150 projects, 91 of which are in informal settlements, to achieve universal access to sanitation.

Air quality: Belo Horizonte ranks above average in air quality. The result is underpinned by better-than-average emissions levels for the three pollutants measured in the Index. For nitrogen dioxide, a primary source of which is automobile exhaust, the city registers 34 micrograms per cubic metre — not its best result, but still below the 17-city average of 38 micrograms. Average daily concentrations for particulate matter and sulphur dioxide are much better and considerably below the average Index concentrations. The city's emissions levels suggest that strong air quality policies are having a positive effect. For example, the city's Committee on Climate Change and Eco-efficiency has identified air pollution as one of the primary areas in which it can improve. The Minas Gerais state environmental foundation, FEAM, operates nine air monitoring stations around the metropolitan area and releases a report on pollution levels once a day.

Green initiatives: Belo Horizonte has a roadside vehicle inspection programme, "Oxygen Operations", in which officials perform random checks on some of the roughly 120,000 diesel vehicles in the city. Vehicle owners that violate pollution regulations are fined and can even have their vehicle taken off the streets.

Environmental governance: Belo Horizonte ranks below average in environmental governance. The city is marked highly for having a dedicated environmental department with wide responsibilities and for the ability to implement its own environmental legislation. The department's remit is, however, somewhat limited, since it must cooperate closely with other organisations responsible for sanitation, transport and housing, for example. But Belo Horizonte's score is hindered by its approach to monitoring. For example, the city does not fully monitor its environmental performance regularly and publish the results. Also, it has conducted a baseline environmental review but left out key policy areas such as sanitation, waste and transport. Belo Horizonte involves its citizens in decisions on projects with environmental impacts. This includes engaging citizens in "participatory budgeting". The programme, adapted from a similar one in Porto Alegre, is a process in which city residents and elected delegates meet annually to vote on a wide range of municipal spending priorities, including for environmental areas such as transport and sanitation. However, Belo Horizonte receives only partial marks for providing the public with access to information on environmental topics.

Green initiatives: Belo Horizonte's Committee on Climate Change and Eco-efficiency is an advisory body that has responsibility for developing initiatives and working with private entities to reduce greenhouse gas emissions, among other aspects of climate change policy. Another key responsibility is knowledge sharing and coordination, in order to harmonise policy between individual government departments. A cross-section of city stakeholders participates in the committee, including representatives from universities, NGOs and local industry.

Quantitative indicators: Belo Horizonte

		Average	Belo Horizonte	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	31.2 [1, e]	2007	EIU estimate; Companhia Energética de Minas Gerais; Instituto Brasileiro de Geografia e Estatística; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	850.3 [1]	2007	Companhia Energética de Minas Gerais; Instituto Brasileiro de Geografia e Estatística; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	7,326.0 [1]	2007	Instituto Brasileiro de Geografia e Estatística
	Green spaces per person (m^2/person)	254.6	18.3 [1]	2007	Secretaria Municipal do Meio Ambiente: Instituto Brasileiro de Geografia e Estatística
Transport	Length of mass transport network (km/km^2)	5.0	5.5 [2, e] 0.08 [1]	2009	EIU estimate; Companhia Brasileira de Trens Urbanos; Prefeitura de Belo Horizonte
	Superior public transport networks (km/km^2)	0.13	0.39 [1]	2010	BHTrans
	Stock of cars and motorcycles (vehicles/person)	0.30	95.0 [1]	2010	Denatran
Waste	Share of waste collected and adequately disposed (%)	96.2	920.7 [1]	2009	Prefeitura de Belo Horizonte / Superintendência de Limpeza Urbana
	Waste generated per person (kg/person/year)	465.0	169.9 [1]	2009	Prefeitura de Belo Horizonte / Superintendência de Limpeza Urbana
Water	Water consumption per person (litres per person per day)	264.3	34.0 [1]	2008	Sistema Nacional de Informações sobre Saneamento; Instituto Brasileiro de Geografia e Estatística
	Water system leakages (%)	34.6	99.5 [1]	2008	Sistema Nacional de Informações sobre Saneamento
	Share of population with access to potable water (%)	97.5	95.4 [3, e]	2008	Sistema Nacional de Informações sobre Saneamento; Instituto Brasileiro de Geografia e Estatística
Sanitation	Population with access to sanitation (%)	93.7	61.8 [1]	2007	Sistema Nacional de Informações sobre Saneamento; Instituto Brasileiro de Geografia e Estatística
	Share of wastewater treated (%)	51.5	33.7 [1]	2007	Sistema Nacional de Informações sobre Saneamento; Instituto Brasileiro de Geografia e Estatística
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	4.4 [1]	2008	Fundação Estadual do Meio Ambiente
	Daily sulphur dioxide levels (ug/m^3)	11.4	27.8 [1]	2008	Fundação Estadual do Meio Ambiente
	Daily suspended particulate matter levels (ug/m^3)	48.0		2008	Fundação Estadual do Meio Ambiente

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Belo Horizonte City, 2) Based on Belo Horizonte City. Figure based on official estimates on the length of bus routes, 3) Based on Belo Horizonte City. Data based on proportion of population with access to sewerage.

Bogotá_Colombia

Background indicators

Total population (million)	7.3
Administrative area (km^2)	1,776.0
GDP per person (current prices) (US$)	8,411.2
Population density (persons/km^2)	4,087.7
Temperature (24-hour average, annual) (°C)	13.0

Based on Bogota, Distrito Capital

Bogotá is the capital of Colombia and the country's most populous city, with 7.3 million people. Located on a high plateau in the Andes mountains, it is the eighth most densely populated city in the Latin American Green City Index, at 4,100 people per square kilometre. The city is Colombia's financial centre, and the metropolitan area boasts some of the country's largest producers of food products and cut flowers. Bogotá has an average GDP per person of US$8,400, the tenth highest in the Index. The metropolitan area, with a population of 8.5 million, includes five distinct municipalities, but all of the figures in the Index were calculated based on the capital district.

Bogotá ranks above average overall in the Index. The city's performance is bolstered by above-average rankings in six of the eight categories: energy and CO_2, land use and buildings, transport, waste, water and environmental governance. Its performance in the energy and CO_2 category is driven by relatively low electricity consumption and comparatively low carbon emissions from electricity production. In land use and buildings, Bogotá has fairly abundant green spaces and some of the better land use policies among the 17 cities. Bogotá ranks below average in sanitation, primarily because of relatively weak sanitation policies, and below average in air quality, a result driven by high levels of sulphur dioxide. The city performs strongly in some categories when compared with cities of similar population and income. Among the nine cities with mid-sized population (between 5 and 10 million people), Bogotá has the most green spaces per person and the highest share of its population with access to potable water. And among the seven cities with incomes in the middle range in the Index (with a GDP per person between US$8,000 and US$16,000), it has the best rate of electricity consumption per unit GDP and the lowest number of vehicles per person.

Energy and CO_2: Bogotá ranks above average in energy and CO_2. It emits an estimated 40 kg of CO_2 per person from electricity consumption, well below the Index average of 202 kg per person. The figure is helped by a comparatively small industrial presence within city limits and also by the high share of renewables in its electricity mix. More than 80% of Bogotá's electricity is generated from hydro power. Also, according to local experts, around 70% of the industry that does operate in the city has converted from coal and diesel to natural gas. Some studies also point out that Bogotá's temperate climate, between 13 to 18 degrees Celsius, reduces the need for air conditioning. Moreover, the city sources more than 80% of its electricity production from hydropower, similar to the rest of the country. Bogotá also scores well for electricity consumption, using an estimated 397 megajoules for every US$1,000 in GDP, far less than the Index average of 761 megajoules. This is also the best rate in the Index among cities with incomes in the middle range. Bogotá does not fare as well for its energy and CO_2 policies, however, particularly regarding clean energy, where it places close to the bottom of the Index. Bogotá is marked down for having an energy strategy that is less comprehensive than in other cities and for not specifically sourcing or producing more clean and renewable energy.

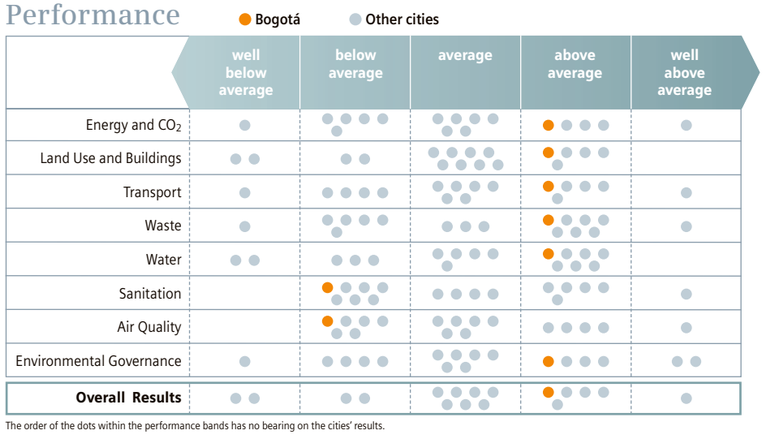
Green initiatives: In the last decade the city has gradually replaced buses that run on carbon-intensive fuel with buses that run on natural gas, particularly through the introduction of the "TransMilenio bus rapid transit" (BRT) system (see "green initiatives" under "Transport" below). The total number of vehicles operating on natural gas in Colombia as a whole rose from about 9,000 in 2002 to 300,000 as of December 2009. The Doña Juana biogas project captures and treats methane from the city's Doña Juana landfill. Project designers expect to save 5.8 million tonnes of CO_2 emissions between 2009 and 2016. The project machinery will run on the biofuel produced from the process, and the remainder will be distributed to local industry.

Land use and buildings: Bogotá ranks above average in land use and buildings, a strong result driven by abundant green space and relatively strong land use policies. At 107 square metres per person, Bogotá's figure for green spaces is sixth highest in the Index and first among cities with mid-sized population. The city also benefits from having relatively robust policy on the protection of green spaces and containment of urban sprawl as well as comparably good green standards for public buildings.

Green initiatives: The "public spaces" policy acknowledges that the city needs more green space, especially in low-income areas, and sets out a general policy to increase investment in this. More specifically, Bogotá's urban planning framework requires designers to set aside green space for new developments. For example, in the plan for the city's northern region, 132,000 new housing units will be accompanied by 76 hectares of parkland.

Transport: Bogotá ranks above average in transport. The city is helped by a relatively lengthy mass transport network. It stretches an estimated 6.9 km per square kilometre, the fifth longest in the Index and higher than the Index average of 5 km per square kilometre. The network lacks a metro, but over the past decade the city authorities have invested heavily in the "TransMilenio BRT system" and in cycle paths (see "green initiatives" below). Bogotá also scores relatively well for having a low ratio of cars to people, at 0.15 vehicles per person, which is the lowest among cities with incomes in the middle range. Bogotá is marked up for having a comprehensive urban mass transport policy and exclusive bus lanes for the BRT. The pricing system for mass transport is partly integrated and the city has taken some steps to reduce emissions from mass transport.

Performance



The order of the dots within the performance bands has no bearing on the cities' results.

Green initiatives: Bogotá's flagship transport initiative, the TransMilenio BRT system, opened in 2000. More than 1,000 buses carry about 1.6 million commuters per day using exclusive lanes throughout the city. Passengers board on elevated platforms using contactless smart cards. The system connects to a feeder system of 400 additional buses, and cycle paths. The BRT was adapted from a system in Curitiba, and similar bus networks have spread throughout Latin America. In addition, Bogotá's 300-km cycle network is one of the most extensive in the world. On Sundays and holidays, Bogotá closes more than 70 km of streets to cars as part of its "Ciclovía" programme, which attracts thousands of cyclists, runners and pedestrians to the city centre. The idea, which was first implemented in 1976, has been copied throughout the world, including in New York and London.

Waste: Bogotá ranks above average in the waste category. The city generates the second-lowest amount of waste in the Index, at an estimated 290 kg per person, well below the Index average of 465 kg. The city also manages to collect and dispose of just under 100% of the city's waste. In contrast, the city's performance is weighed down by relatively weak waste policies, including a partly integrated waste strategy and insufficient monitoring of illegal waste. There are also shortcomings in enforcing waste disposal standards. Although Bogotá does have a recycling service, it is often informal, and there are no easily accessible central collection points.

Water: Bogotá ranks above average in the water category. The city has the Index's lowest rate of water consumption per person, at 114 litres per person per day compared with an average of 264 litres. Official figures suggest that close to 100% of the population has access to potable water, which leads the Index among cities with incomes in the middle range. However, Bogotá lacks a comprehensive policy on water conservation. It is also one of a few cities in the Index that receives only partial marks for promoting water conservation among the public because awareness campaigns on the rational use of water are undertaken by the national government rather than the city administration. Like most cities in the Index, Bogotá sets standards for levels of key pollutants in drinking water, regularly monitors water quality and enforces water pollution standards on local industry.

Green initiatives: In July 2010 the mayor proposed an initiative to conserve water, through a twin-pronged strategy of public awareness campaigns and more accurate billing. The proposal was part of a five-point strategy covering water policy, as well as sanitation, wetland revival and drainage improvements.

Sanitation: Bogotá has a below-average rank in the sanitation category. Although the city has the second highest rate of access to sanitation services in the Index, with official figures at nearly 100%, it scores relatively poorly on levels of wastewater treated. Only an estimated 29% of its wastewater is treated, compared with the Index average of 52%. Bogotá ranks poorly for sanitation policies too, mainly owing to a lack of monitoring and standards for wastewater treatment.

Green initiatives: The city's water and sewerage masterplan calls for the aqueduct network to be rehabilitated and extended by around 200 km and the sewerage network to be extended and improved by 2015. It also calls for decontamination of the Bogotá river, one of the region's main water sources. As part of the plan, the national government is helping to finance a new sewage plant to serve the river basin region.

Air quality: Bogotá ranks below average for air quality, which is largely attributable to relatively high levels of sulphur dioxide and suspended particulate matter. At 22 micrograms per cubic metre, Bogotá registers the second highest average daily level of sulphur dioxide in the Index.

The sulphur dioxide figure was taken from 2008, the same year that the city put restrictions on sulphur in diesel fuel (see "green initiatives" below), so the city's performance is likely to improve over the next few years. And for average daily levels of suspended particulate matter, Bogotá measures 58 micrograms per cubic metre, above the average of 48 micrograms. Bogotá scores relatively well on average daily levels of nitrogen dioxide, at 33 micrograms per cubic metre, compared with the Index average of 38 micrograms. Regarding clean air policies, Bogotá scores reasonably well, with good marks for its air quality codes, monitoring standards and public awareness campaigns. The city has 13 air quality stations continuously monitoring the concentration of major air pollutants and publishing the information on the departmental website.

Green initiatives: A national law from 2008 requires fuel distributors to reduce the sulphur content in diesel from 1,200 parts per million to less than 500 parts per million, with the goal of reaching 50 parts per million by 2013. All TransMilenio buses currently use diesel with 50 parts per million of sulphur content. The city's environmental authority is working in partnership with TransMilenio and local universities on a 10-year air decontamination plan, which outlines policies to raise air quality over the period. The work is in its early stages and the partnership has run a series of public workshops to gather ideas.

Environmental governance: Bogotá ranks above average for environmental governance. The city does particularly well in environmental management and environmental monitoring, owing to a decade of implementing some key environmental initiatives, including the cycle paths mentioned above. Bogotá's environmental authority also has one of the widest remits of the 17 cities and is responsible for monitoring most of the key environmental areas covered in the Index.

The city has a relative lack of public participation in the development of environmental policies, defined in the Index by whether public consultation is planned or has taken place for projects with a relatively high environmental impact. However, Bogotá appears willing to improve in this area, with an initiative aimed at increasing public participation (see "green initiatives" below).

Green initiatives: In order to improve public participation and environmental awareness, the local government has developed an outreach and civic engagement centre, including a programme for children called the "Environmental Classroom" with meetings that take place in local parks. The civic centre also presents a variety of indicators that allow citizens to track the planning and implementation of local environmental projects.

Quantitative indicators: Bogotá

		Average	Bogotá	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	40.4 [1, e]	2007	EIU estimate; Departamento Administrativo Nacional de Estadística; International Energy Agency; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	396.8 [1,e]	2007	EIU estimate; Departamento Administrativo Nacional de Estadística
Land use and Buildings	Population density (persons/km^2)	4,503.0	4,087.7 [1]	2008	Depart. Administrativo Nacional de Estadística; Alcaldía Mayor de Bogotá D.C.
	Green spaces per person (m^2/person)	254.6	107.3 [1]	2008	Secretaría de Planeación; Departamento Administrativo Nacional de Estadística
Transport	Length of mass transport network (km/km^2)	5.0	6.9 [2, e]	2007	EIU estimate; Secretaría de Planeación
	Superior public transport networks (km/km^2)		0.05 [1]	2010	Transmilenio, S.A.
	Stock of cars and motorcycles (vehicles/person)	0.13 0.30	0.15 [1]	2007	Subsecretaria de Planeacion Territorial, „Destino Capital; Movilidad Sostenible", Nov. 2009
Waste	Share of waste collected and adequately disposed (%)	96.2	99.7 [3, e]	2009	Secretaría de Planeación; Secretaría de Hábitat
	Waste generated per person (kg/person/year)	465.0	289.8 [4, e]	2009	Secretaría de Hábitat: Departamento Administrativo Nacional de Estadística
Water	Water consumption per person (litres per person per day)	264.3	114.3 [1]	2009	Acueducto Agua y Alcantarillado de Bogota; Departamento Administrativo Nacional de Estadística
	Water system leakages (%)	34.6	36.6 [5, e]	2009	Acueducto Agua y Alcantarillado de Bogota
	Share of population with access to potable water (%)	97.5	99.4 [1]	2007	Secretaría de Planeación
Sanitation	Population with access to sanitation (%)	93.7	99.8 [6, e]	2007	Secretaría de Planeación
	Share of wastewater treated (%)	51.5	28.6 [3, e]	2009	Agua y alcantarillado de Bogotá
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	32.9 [1]	2008	Secretaría Distrital de Medio Ambiente
	Daily sulphur dioxide levels (ug/m^3)	11.4	21.7 [1]	2008	Secretaría Distrital de Medio Ambiente
	Daily suspended particulate matter levels (ug/m^3)	48.0	58.0 [1]	2008	Secretaría Distrital de Medio Ambiente

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Bogotá, Distrito Capital, 2) Based on Bogotá, Distrito Capital. Estimate based on average length of bus route and number of bus routes, 3) Based on Bogotá, Distrito Capital, 4) Based on Bogotá, Distrito Capital. Based on total amount of waste collected, 5) Based on Bogotá, Distrito Capital. Based on total non-billed water volume, 6) Based on Bogotá, Distrito Capital. Proportion of population with access to sewerage

Brasília_Brazil

Brasília, with 2.5 million residents, is the capital city of Brazil. The purpose-built city was founded in 1960, when it replaced Rio de Janeiro as the seat of the federal government. It is today renowned for its modernist architecture and broad avenues, and considered one of the great experiments in urban planning of the 20th century. The city was designed along two main thoroughfares with distinct residential, commercial and administrative zones. Brasília boasts the second highest GDP per capita in the Index, at US$21,100 per person — considerably higher than the 17-city average of US$11,100 per person. Public administration dominates Brasília's economy, but the city also has a large services industry and is home to one of Brazil's largest telecommunications companies and several major banks. Much of the city's 5,800 square kilometres of the federal district, Brasília's administrative area, is classified as a conservation area. The wider metropolitan area has a population of 3.7 million people and a much larger boundary, but all data used in the Index come from the federal district.

Brasília ranks above average in the Index overall. It performs best in the categories for water, sanitation, air quality and environmental governance, where it ranks above average. Brasília's performance is bolstered in these categories by a very low rate of water system leakages, a high share of wastewater treated, below-average concentrations of two out of three air pollutants measured in the Index and a strong record of environmental management. The city receives average rankings for energy and CO_2 and land use and buildings. Despite its strong overall performance, Brasília has significant room for improvement in waste and transport, earning ranks of well below average in both categories. Brasília generates one of the highest rates of waste per capita and, as a city designed for cars, its mass transport system remains sub-standard. When compared with the two other cities with high incomes in the Index (with GDP per head of above US$16,000), it has the lowest rate of CO_2 emissions from electricity consumption.

Background indicators

Total population (million)	2.5
Administrative area (km^2)	5,802.0
GDP per person (current prices) (US$)	21,082.1
Population density (persons/km^2)	436.5
Temperature (24-hour average, annual) (°C)	21.0

Based on Brasilia, Distrito Federal

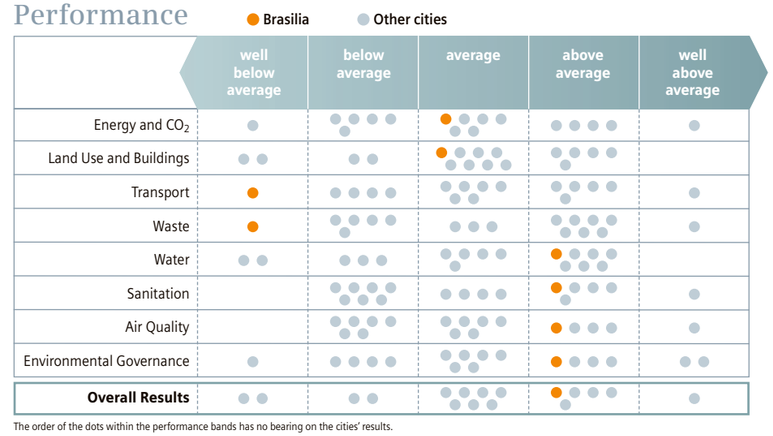
Energy and CO_2: Brasília has an average rank for energy and CO_2. With all of its electricity coming from renewable sources — 98% of it from hydroelectric plants — the city has one of the lowest rates of CO_2 emissions from electricity, at an estimated 8 kg per person. This is second only to São Paulo and considerably below the Index average of 202 kg per capita. Brasília's CO_2 emissions from electricity are particularly impressive when measured against the two other cities with high incomes in the Index. The average emissions from electricity for high-income cities jumps to 285 kg per person. The city also has one of the lowest rates of electricity consumption compared with its economic output. Brasília consumes 301 megajoules of electricity per US$1,000 GDP, less than half of the 17-city average of 761 megajoules. However, the city's performance on emissions and energy consumption is partly cancelled out by weaker results for government energy policy. Although the city recently formed a council on climate change, it has failed to adopt any clear CO_2 emissions reduction targets or sign up to any international covenants regarding the reduction of greenhouse gases. Furthermore, Brasília is one of only four cities in the index not to have conducted a recent baseline review of greenhouse gas emissions.

Land use and buildings: Brasília has an average rank for land use and buildings. Although the city is renowned for urban planning, its middling score in this category is largely attributable to its low population density. At 436 people per square kilometre versus the Index average of 4,500 people per square kilometre, Brasília's population density is the lowest in the Index. This is distorted by the city's vast administrative area, much of which is uninhabited. However, Brasília was designed with large and plentiful parks and therefore boasts an estimated 985 square metres of green space per person — the second highest in the Index, behind Quito. Brasília's 67 protected parks and conservation areas are subject to an environmental law, and a land management plan establishes limits on urban sprawl. Brasília could improve its ranking in this category by strengthening its policies on eco-buildings: the city does not offer incentives to motivate businesses or households to lower energy use nor does it have a plan for implementing green standards in public buildings or any standards for energy efficiency in new buildings.

Green initiatives: In 2009 Brasília's state-owned property company, Terracap, began work on its long-planned "Green Neighbourhood" in the north-west of the city. The new residential community includes 220 energy-efficient buildings, which will be built with installed solar panels and eventually house an estimated 40,000 people. The neighbourhood is due to be completed by 2025. Furthermore, Brasília, with support of the World Bank, is also planning to launch a US$34 million urbanisation programme in an informal settlement at the edge of the city's open air dump. Once the dump is closed, the city will build permanent houses connected to its sanitation network and with potable water connections for nearly 35,000 people living in the area, in addition to building schools and other neighbourhood infrastructure.

Transport: Brasília ranks well below average in transport. The city was planned in the 1950s, when Brazil's automotive industry was taking off. As a result the city is designed for cars, with few pedestrian paths. Today the city's stock of cars and motorcycles totals 0.37 vehicles per person, compared with a 17-city average of 0.30. Brasília has a 45-km metro consisting of two lines with about 150,000 daily passengers. Its superior transport network (defined in the Index as transport that moves large numbers of passengers quickly in dedicated lanes, such as a metro, bus rapid transit or tram network) totals about 0.09 km per square kilometre of urban

Performance



The order of the dots within the performance bands has no bearing on the cities' results.




territory, just below the Index average of 0.1 km. However, buses are the primary form of public transport, and they are frequently overcrowded. Brasília is shown to have the shortest mass transport network in the Latin American Green Cities Index in relation to its size, at just 0.5 km per square kilometre of urban territory compared with a 17-city average of 5.0 km. The city also performs poorly in urban mass transport policy. The city's mass transport plan, "Integrated Brasília", calls for investment in expanding bus and metro services, construction of passenger terminals and the creation of more bus lanes, but has yet to be fully implemented. Brasília scores better on policy to reduce congestion. Although the city lacks traffic reduction initiatives like carpooling lanes or park and ride systems, officials have begun to promote cycling as a form of transport, which boosts its score.

Green initiatives: In 2009 Brasília started constructing the country's first modern, electricity-powered tram system. Scheduled for completion ahead of the 2014 World Cup, the tram line will extend 23 km and link Brasília's airport to the city's southern, central, and northern zones, with 25 stations. The US$870 million project is expected to reduce road traffic on the W3, one of Brasília's major thoroughfares, by 30%. Further tram lines are under consideration.

Waste: Brasília is well below average in the waste category. The city's poor performance is largely attributable to a very high rate of waste production: Brasília generates 875 kg of waste per person per year, considerably higher than the Index average of 465 kg. This is even high when compared with other high-income cities in the Index, which produce an average of 657 kg of waste per person per year. Brasília collects and disposes of 95% of its waste, just below the 17-city average of 96%. It is one of the few major cities in Brazil that still operates an open-air dump, which has long been slated for closure (see "green initiatives" below). There are 12 waste management stations in the city and a local system to recycle waste was launched in 2007.

Green initiatives: In 2009 Brasília opened a public bidding process to build a new managed landfill. The US$175 million, state-of-the-art facility will be the city's first and only landfill, and the winner will have one year to build the facility. When the new landfill is fully operational, the city will close its existing open air dump. The bidding process was suspended on technical grounds, but officials say it will be reopened in 2011.

Water: Brasília ranks above average for water. Its strong performance in this category is largely thanks to a comparably low rate of water system leakages. Brasília loses 27% of its water supply to leakages, less than the 17-city average of 35% — only Monterrey and Puebla have lower rates. Brasília's water infrastructure is relatively new and therefore more efficient than the infrastructure of many other cities in the Index. Almost 100% of the population has access to potable water, according to official sources.

On average, Brasília consumes 176 litres of water per capita per day versus the Index average of 264 litres. The capital city has a regulatory agency for water, energy and basic sanitation, which, along with the waterworks company Caesb, regularly monitors the water system for pollutants. Brasília is also taking steps to preserve the quality of its vast underground water resources, natural springs and the man-made Paranoá Lake (see "green initiatives" in "Sanitation" below).

Green initiatives: In an effort to reduce water consumption, in 2009 the city adopted a measure that offers consumers a 20% discount on water bills if they consume less water in a given month than during the same month in the previous year. In addition, over the past two years new buildings have been equipped with water meters, and meters will be installed in older buildings within five years.

Sanitation: Brasília ranks above average for sanitation. As a relatively young city, Brasília benefits in this category from its comparatively new sanitation infrastructure. The city treats 100% of its collected wastewater, considerably higher than the Index average of 52%. However, an estimated 92% of Brasília's residents have access to sanitation services, which is slightly lower than the 17-city average of 94%. The city's record in this area will likely improve thanks to ongoing projects (see "green initiatives" below). The city's score is further bolstered by a solid record in sanitation policy. It regularly monitors on-site sanitation facilities in homes and communal areas, for example, and like most cities in the Index, Brasília promotes awareness of preventative sewerage maintenance mainly through public awareness campaigns.

Green initiatives: In 2007 the city launched the $150 million "Sustainable Brasília" project in partnership with the World Bank to preserve the quality of water resources and expand environmental sanitation services. Under the programme Brasília is undertaking a combination of activities to reduce pollution and prevent the dumping of untreated wastewater into its water sources. The initiatives are primarily aimed at expanding sanitation infrastructure to currently under-served neighbourhoods and upgrading drainage and pipe networks. "Sustainable Brasília" also has a significant urbanisation component and aims to improve living standards for residents close to the city's natural springs.

Air quality: Brasília ranks above average for air quality, together with Belo Horizonte, Quito and Medellín. The city's strong performance in this category is largely attributable to the relative absence of polluting industries. Brasília records an annual average daily concentration of nitrogen dioxide of just 13 micrograms per cubic metre, which is the lowest in the Index, and well below the 17-city average of 38 micrograms. The city also has the lowest concentration of particulate matter, at just 11 micrograms per cubic metre versus the Index average of 48 micrograms. However daily sulphur dioxide concentrations of 13 micrograms per cubic metre are slightly higher than the average of 11 micrograms. Although the city's performance in this category is already impressive, less reliance on private car transport would boost its score further. Brasília monitors air quality (see "green initiatives" below) and also promotes cleaner air by informing citizens about pollutant levels and about the dangers of household pollution.

Green initiatives: Brasília's state-run environmental institute, IBRAM, runs seven monitoring stations in the city, and in 2009 IBRAM partnered with the University of Brasília to improve its capabilities. Together the organizations are closely monitoring air quality in highly polluted areas close to the main bus station, along major streets and near a large cement factory. The organisations also co-produce the city's annual air quality report.

Environmental governance: Brasília ranks above average for environmental governance, one of its best performances in the Index. The city's environmental policy and programmes seem to have been unaffected by political difficulties in early 2010. The state secretariat for urban development, habitation and environment, Seduma, acts as the central point of contact for public information on environmental performance. The department also conducts regular reviews of its environmental performance and the results are publicly available. The environment department also organises regular public audiences with non-governmental organisations and other stakeholders, particularly when drafting plans for programmes such as "Sustainable Brasília".

Quantitative indicators: Brasília

		Average	Brasília	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	7.8 [1, e]	2009	EIU estimate; Companhia Energética de Brasilia; Secretaria de Estado de Desenvolvimento Urbano, Habitação e Meio Ambiente
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	301.2 [1]	2007	Companhia Energética de Brasilia; Instituto Brasileiro de Geografia e Estatística; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	436.5 [1]	2009	Secretaria de Estado de Desenvolvimento Urbano, Habitação e Meio Ambiente; Instituto Brasileiro de Geografia e Estatística
	Green spaces per person (m^2/person)	254.6	985.1 [1, e]	2009	Secretaria de Estado de Desenvolvimento Urbano, Habitação e Meio Ambiente
Transport	Length of mass transport network (km/km^2)	5.0	0.5 [2, e]	2009	Secretaria de Estado de Desenvolvimento Urbano, Habitação e Meio Ambiente
	Superior public transport networks (km/km^2)	0.13	0.09 [3]	2010	Dftran, DFMetro
	Stock of cars and motorcycles (vehicles/person)	0.30	0.37 [1]	2010	Denatran
Waste	Share of waste collected and adequately disposed (%)	96.2	95.1 [4]	2009	Secretaria de Estado de Desenvolvimento Urbano, Habitação e Meio Ambiente
	Waste generated per person (kg/person/year)	465.0	874.6 [4]	2009	Secretaria de Estado de Desenvolvimento Urbano, Habitação e Meio Ambiente
Water	Water consumption per person (litres per person per day)	264.3	175.9 [1]	2008	Companhia de Saneamento Ambiental do Distrito Federal; Secretaria de Estado de Desenvolvimento Urbano, Habitação e Meio Ambiente
	Water system leakages (%)	34.6	27.0 [1]	2008	Secretaria de Estado de Desenvolvimento Urbano, Habitação e Meio Ambiente Sistema Nacional de Informações sobre Saneamento; Secretaria de Estado de
	Share of population with access to potable water (%)	97.5	99.8 [1]	2008	Desenvolvimento Urbano, Habitação e Meio Ambiente
Sanitation	Population with access to sanitation (%)	93.7	91.8 [5, e]	2008	Sistema Nacional de Informações sobre Saneamento
	Share of wastewater treated (%)	51.5	100.0 [1]	2008	Secretaria de Estado de Desenvolvimento Urbano, Habitação e Meio Ambiente
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	13.4 [6, e]	2008	Secretaria do Meio Ambiente
	Daily sulphur dioxide levels (ug/m^3)	11.4	13.4 [7, e]	2008	Secretaria do Meio Ambiente
	Daily suspended particulate matter levels (ug/m^3)	48.0	10.9 [8, e]	2008	Secretaria do Meio Ambiente

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Brasília, Distrito Federal, 2) Based on the urban area of Brasília. Not all data on bus lines accounted for due to unavailability of data, 3) Based on the urban area of Brasília, 4) Based on Brasília, Distrito Federal. Based on total waste collected, 5) Based on Brasília, Distrito Federal. Proportion of population with access to sewerage, 6) Based on Brasília, Distrito Federal. Estimated annual daily mean of NO_2, 7) Based on Brasília, Distrito Federal. Estimated annual daily mean of SO_2, 8) Based on Brasília, Distrito Federal. Estimated annual daily mean of PM10.

Buenos Aires_Argentina

Buenos Aires is the capital city of Argentina. Although the metropolitan area is home to some 12.5 million people, the Autonomous City of Buenos Aires is considerably smaller, with 3.1 million inhabitants. Only the smaller city proper is calculated in the Latin American Green City Index, making Buenos Aires the tenth biggest city in the Index. The city has the highest GDP per capita in the Index, at an estimated US$24,200. And along with the wider metropolitan area, Buenos Aires is the country's economic powerhouse, contributing nearly a quarter of Argentina's GDP. Its commercial activities are dominated by financial services, real estate, business services and manufacturing. It also boasts one of the busiest ports in South America. The port is located on the River Plate, which runs along Buenos Aires and links Argentina to Uruguay. As a result, the city is a major logistics and transport hub.

Despite its relative affluence, Buenos Aires ranks below average in the Index overall. The city's best results come in the areas of energy and CO_2, land use and buildings, transport, and environmental governance; in each of these categories it ranks average. Its performance in the energy and CO_2 category is driven by a relatively low rate of electricity consumption per unit of GDP and strong policies aimed at curbing the effects of climate change. In the area of transport, Buenos Aires has one of the longest public transport networks and well-developed policies aimed at congestion reduction. However, the city's overall performance is weighed down by a well below average rank in the water category. Although all of Buenos Aires's residents have access to potable water, the city has a high rate of water consumption and system leakages. The city's score is further hindered by below average rankings in waste, sanitation and air quality. However, when measured against other high-income cities in the Index (GDP per capita above US$ 16,000), Buenos Aires has the highest share of residents with access to potable water and sanitation services. Furthermore, the city has adopted one of the most ambitious climate change action plans in the Index, and its performance in many categories will likely improve as a result.

Background indicators

Total population (million)	3.1
Administrative area (km^2)	203.2
GDP per person (current prices) (US$) [e]	24,222.9
Population density (persons/km^2)	15,013.4
Temperature (24-hour average, annual) (°C)	17.8

Based on Ciudad Autonoma de Buenos Aires
e) EIU estimate

Energy and CO2: Buenos Aires ranks average in energy and CO_2, due mainly to a high level of CO_2 emissions from electricity usage. Each year the city produces 527 kg of CO_2 emissions per capita from electricity usage, almost triple the 17-city average of 202 kg per person, and the second highest level in the Index. Its high level of CO_2 emissions from electricity is largely due to the low share of renewables used in electricity production. Just over a quarter of the electricity consumed in Buenos Aires comes from hydropower, while the majority is produced from natural gas. On the other hand, the city consumes 535 megajoules of electricity per US$1,000 GDP, compared to the Index average of 761 megajoules. However, this is the highest rate of electricity consumption when measured against the two other higher-income cities in the Index. Buenos Aires performs better when it comes to policies aimed at reducing CO_2 emissions. The city has adopted a comprehensive climate change action plan, which is described in more detail in the "green initiatives" below. However, Buenos Aires could improve its performance in this category by implementing a clean energy strategy aimed at reducing the environmental impact of energy consumption and increasing investment in energy efficiency.

While several cities in the Index have already begun converting local waste by-products to energy, bolstering their energy and CO_2 score in the process, Buenos Aires scores less well on this indicator because it has only gone as far as completing feasibility studies on bio-digestion and biogas recovery. The city also lags behind other Index cities in terms of investing in clean energy and renewables.

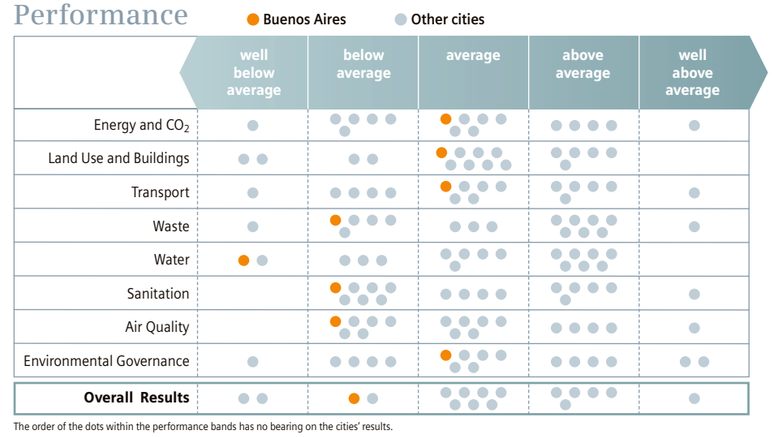
Green initiatives: In 2009 the city adopted a comprehensive climate change action plan. It sets a target to reduce CO_2 emissions 30% by 2030 from 2008 levels, achieving a reduction of 5 million tonnes of CO_2 per year. Specific measures in the plan include replacing standard street lights with energy-efficient LED lights, introducing more efficient household appliances, and launching a public-awareness campaign to promote energy conservation.
In 2010 the city of Buenos Aires put its first hybrid electric bus into circulation, the first stage in its "Ecobus" project. The project aims to replace the city's entire fleet with low-pollution hybrid vehicles, which, authorities say, will cut CO_2 emissions by 230,000 tonnes a year.

Land use and buildings: Buenos Aires ranks average in the land use and buildings category. The city scores well for population density, with the highest density among the cities in the Index, at 15,000 inhabitants per square kilometre, compared to the 17-city average of 4,500 people per square kilometre. However, this high density comes at the expense of green spaces. With just 6 square metres of green spaces per person within the city area, Buenos Aires has one of the lowest figures in the Index. While the city does not actively promote awareness among residents about ways to improve energy efficiency in their homes, its score is bolstered by the city administration's proactive measures to implement energy-efficient and environmentally friendly programmes in municipal buildings. The city has pledged to cut energy consumption in government buildings by 20% from 2007 levels through the end of 2012 (see "green initiatives" below).

Green initiatives: The city's "Energy Efficiency Programme in Public Buildings" aims to reduce energy consumption in public buildings by 10% in 2010 and 20% from 2007 levels through the end of 2012. Under the initiative, the city first conducted energy assessments of municipal buildings, taking into account air conditioning, heating, lighting, use of computers and other electric equipment. Individual energy-efficiency plans were then tailored for each building to maximise energy-savings opportunities and will be used as best practice to adopt in other public buildings. The city is also developing a plan to revitalise green spaces by creating a network of green corridors with bicycle lanes that connect existing green spaces. This will include parks, plazas and the Costanera Sur Ecological Reserve, in the east of Buenos Aires, which remains an important focus for environmental conservation. Neither a timeline nor firm targets for the programme have been announced.

Transport: Buenos Aires ranks average in transport. The city's public transport system is well developed, and the density of the network, at 7 km per square kilometre of city territory is above the 17-city average of 5 km per square kilometre. The metro boosts Buenos Aires's score in the area of superior public transport networks (defined in the Index as transport that moves large numbers of passengers quickly in dedicated lanes, such as a metro, bus rapid transit or tram network). It is one of the longest in the Index at 0.26 km per square kilometre of city territory. However, many commuters still choose to drive. Buenos Aires has the highest stock of cars and motorcycles in the Index, at an estimated 0.66 vehicles per person — more than twice

Performance



The order of the dots within the performance bands has no bearing on the cities' results.

the 17-city average of 0.3. The city is working to reduce emissions from mass transport and has adopted low-emission public buses. The city also promotes green transport, such as cycling.

Green initiatives: As part of its "Plan for Sustainable Mobility", the city has added "preferential routes" to eight major commuter thoroughfares to improve traffic flow. Measures include designating separate lanes along these routes for public and private transport. The initiative has cut travel times by up to two thirds and has also reduced emissions from idling vehicles. The sustainable mobility plan also foresees a bicycle rental scheme, similar to those in many European cities. Users will be able to rent bicycles from designated locations for short periods and return them to any other station in the city. The city administration has not yet announced a timeline for this initiative.

Waste: Buenos Aires ranks below average in the waste category. The city of Buenos Aires collects and adequately disposes of 100% of its waste, compared to the 17-city average of 96%. However, the city of Buenos Aires generates 606 kg of waste per person per year. This is the third highest rate of waste generation in the Index — only Brasília and Belo Horizonte produce more waste. On average the cities in the index produce 465 kg per inhabitant per year. The large amount of waste generation is largely attributable to the city's well-developed consumer culture and the high standard of living that many of Buenos Aires's residents enjoy. The city performs better on waste policy because it imposes environmental standards for landfills, enforces and monitors the proper disposal of hazardous waste, and boasts an integrated strategy aimed at reducing waste and promoting re-use or recycling.

Green initiatives: The Ministry of Environment and Public Space released its draft Urban Hygiene Proposal for the city in July 2010. The plan calls for an overhaul of the city's waste collection system, and includes the guiding principal of "zero waste", which aims to be achieved by expanding recycling and improving collection and disposal services.

Water: Buenos Aires ranks well below average for water, its poorest placement in the Index. While 100% of Buenos Aires's population have access to potable water, ranking first with Porto Alegre, Curitiba and Quito, the city has considerable scope for improvement in this category. The residents of Buenos Aires have the highest rate of water consumption in the Index, at 669 litres of water per person per day, more than double the 17-city average of 264 litres per day. The high rate of consumption is in part attributable to the city's lack of progress in the area of water sustainability policy. The city does not have a code for reducing water stress or consuming water more efficiently. Buenos Aires also loses an estimated 41% of its water to leakages, compared to an Index average of 35%. And while the city does monitor the quality of surface water, Buenos Aires is the only city in the Index that lacks a policy aimed at improving the quality of its surface water.

Green initiatives: Buenos Aires has adopted a city-wide water master plan to deal with all facets of water management. An essential component of the plan is the installation of water usage meters across the city. While many regional peers have already taken this step and have cut water usage, Buenos Aires hopes to catch up by setting a target to reduce water consumption by 40% from current levels by 2012.

Sanitation: Buenos Aires places below average in sanitation. Although the high population density of Buenos Aires and historical wealth mean that the city has a widespread and generally robust sanitation infrastructure — an estimated 99% of residents have access to sanitation, which is above the Index average of 94% — the city is one of only two in the Index that fails to treat its wastewater. A large quantity of untreated sanitation flows directly into the already-polluted River Plate. Furthermore, the city is one of just a few in the Index that does not have any public awareness campaigns to promote the efficient use of sanitation systems.

Green initiatives: As part of the city's water master plan the government is working to upgrade the outdated infrastructure of the Radio Antiguo sewerage system, which dates back to 19th century and accounts for 8% of the total network. A lack of investment has resulted in a poor record for sewage treatment, and most efforts are currently focused solely on monitoring. Further initiatives in the plan include the installation of new drains and secondary collectors in 17 water basins around the city by 2012.

Air quality: Buenos Aires places below average for air quality. The city's dense, traffic-choked streets are the primary source of most of the air pollution. While the city has inaugurated a new air monitoring network (see "green initiatives" below) it does not yet monitor sulphur dioxide or particulate matter, which hinders its score in the area of air quality monitoring. The city has an average daily concentration of nitrogen dioxide of 27 micrograms, one of the lowest concentrations of nitrogen dioxide in the Index and well below the 17-city average of 38 micrograms. Due to lack of monitoring, however, data on average daily sulphur dioxide and particulate matter concentrations is outdated. Buenos Aires also underperforms most other cities in the Index when it comes to having a comprehensive air quality code, but it does score highly for informing citizens about the danger of household pollutants.

Green initiatives: Buenos Aires has recently implemented a new air monitoring network designed to help tackle the city's chronically poor air quality. The network has 45 monitoring facilities analysing various common pollutants at strategic locations throughout the city.

Buenos Aires has also set a target to reduce greenhouse gas emissions from mobile and stationary sources by 10% by 2012, partly through verifying that vehicles meet minimum emission standards.

Environmental governance: Buenos Aires ranks average in environmental governance. The city's score in this category is bolstered by the wide-ranging scope of its Environmental Protection Agency's activities and its regular monitoring of environmental performance.

The city also has the legal capacity to implement its own environmental legislation, but it is marked down for the limited scope of citizen and NGO involvement in drafting environmental plans. Furthermore, the city's most recent environmental review omitted sanitation, waste, transport, land use, and human settlements.

Quantitative indicators: Buenos Aires

		Average	Buenos Aires	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	527.3 [1, e]	2008	EIU estimate; Agencia de Protección Ambiental, Ciudad de Buenos Aires; International Energy Agency; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	535.3 [2]	2008	Agencia de Protección Ambiental, Ciudad de Buenos Aires; Gobierno de la Ciudad de Buenos Aires
Land use and Buildings	Population density (persons/km^2)	4,503.0	15,013.4 [2]	2009	Instituto Nacional de Estadísticas y Censos de la República; Gobierno de la Ciudad de Buenos Aires
	Green spaces per person (m^2/person)	254.6	6.1 [2]	2008	Gobierno de la Ciudad de Buenos Aires
Transport	Length of mass transport network (km/km^2)	5.0	7.0 [2]	2008	EIU estimate; Atlas Ambiental de la Ciudad 2009; Subgerencia de Transporte Urbano
	Superior public transport networks (km/km^2)	0.13	0.26 [2]	2010	Subteraneos de B.A.
	Stock of cars and motorcycles (vehicles/person)	0.30	0.66 [3, e]	2008	Dirección Nacional del Registro de la Propiedad del Automotor; Gobierno de la Ciudad de B.A.
Waste	Share of waste collected and adequately disposed (%)	96.2	100.0 [2]	2008	Gobierno de la Ciudad de Buenos Aires, Minist. de Ambiente y Espacio Público
	Waste generated per person (kg/person/year)	465.0	606.1 [2]	2008	Gobierno de la Ciudad de Buenos Aires; Instituto Nacional de Estadísticas y Censos de la República
Water	Water consumption per person (litres per person per day)	264.3	669.2 [2]	2008	Gobierno de la Ciudad de Buenos Aires
	Water system leakages (%)	34.6	41.0 [2, e]	2008	Asociación de Entes Reguladores de Agua Potable y Saneamiento de las Américas
	Share of population with access to potable water (%)	97.5	100.0 [2]	2001	Gobierno de la Ciudad de Buenos Aires
Sanitation	Population with access to sanitation (%)	93.7	99.3 [4, e]	2008	Anuario Estadístico 2009, Ministerio de Hacienda GCABA
	Share of wastewater treated (%)	51.5	0.0 [2]	2008	Agencia de Protección Ambiental, Ciudad de Buenos Aires
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	27.0 [2]	2009	Agencia de Protección Ambiental, Ciudad de Buenos Aires
	Daily sulphur dioxide levels (ug/m^3)	11.4	16.0 [5, e]	1997	Atlas de Buenos Aires
	Daily suspended particulate matter levels (ug/m^3)	48.0	107.0 [2]	1999	World Bank

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Ciudad Autonoma de Buenos Aires. Based on composition of energy sources used in generation of electricity in Argentina, 2) Based on Ciudad Autonoma de Buenos Aires, 3) Based on Ciudad Autonoma de Buenos Aires. Year for motorcycle data is 2003, 4) Based on Ciudad Autonoma de Buenos Aires. Based on proportion of population with access to sewerage, 5) Based on Ciudad Autonoma de Buenos Aires. Based on the median of minimum and maximum of the daily air emissions

Curitiba_Brazil

Curitiba is the capital of the Brazilian state of Paraná, situated in the country's fertile southern region. Although 3.5 million people reside in the metropolitan area, just 1.9 million live within the Curitiba city limits, making it the second smallest city in the Latin American Green City Index. All data included in the Index is based on the smaller city proper. Its economy, the fourth biggest in Brazil, is driven primarily by commerce and services, but industry makes up about a third of its GDP. It is, for example, the second largest car manufacturer in the country.

Background indicators

Total population (million)	1.9
Administrative area (km^2)	430.9
GDP per person (current prices) (US$)	10,796.6
Population density (persons/km^2)	4,296.2
Temperature (24-hour average, annual) (°C)	17.0

Based on City of Curitiba

The city is also home to numerous well-known national and international companies. Curitiba boasts the eighth highest GDP per person in the Index, at US$10,800. The city also is widely considered to be the best planned of Brazil's major cities, and it has won international recognition for its efforts in sustainable development.

Curitiba continues to live up to its reputation for sustainable urban planning with an exceptional performance in the Index. It is the only city that achieves an overall rank of well above average, making it the greenest city in the Index. Curitiba performs particularly well in the area of waste and air quality, and is the only city to achieve well above average in these categories. Its placement is bolstered by progressive policies in both waste management and clean air. In most other categories Curitiba places among the top performers, ranking above average. Its poorest placement is in the area of land use and buildings, where it ranks average. Curitiba's impressive performance is largely attributable to its well-developed policies. The city is among the best-performing cities for its policies in almost all categories, with a few notable exceptions. Curitiba remains at the top of the Index when measured against cities with similar incomes and populations.

Energy and CO_2: Curitiba ranks above average in energy and CO_2. The city emits considerably less CO_2 from electricity than the Index average, at an estimated 70 kg of CO_2 per person compared to the 17-city average of 292 kg. The city consumes 743 megajoules of electricity per US$1,000 GDP, which is just slightly below the average of 761 megajoules. Curitiba has a good record in trying to reduce loss of energy in transmission and to consume energy more efficiently, and it makes at least partial efforts to convert waste by-products to energy. And although the city scores well for its energy strategy and investments in renewable energy — the city produces 84% of its electricity from hydropower — it is marked down for not having monitored greenhouse gas emissions and publishing the results. However, this will likely change (see "green initiatives" below).

Green initiatives: Since 2009 the city's environmental authority has been conducting an ongoing study on the CO_2 absorption rate in Curitiba's green spaces, as well as evaluating total CO_2 emissions in the city. Curitiba officials say the results will help them draft plans to neutralise emissions. The city is also in the process of changing all street lights from incandescent to energy-efficient fluorescent bulbs. It has announced plans to replace all diesel oil used in public transport with environmentally friendly, low-emission biofuels, although the timetable is unclear.

Land use and buildings: Curitiba ranks average in land use and buildings, its lowest placement in the Index. As a city with a low population and one of the smallest administrative areas in the Index, Curitiba has a population density of 4,300 persons per square kilometre, which is mid-range for the Index and just slightly below the 17-city average of 4,500 inhabitants. The city could improve its performance in this category by increasing its green spaces. At 52 square metres per person, Curitiba is just mid-range in the Index. However, Curitiba receives the best scores for protecting the green spaces it does have, and for its comprehensive plan to contain urban sprawl. The city is a middling performer on eco-buildings policies, since it has neither adopted eco-efficient standards for buildings, nor does it offer incentives for businesses and households to lower their energy use.

Green initiatives: Curitiba is participating in the federal government's "My House, My Life" scheme to provide low-cost housing for people living in informal settlements. The city administration says it aims to relocate to permanent housing some 18,000 families living in informal settlements along Curitiba's river banks by the end of 2012. This project aims to improve living standards and protect the city's more vulnerable ecological areas. In 2007 Curitiba launched a programme to incentivise landowners to establish public parks on their private land. Landowners who create parks are exempt from local and federal urban land taxes. The city says the programme is helping preserve green areas and limit urban sprawl.

Transport: Curitiba ranks above average in transport. Over the last three decades, Curitiba has based its mass transport system on bus "axes", which are dedicated corridors where only buses operate, also known as "bus rapid transit" (BRT). The city has six such axes carrying 710,000 daily commuters. The transit system is integrated, with commuters able to pay one fare and transfer between different bus lines. Curitiba's investment in buses has helped give it the second longest mass transport network in the Index, at an estimated 8.5 km per square kilometre, well above the 17-city average of 5 km per square kilometre. At the same time, the city scores well for its urban mass transport policy. Curitiba is taking steps to reduce emissions from urban mass transport, through the replacement of diesel-powered buses with ones running on biofuels (see "green initiatives" below). Despite its well-developed public transport system, Curitiba is marked down for its stock of cars and motorcycles. The city has 0.50 vehicles per person, the second highest rate in the Index and well above the average of 0.30 cars per person. However, the city is proactively tackling its traffic problems, and earns top place for its congestion reduction policies. Curitiba uses a combination

Performance

● Curitiba ● Other cities

	well below average	below average	average	above average	well above average
Energy and CO_2	●	● ● ●	● ● ● ●	● ● ● ●	●
Land Use and Buildings	● ●	● ●	● ● ● ●	● ● ● ●	
Transport	●	● ● ● ●	● ● ● ●	● ● ● ●	●
Waste	●	● ● ● ●	● ● ●	● ● ● ●	●
Water	● ●	● ● ●	● ● ● ●	● ● ● ●	
Sanitation		● ● ● ●	● ● ● ●	● ● ● ●	●
Air Quality		● ● ● ●	● ● ● ●	● ● ● ●	●
Environmental Governance	●	● ● ● ●	● ● ● ●	● ● ● ●	● ●
Overall Results	● ●	● ●	● ● ● ●	● ● ● ●	●

The order of the dots within the performance bands has no bearing on the cities' results.





of traffic light sequencing, traffic information systems, dedicated delivery times and access points around the city in order to reduce congestion.

Green initiatives: In 2007 Curitiba started rehabilitating the Green Line, a stretch of federal highway that links eastern and western Curitiba. The Green Line now has four exclusive bus lanes and three lanes for private vehicles in each direction. The aim is to cut commuting times, link opposite sides of the city and the neighborhoods in between, and encourage the use of public transport by cutting bus travel times. Furthermore, six of the 12 buses running on the line operate on soybean-derived biofuel. Officials are closely monitoring their performance, and eventually the city wants all of its buses to run on biofuels. The city is also establishing a public-private partnership to build the city's first metro. The US$1.2 billion project is scheduled to open in 2014, although this target seems unlikely given that construction has not yet begun. The transport department says nearly 500,000 commuters will travel between the 22 planned metro stations every day.

Waste: Curitiba is the only city in the Index to achieve a well above average ranking in the waste category. In 1988 it became the first of six Brazilian cities in the Index to shut down its open rubbish dump, and instead dispose of all waste in a managed landfill. Now Curitiba is one of eight cities in the Index that collects and adequately disposes of 100% of its municipal waste. Its score is also bolstered by progressive policies on waste collection and disposal, and waste recycling and re-use. The city enforces strict environmental standards on its sole landfill and also has a programme to separately collect and treat hazardous waste, as well as debris from construction and demolition. Curitiba also has the most advanced recycling programme in Brazil (see "green initiatives" below). On the other hand, the city generates 473 kg of waste per person per year, slightly more than the 17-city average of 465 kg. Reducing the amount of waste generated would boost its already impressive performance in this category even more.

Green initiatives: In 1989 Curitiba launched its now-renowned recycling programme. Residents separate recyclable materials, including glass, plastics, paper and old electronic devices, which the city collects from households three times a week. To ensure proper disposal of waste generated in 41 informal settlements, which have dense, winding streets that are difficult for waste companies to access, the city introduced its "Purchase of Garbage" initiative. The city has designated central collection points where residents receive food baskets in ex-change for each 8-10 kg of waste they hand over. Furthermore, the city pays the neighborhood association 10% of the value of each food basket for community works or services. Curitiba authorities estimate that 6,800 tonnes of waste are collected through this initiative each year.

Water: Curitiba ranks above average in the water category. The city's water consumption is one of the lowest in the Index, behind only Bogotá. On a per capita basis, the city consumes 150 litres of water per day, well below the 17-city average of 264 litres. The low level of water consumption is largely attributable to many years of successful public awareness campaigns to encourage water conservation. Furthermore, Curitiba is the leading city in the Index for the strength of its water sustainability policy, which is contained in the city's municipal water resources plan. The top marks for policy are driven by the presence of several efficiency measures, including water meters, separate pipes for non-drinking water, hose-pipe bans and rainwater collection. The city is marked down for only partially monitoring surface water quality and imposing limits for levels of pollutants in surface or drinking water. However, this result is skewed by the fact that the state-run environmental agency monitors water quality rather than the city itself. This should change though, as the city has plans to monitor water quality at 70 points throughout the city in the future.

Green initiatives: The state water company has extended water services — as well as sewerage connections — to all of the 1,790 households in "Vila Zumbi dos Palmares", an informal settlement. The programme guarantees the delivery of clean drinking water and also improves water quality for Curitiba as a whole, largely because the informal settlement sits along the banks of the Palmital River, one of the city's main water sources.

Sanitation: Curitiba ranks above average in sanitation. The city treats 98% of its wastewater, the third best performance in the Index, behind Brasília and Monterrey, and much higher than the 17-city average of 52%. Curitiba's score is also boosted by strict standards for wastewater treatment and regular monitoring, and the city promotes public awareness on the efficient use of sanitation systems. The city could work to improve sanitation access, however. Only 93% of residents have access to services, one of the lower rates in the Index and slightly below the average of 94%.

Green initiatives: The main initiative to improve the Curitiba's sanitation system is a US$585 million statewide programme called "From River to River". This comprehensive plan involves improving sanitation, as well as drainage and the quality of the state's water basins. The programme will run through 2018.

Air quality: Curitiba ranks well above average in air quality. Along with Santiago, the city boasts the most advanced clean air policy in the Index. It regularly monitors air pollutants, for example, and participates in a statewide programme to inform citizens about the dangers of household pollutants. It also has a comprehensive air quality code, helping Curitiba achieve better than average pollutant levels. The city records an average daily concentration of nitrogen dioxide at 23 micrograms per cubic metre, compared to the Index average of 38 micrograms. While still well below the average, the city's nitrogen dioxide emissions can likely be attributed to the city's continued reliance on motor vehicles — they are a primary source of this pollutant. The city also does well on sulphur dioxide and suspended particulate matter emissions, with both well below the average levels.

Green initiatives: In 2002 the state government introduced a law that establishes strict emissions standards for industry, and mandates emissions audits at factories every four years. Authorities issue fines to facilities that do not meet standards, and if factories fail twice, the state can close them down.

Environmental governance: Curitiba ranks above average for environmental governance. It performs particularly well for environmental management, thanks to having a designated environmental department which monitors the city's environmental impact and drafts strategic plans on environmental policy. In 2010 the city allocated about US$106 million to the environmental department, or about 5% of the total city budget. Curitiba also actively engages citizens and NGOs in formulating environmental policy. As a result it gets the highest marks in the Index for public participation, along with Santiago. While Curitiba has conducted a recent baseline environmental review that included water, sanitation, waste, transport, human settlements and climate change, the review omitted air quality, land use and energy. Other Index cities included all of these components in their review.

Green initiatives: In 1989 Curitiba added environmental education into the curriculum of its public schools. The school system adopted an interdisciplinary method for teaching conservation, recycling and a wide range of environmental issues. The city provides training courses on environmental education for teachers and supports class fieldtrips to parks and forests.

Quantitative indicators: Curitiba

		Average	Curitiba	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	70.4 [1, e]	2007	EIU estimate; Agência Curitiba; Curitiba, Prefeitura da Cidade; International Energy Agency; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	743.5 [2]	2007	Agência Curitiba; Curitiba, Prefeitura da Cidade; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km²)	4,503.0	4,296.2 [2]	2009	Agência Curitiba; Curitiba, Prefeitura da Cidade
	Green spaces per person (m²/person)	254.6	51.5 [2]	2009	Agência Curitiba; Curitiba, Prefeitura da Cidade
Transport	Length of mass transport network (km/km²)	5.0	8.5 [2, e]	2009	Agência Curitiba; Curitiba, Prefeitura da Cidade
	Superior public transport networks (km/km²)	0.13	0.19 [2]	2010	URBS Curitiba
	Stock of cars and motorcycles (vehicles/person)	0.30	0.50 [2]	2010	Denatran
Waste	Share of waste collected and adequately disposed (%)	96.2	100.0 [2]	2007	Agência Curitiba; Curitiba, Prefeitura da Cidade
	Waste generated per person (kg/person/year)	465.0	473.2 [2]	2009	Agência Curitiba; Curitiba, Prefeitura da Cidade
Water	Water consumption per person (litres per person per day)	264.3	150.0 [2]	2010	SANEPAR - Companhia de Saneamento do Paraná
	Water system leakages (%)	34.6	39.2 [2]	2009	Agência Curitiba; Curitiba, Prefeitura da Cidade
	Share of population with access to potable water (%)	97.5	100.0 [2]	2009	Agência Curitiba; Curitiba, Prefeitura da Cidade
Sanitation	Population with access to sanitation (%)	93.7	92.5 [3]	2010	SANEPAR - Companhia de Saneamento do Paraná
	Share of wastewater treated (%)	51.5	98.3 [2]	2010	SANEPAR - Companhia de Saneamento do Paraná
Air Quality	Daily nitrogen dioxide levels (ug/m³)	37.8	22.5 [2]	2007	Secretaria de Estado do Meio Ambiente - Relatório de Qualidade do Ar Curitiba e RMC
	Daily sulphur dioxide levels (ug/m³)	11.4	6.6 [2]	2007	Secretaria de Estado do Meio Ambiente - Relatório de Qualidade do Ar Curitiba e RMC
	Daily suspended particulate matter levels (ug/m³)	48.0	25.9 [2]	2007	Secretaria de Estado do Meio Ambiente - Relatório de Qualidade do Ar Curitiba e RMC

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on City of Curitiba. Estimated from energy sources used in electricity production in Brazil, 2) Based on City of Curitiba, 3) Based on City of Curitiba. Based on proportion of population with access to sewerage

Guadalajara_Mexico

Guadalajara, the capital of the Mexican state of Jalisco, is the country's second most populous city behind Mexico City. The metropolitan area, with a population of 4.4 million, includes the municipality of Guadalajara City and seven other municipalities. Data included in the Latin American Green City Index are based on a combination of municipal, metropolitan and state figures, according to availability. The local economy has grown quickly in recent years, driven by an export boom following the 1994 North American Free Trade Agreement with the US and Canada. Guadalajara has in particular become an electronics industry hub, with several major international players locating operations in the city. The manufacturing sector, including shoes and textiles, also contributes significantly to the city's economic output. Guadalajara boasts a GDP per person of an estimated US$9,400, putting it mid-range in the Index in terms of income.

Economic growth has brought environmental challenges though, and Guadalajara is ranked well below average overall in the Latin American Green City Index. The city's highest rankings are in the land use and buildings, waste, and air quality categories, where it places average. Guadalajara places below average in energy and CO_2, transport and sanitation. It has significant room for improvement in the areas of water and environmental governance, placing well below average, due to a very high rate of water consumption, and weaknesses in environmental monitoring. Guadalajara's scores in several categories are hindered by its policies, which are in many cases less robust than those of other cities in the Index; however, the city scores much better for its codes regarding clean energy, waste collection and air quality.

Background indicators

Total population (million)	4.4
Administrative area (km^2)	2,734.0
GDP per person (current prices) (US$) [e]	9,408.8
Population density (persons/km^2)	1,596.6
Temperature (24-hour average, annual) (°C)	20.0

Based on Guadalajara Metropolitan Area
e) EIU estimate

Energy and CO_2: Guadalajara ranks below average in energy and CO_2. Its performance is influenced by relatively high CO_2 emissions from electricity consumption and relatively weak policies to address climate change. The city, with its significant manufacturing sector, emits an estimated 333 kg of CO_2 per capita from electricity consumption, well above the Index average of 202 kg. This high rate of CO_2 emissions is partly a result of the low share of renewables in electricity production. An estimated 15% of Guadalajara's electricity comes from renewable sources (primarily hydropower), though due to a lack of local data, this percentage is estimated on the basis of national figures. So far, Guadalajara has not regularly monitored greenhouse gas levels, nor has it adopted a climate change action plan of its own, although it will be covered by a forthcoming plan by the state of Jalisco (see "green initiatives" below). Guadalajara also has a relatively low rate of electricity consumption compared to its economic output, at an estimated 632 megajoules per US$1,000 of GDP, below the Index average of 761 megajoules.

Green initiatives: The state of Jalisco is developing a "State Action Programme on Climate Change", modeled on other statewide plans created elsewhere in Mexico. Although still unfinished, some of the plan's details have been released. It will call for an inventory of greenhouse gas emissions in the state, and promote greenhouse gas reductions through a number of specific measures aimed at buildings, landfills, transport, and forest protection. Many of these measures are aimed specifically at improving Guadalajara's environmental performance. In addition, the 2009 opening of the city's first "bus rapid transit" (BRT) could reduce the city's CO_2 emissions by 30,000 tonnes per year, according to city officials (see "green initiatives" under "Transport" below).

Land use and buildings: Guadalajara is average in land use and buildings. The metropolitan area has the fourth highest amount of green spaces among the 17 cities in the Index, at 423 square metres per person. Guadalajara is, however, marked down for its policies to maintain green spaces relative to other cities in the Index, although it does better for protecting environmentally sensitive areas from development. The city requires that all development projects pass an environmental impact study. Guadalajara's score is hindered by its policies regarding eco-buildings. The city does not set standards for the eco-efficiency of new buildings by private developers, for example, nor does it implement green standards for public building projects. However, its performance in this area should improve thanks to the state's forthcoming climate change action plan, which is expected to address some of these issues.

Green initiatives: The State Action Programme on Climate Change (see "green initiatives" under "Energy and CO_2") will outline a "state sustainable buildings policy project" that will promote using LEDs for public lighting, as well as solar panels and energy-efficient appliances in homes. In addition, there is a national "Sustainable Light" plan to replace more than 45 million incandescent light bulbs in 11 million Mexican homes with energy-saving bulbs by 2012. The initiative will save an estimated 2.8 million tonnes of greenhouse gas emissions annually. The city of Guadalajara is also reviewing existing green buildings policies across Mexico, with a view to implementing its own regulations based on best practices.

Transport: Guadalajara ranks below average in transport. The metropolitan area's mass transport network, which consists of a two-line metro, an electric trolley line and a large fleet of buses, is shorter than the 17-city average, at 2.3 km per square kilometre, compared to the average of 5 km. While the system has suffered in the past from underinvestment and a lack of coordinated planning, Guadalajara has recently

Performance

● Guadalajara ● Other cities

	well below average	below average	average	above average	well above average
Energy and CO_2	●	● ● ●	● ● ●	● ● ● ●	●
Land Use and Buildings	● ●	● ●	● ● ● ●	● ● ● ●	
Transport	●	● ● ●	● ● ●	● ● ● ●	●
Waste	●	● ● ●	● ●	● ● ●	●
Water	● ●	● ●	● ● ●	● ● ●	
Sanitation		● ● ●	● ● ●	● ● ●	●
Air Quality		● ● ●	● ● ●	● ● ● ●	●
Environmental Governance	●	● ● ● ●	● ● ●	● ● ● ●	● ●
Overall Results	● ●	● ●	● ● ●	● ● ●	●

The order of the dots within the performance bands has no bearing on the cities' results.




taken notable steps to significantly improve its transport system. In 2009, the city opened its first BRT line (see "green initiatives" below), following the model of several other cities in the Index. Its superior public transport network (defined in the Index as transport that moves large numbers of passengers quickly in dedicated lanes, such as a metro, bus rapid transit or trams) is the second longest in the Index, at 0.26 km per square kilometre, above the 17-city average of 0.1 km per square kilometre. On the other hand, the city lacks an integrated pricing system for public transport, though officials say they will introduce one in the future, along with planned park and ride systems. But some local government policies have served inadvertently to increase car traffic rather than reduce it. Tax cuts for car owners have contributed to a 23% drop in the use of public transport in the last decade, while private transport has jumped 14%, according to state statistics. Today the municipality of Guadalajara has 0.37 vehicles for every inhabitant, slightly above the Index average of 0.3.

Green initiatives: The city opened its US$48 million BRT system in March 2009, with routes totalling 16 km. A further 56 km are scheduled to be added by 2010. Overseen by the state government but operated by a private company, the system of exclusive high-speed bus lanes is similar to many others opening across Latin America. The city is also planning on adding a third line to its existing metro system. Furthermore, in 2008, Guadalajara started a free bicycle-lending programme, "Pedalling Guadalajara". There are now 200 cycle stations around the city with capacity for up to 74,000 users per day. Guadalajara also launched a voluntary share and ride car programme for public sector employees in 2008, called "share your car". The city is also planning on introducing congestion charges and "no-car days" to reduce the number of private vehicles on city roads.

Waste: Guadalajara is average in the waste category. The city scores well for collecting and adequately disposing of an estimated 100% of its waste, based on official statewide figures. The Guadalajara metropolitan area generates just slightly more than the average amount of waste, at 473 kg per person per year versus of 465 kg. The city enforces environmental standards on landfill and incineration sites, and has rules to encourage residents to properly dispose of waste. Its results for recycling policies are mixed, however. On one hand, Guadalajara has a collection programme and recycles all of the five materials included in the Index — organic waste, electrical waste, glass, plastics and paper. On the other hand, it lacks an integrated strategy aimed at reducing, recycling and re-using waste.

Green initiatives: Local authorities plan to increase the total amount of organic and non-organic separated waste from 40% to 50%. However, no specific timetable or details on how they will achieve this target have been disclosed. The city is also calling for greater emphasis on the conversion of municipal waste into energy, although hard details on the investment required — and specific targets set — remain elusive.

Water: Guadalajara ranks well below average in the water category. The city's daily average consumption, at an estimated 651 litres per person per day, is the second highest in the Index and well above the 17-city average of 264 litres. This estimate is based on the municipality of Guadalajara rather than the metropolitan area, due to a lack of data. Guadalajara also gets marked down for the relatively low proportion of its population with access to potable water, at 89%, compared to the average of 98%. The city loses 37% of its water through system leakages, slightly more than the 35% Index average. However the city scores better for water sustainability policies, thanks to a code aimed at reducing water stress and programmes to promote public awareness about efficient water consumption. The city also uses water meter tariffs to improve efficiency. And while Guadalajara has a code that targets the quality of surface water, it could improve its performance by enforcing stricter water pollution standards on local industry.

Green initiatives: To respond to water leakage reports, as well as to answer general customer enquiries, the Inter-municipal System of Water and Sewage (SIAPA), which manages Guadalajara's water supply and service, has an online customer service capability, and 11 offices spread across the metropolitan area. The department also promotes sustainable practices for domestic water use, such as bathroom maintenance, and informing citizens about how to conserve water while going about daily activities such as dish washing, showering, car washing and cooking.

Sanitation: Guadalajara ranks below average in the sanitation category. According to official figures, a high percentage of the population in the metropolitan area has access to sanitation, at an estimated 95%, just above the 17-city average of 94%. However, only an estimated 25% of Guadalajara's wastewater is treated, against a much higher Index average of 52%. This estimate is based on statewide figures due to a lack of local data. The city could also boost its score by strengthening sanitation policies. Guadalajara lacks a code promoting environmentally sustainable sanitation systems; also it does not regularly monitor on-site treatment facilities like septic tanks. On the other hand, the city does have minimum standards for the treatment of wastewater and regularly monitors the wastewater that is treated.

Green initiatives: Plans are underway to build two new water treatment plants, El Ahogado and Agua Prieta, which should substantially raise the rate of wastewater treatment in Guadalajara. The US$80 million El Ahogado plant is already under construction, with just over a third finished. The Agua Prieta plant, which is estimated to need US$90 million to complete, still needs approval from the state congress.

Air quality: Guadalajara ranks average in air quality. The city's emissions are near the averages for each of the air pollutants measured in the Index — sulphur dioxide, nitrogen dioxide and suspended particulate matter.

Like many cities in Latin America, Guadalajara has an abundance of cars, which are mainly responsible for pollutant levels. Guadalajara does benefit from having relatively robust clean air policies. It has an air quality code, regularly monitors pollutants at different locations around the city and is participating in a nationwide programme to improve monitoring capabilities. Furthermore, it receives full marks for measures to inform citizens about the dangers of air pollution.

Environmental governance: Guadalajara ranks well below average in environmental governance.

While it does have a dedicated environmental department that oversees and implements policy, the department does not have the remit to address issues regarding sanitation, human settlements, energy or climate change. The city does not regularly monitor its overall environmental performance and publish information on its progress.

To respond to enquiries by the public, Guadalajara has a central contact point for information on environmental topics and projects. But it only partly involves citizens, non-government organisations and other stakeholders in decisions on projects of major environmental impact.

Quantitative indicators: Guadalajara

		Average	Guadalajara	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	332.9 [1, e]	2008	EIU estimate; Instituto Nacional de Estadística y Geografía; International Energy Agency; Consejo Nacional de Población; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	631.6 [2, e]	2008	EIU estimate; Instituto Nacional de Estadística y Geografía; Consejo Nacional de Población; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	1,596.6 [3]	2009	Consejo Nacional de Población
	Green spaces per person (m^2/person)	254.6	423.3 [3]	2005	Instituto Nacional de Estadística y Geografía
Transport	Length of mass transport network (km/km^2)	5.0	2.3 [3]	2009	Secretaría del Medio Ambiente para el Desarrollo Sustentable; Sistema de Tren Eléctrico Urbano; Consejo Nacional de Población
	Superior public transport networks (km/km^2)	0.13	0.26 [4]	2010	Macrobus
	Stock of cars and motorcycles (vehicles/person)	0.30	0.37 [4]	2010	INEGI
Waste	Share of waste collected and adequately disposed (%)	96.2	100.0 [1, e]	2008	Secretaría de medio ambiente y recursos naturales
	Waste generated per person (kg/person/year)	465.0	472.7 [5]	2008	Instituto Nacional de Estadística y Geografía; Consejo Nacional de Población
Water	Water consumption per person (litres per person per day)	264.3	651.2 [6, e]	2008	Instituto Nacional de Estadística y Geografía; Consejo Nacional de Población
	Water system leakages (%)	34.6	37.0 [4]	2008	Comisión Nacional del Agua
	Share of population with access to potable water (%)	97.5	89.1 [7]	2005	Consejo Estatal de Población
Sanitation	Population with access to sanitation (%)	93.7	94.5 [8, e]	2005	Consejo Estatal de Población
	Share of wastewater treated (%)	51.5	24.7 [1, e]	2008	Comisión Nacional del Agua
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	41.4 [3]	2008	Gobierno de Jalisco
	Daily sulphur dioxide levels (ug/m^3)	11.4	11.4 [3]	2008	Gobierno de Jalisco
	Daily suspended particulate matter levels (ug/m^3)	48.0	41.5 [3]	2008	Gobierno de Jalisco

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on state of Jalisco, 2) Based on state of Jalisco. GDP estimate based on figures, 3) Based on Guadalajara Metropolitan Area, 4) Based on municipality of Guadalajara, 5) Based on Gualalajara Metropolitan Area. Based on total waste collected, 6) Based on municipality of Guadalajara. Based on daily water extraction, 7) Based on Guadalajara Metropolitan Area. Households with access to potable water, 8) Based on Guadalajara Metropolitan Area. Households with access to sewerage

Lima_Peru

Background indicators

Total population (million)	8.4
Administrative area (km^2)	2,817.0
GDP per person (current prices) (US$) [1]	4,873.0
Population density (persons/km^2) [e]	2,982.2
Temperature (24-hour average, annual) (°C)	20.0

Based on Lima Metropolitana
1) Based on Departamento de Lima
e) EIU estimate

The capital of Peru, Lima is home to 8.4 million people in the metropolitan area, about a third of the country's population. It is the third most populous city in the Latin American Green City Index. Data for Lima are based primarily on the metropolitan area and state figures. Lima is the second poorest city in the Index in terms of GDP per capita, at US$4,900, which is less than half the Index average. Lima is Peru's political and economic hub, accounting for over half of the country's GDP. Some of the biggest contributors to the local economy are manufacturing, construction, and fishing. A considerable portion of Lima's businesses are small and micro enterprises, many operating in the informal sector, which hampers the authorities' efforts to enforce environmental standards. Lima is surrounded by a desert and has extremely low levels of rainfall, putting tremendous pressure on existing water resources. The metropolitan area of Lima comprises the city of Lima, which is divided into 43 separate local government districts, and Callao, a separate region adjacent to the city, divided into six districts.

Lima ranks well below average overall in the Latin American Green City Index. The city's best performances are in the areas of energy and CO_2, and transport, placing average in both. Its comparatively better placements in these categories are due to a relatively low level of electricity consumption per unit of GDP as well as robust traffic congestion reduction policies. The city places below average in most other categories, but its poorest rank is in the land use and buildings category, owing to a very small amount of green spaces and weak policies regarding energy efficiency in buildings. However, when measured against the six other cities in the Index with low incomes (below US$8,000 GDP per capita), Lima has both the lowest water consumption per person and the lowest average daily concentration of nitrogen dioxide levels.

Energy and CO_2: Lima ranks average for energy and CO_2. The city consumes an estimated 678 megajoules of electricity per US$1,000 of GDP, compared to a 17-city average of 761 megajoules. This estimate is based on statewide data. With 59% of its electricity coming from hydropower, the city emits an estimated 217 kg of CO_2 per person from electricity consumption, above the Index average of 202 kg. The city may improve its performance in this area in the coming years thanks to national legislation aimed at improving energy efficiency and boosting investment in renewables. Lima is a member of "C40", a group of large cities committed to tackling climate change, promoted by the Clinton Foundation. However, given that initiatives to reduce CO_2 emissions fall under the auspices of the national environmental ministry, created in 2008, the municipality's efforts have concentrated on energy-efficiency projects. But the city itself lacks a comprehensive plan for reducing the environmental impact of energy consumption.

Green initiatives: By the end of 2010 the city aims to replace over 6,000 incandescent traffic lights with new LED lights, considered to be 90% more efficient. Furthermore, in the last few years, leading electricity generators have begun using natural gas sourced from the large natural gas fields located in Camisea, in the south of Peru. The national government is promoting natural gas consumption in the transport and industrial sectors by providing financial incentives for car conversions from oil to natural gas. By April 2010, more than 85,600 vehicles had been converted nationwide, from just 150 in 2005. Furthermore, the entire fleet of buses running on Lima's Metropolitano bus corridor (see "green initiatives" in "Transport" below) runs on 100% natural gas, resulting in a reduction of 185,000 tonnes of CO_2 emissions annually.

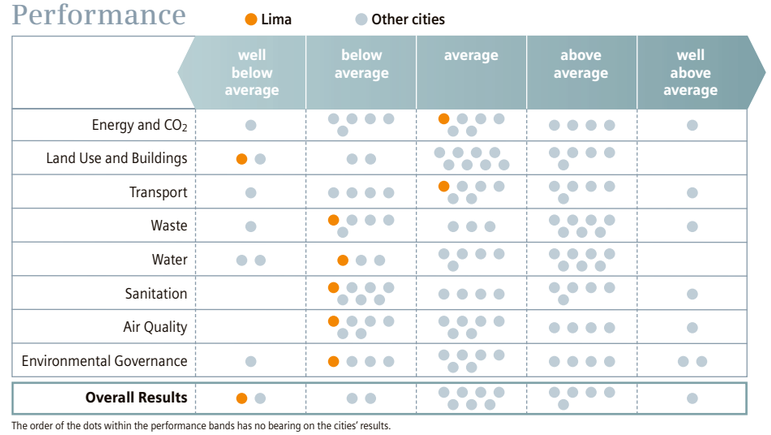
Land use and buildings: Lima ranks well below average for land use and buildings. Like many cities in Latin America, Lima experienced a population boom in the 20th century, driven by massive waves of rural migration, and today the city faces a severe housing shortage. However, given the large size of its administrative area, the city has a below-average population density of an estimated 3,000 people per square kilometre, compared with the Index average of 4,500 people. The metropolitan area of Lima has just 2 square metres of green spaces per person, the lowest amount in the Index, although the city does protect its existing green spaces and environmentally sensitive areas. Lima performs less well in the area of eco-buildings policies. The city lacks incentives, regulations and standards, as well as awareness campaigns, to promote greater energy efficiency in buildings.

Green initiatives: In 2007 the 49 districts in the Lima metropolitan area signed the "Green Lima and Callao Pact", aimed at increasing the share of green spaces around the city. The programme has yielded some results: the municipality has prioritised building large recreational areas, such as the Water Park and several other parks in the city's poorest neighbourhoods. Officials also have been revamping public squares and other green areas along the main avenues in the city centre. According to Grupo GEA, a non-governmental organisation, green spaces have increased by about 58% since 2004.

Transport: Lima is average for transport. The city's mass transport system consists of a metro running on one line, which is currently being extended (see "green initiatives" below), and an extensive fleet of buses. In 2009 the network serving the metropolitan region measured an estimated 5.2 km per square kilometre, just slightly longer than the Index average of 5 km per square kilometre. However, the overall length of the network masks the generally chaotic state of the city's transport system and serious congestion problems caused by an excess amount of buses and taxis. The city, in collaboration with the national ministry of transportation, has attempted to reorganise bus routes and remove polluting vehicles, but with little success. Lima lacks an integrated pricing system for mass transport, and it has been slow to improve the network in general (though this should change as measures in the city's master plan are adopted). The city scores better for its traffic management system, which includes traffic light sequencing, dedicated freight delivery times, and the construction of access points around the city.

Green initiatives: In mid-2010 the city unveiled its first "bus rapid transit" (BRT) system along the so-called Metropolitano corridor. The 26 km corridor runs from north to south along 38 stations. Four private companies operate 75 high-capacity buses, all of which run on natural gas and transport nearly one million passengers per day. This BRT corridor is the first stage in a long-term master plan to overhaul the city's transport network. The master plan, published in 2005, calls for the construction of eight addi-

Performance



The order of the dots within the performance bands has no bearing on the cities' results.

tional BRT corridors and the extension of the city's existing metro line. Works are currently underway on the metro, at a cost of US$300 million. Due for completion by July 2011, the city will add an additional 11.7 km to the existing 9.2 km line. Studies to build a second, 22-km line, which will run from east to west, are due to begin before the end of 2010.

Waste: Lima ranks below average in the waste category. Although it places comparatively poorly in this category, Lima, like many other low-income cities in the Index, generates one of the lowest amounts of waste. The city produces 314 kg of waste per person each year, well below the Index average of 465 kg. However, the city collects and adequately disposes of just 78% of its waste, the lowest rate in the Index and well below the 17-city average of 96%. The city's waste is processed in six landfills around the metropolitan area. But a large portion still ends up at open-air dumps, is incinerated, or thrown into either the Rímac River or the Pacific Ocean. Each of the 49 administrative districts in the Lima and Callao metropolitan area collects and disposes of its own waste, resulting in a fragmented waste strategy. Lima complies with national efforts to encourage residents to re-use and recycle, and is one of several cities in the Index that has legalised and carefully regulates waste picking.

Green initiatives: Waste pickers, who conduct a large share of recycling in the city, are being organised into unions. There are currently more than 200 organisations that collect solid waste and more than 400 that sort and sell it to be re-used. Private and public initiatives have resulted in the installation of central collection points for glass, paper and plastics recycling, which have been embraced to varying degrees by the public, depending on the district. Furthermore, the Huaycoloro landfill, where almost half of Lima's waste is processed, is implementing a waste-to-energy project.

Water: Lima ranks below average for water. Lima's water consumption, at 151 litres per person per day, is the third lowest in the Index and well below the 17-city average of 264 litres. However, this is primarily due to lack of supply rather than efficient water use. Rainfall in Lima averages just 9 millimetres per year; water is therefore extremely scarce and most of the city's drinking water is from the Rimac River. Just 87% of the city's residents have access to potable water, well below the 17-city average of 98%. Furthermore, the city loses 38% of its water supply to system leakages, compared to an Index average of 35%. Despite its overall poor performance in this category, the city performs better in the area of water sustainability policies. It has a policy aimed at reducing water stress and consuming water more efficiently, and also actively promotes public awareness about efficient water consumption. Water and sanitation services are provided by Sedapal, a state-run waterworks company with no institutional links to the municipality of Lima. The production of potable water takes place at three treatment plants, and the national environmental health department is in charge of monitoring of water quality. While water quality monitoring takes place, and standards regarding levels of pollutants exist, the enforcement of those standards, particularly on industrial polluters, tends to be low. This hinders the city's score in the area of water quality policy.

Green initiatives: Since 2006 the national ministry of housing, construction and sanitation, has collaborated with Sedapal on an initiative to expand the potable water supply to an additional 1 million people in Lima. The US$715 million national programme, known as "Water for All", is running 344 projects, including the construction of water treatment facilities. In an effort to improve water management, the national government passed a new law regulating the sector in 2010. The law also created a national water authority (ANA) to act as a supervisory body.

Sanitation: Lima ranks below average in the sanitation category. The city's performance is largely attributable the negligible share of wastewater treated. Lima treats just 9% of its wastewater, and most untreated wastewater is dumped into the Pacific Ocean. Furthermore, only 86% of the population has access to sanitation services, compared to the Index average of 94%. Areas with no sewage system use septic tanks. Sedapal, the state-owned water company responsible for sanitation, monitors the few existing treatment sites. But the city lacks a comprehensive plan to provide environmentally sustainable sanitation services, although it is making more investment to improve its sanitation infrastructure (see "green initiatives" below).

Green initiatives: Since 2006 the national government has sought to reverse decades of underinvestment in sanitation infrastructure, and has named sanitation one of its top priorities. In 2009 the government auctioned the construction of a large wastewater treatment plant known as Taboada, and by the end of 2010 it will tender a second concession to build and operate another mega plant known as La Chira, at a cost of US$145 million. The city expects that these two plants will have the capacity to treat all of Lima's wastewater.

Air quality: Lima ranks below average for air quality. Its performance in this category is due to above-average levels of sulphur dioxide and particulate matter, mainly from transport. According to city officials, a majority of cars in the city operate on highly polluting diesel fuel. The daily concentration of particulate matter, at 94 micrograms per cubic metre, is nearly double the Index average of 48 micrograms. Sulphur dioxide concentrations are also high, at 18 micrograms per cubic metre, compared to a 17-city average of 11 micrograms. Only nitrogen dioxide levels are below average. The city has weak clean air policies, which are a reflection of the fragmentation of responsibilities between several national ministries, municipalities and other institutions.

Green initiatives: In 2001 the city created the "Management Committee of the Clean Air Initiative for Lima and Callao", comprised of representatives from several relevant ministries and the private sector. The committee prepared a clean air programme for 2005 to 2010 that identified five areas of action to reduce air pollution in the metropolitan area, including measures to tackle polluting fuels and to manage traffic. However, according to some estimates, only about 15% of the measures have been completed so far.

Environmental governance: Lima ranks below average for environmental governance. This ranking is largely a result of the fragmented allocation of resources and responsibilities for environmental management among multiple institutions and levels of government. In 2006 the municipality of Lima created a dedicated environmental department, but it lacks the authority to implement its own environmental legislation.

In the last five years the city has conducted a baseline review of only its waste sector, omitting water, sanitation and air quality, among others. Most policy initiatives come from the recently created national ministry for the environment, where technical expertise is concentrated. On the other hand, like most cities in the Index, Lima involves citizens, NGOs and other stakeholders in decisions on projects with environmental impact.

Quantitative indicators: Lima

		Average	Lima	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	217.1 [1, e]	2007	EIU estimate; Instituto Nacional de Estadística e Informática; International Energy Agency; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	678.3 [2, e]	2007	EIU estimate; Instituto Nacional de Estadística e Informática; International Energy Agency; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	2,982.2 [3, e]	2006	Instituto Nacional de Estadística e Informática; Municipalidad Metropolitana de Lima
	Green spaces per person (m^2/person)	254.6	2.0 [3]	2009	Pensando Lima
Transport	Length of mass transport network (km/km^2)	5.0	5.2 [3, e]	2009	EIU estimate; Tren Urbano de Lima; Municipalidad Metropolitana de Lima
	Superior public transport networks (km/km^2)	0.13	0.01 [4]	2010	Metropolitano , Autoridad Autonoma de Tren Electrico
	Stock of cars and motorcycles (vehicles/person)	0.30	0.14 [4]	2009	Ministerio Transportes y Comunicaciones
Waste	Share of waste collected and adequately disposed (%)	96.2	78.1 [3]	2009	Municipalidad Metropolitana de Lima
	Waste generated per person (kg/person/year)	465.0	314.2 [3]	2009	Municipalidad Metropolitana de Lima
Water	Water consumption per person (litres per person per day)	264.3	151.5 [3]	2009	Servicio de Agua Potable y Alcantarillado de Lima; Instituto Nacional de Estadística e Informática
	Water system leakages (%)	34.6	37.5 [3]	2008	Superintendencia Nacional de Servicios de Saneamiento
	Share of population with access to potable water (%)	97.5	87.3 [5]	2007	Instituto Nacional de Estadística e Informática
Sanitation	Population with access to sanitation (%)	93.7	85.8 [6]	2007	Instituto Nacional de Estadística e Informática
	Share of wastewater treated (%)	51.5	8.5 [3]	2008	Servicio de Agua Potable y Alcantarillado de Lima
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	24.5 [3]	2009	Programa Nacional de Vigilancia Sanitaria de Calidad del Aire
	Daily sulphur dioxide levels (ug/m^3)	11.4	18.1 [3]	2009	Programa Nacional de Vigilancia Sanitaria de Calidad del Aire
	Daily suspended particulate matter levels (ug/m^3)	48.0	93.5 [3]	2009	Programa Nacional de Vigilancia Sanitaria de Calidad del Aire

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Departamento de Lima. Based on electricity consumption estimates for Departamento de Lima and composition of energy sources used in electricity generation in Peru, 2) Based on Departamento de Lima. Based on regression analysis. GDP figures are for Departamento de Lima and the year 2006, 3) Based on Lima Metropolitana, 4) Based on Ciudad de Lima, 5) Based on Departamento de Lima, 6) Based on Departamento de Lima. Population with access to sewerage and septic tanks

Medellín_Colombia

Background indicators

Total population (million)	3.5
Administrative area (km^2)	1,165.0
GDP per person (current prices) (US$)	5,547.8
Population density (persons/km^2)	3,001.5
Temperature (24-hour average, annual) (°C)	22.0

Based on Medellin Metropolitan Area

Medellín is Colombia's second largest city, behind Bogotá, and an important economic and political centre in the country. As the capital of the Antioquia department, Medellín accounts for around 11% of Colombia's GDP. It is the country's top exporter of clothing, cut flowers and chemical products. The Medellín metropolitan region has a population of 3.5 million and the third smallest average income, at US$5,500 GDP per person, nearly half the Index average of US$11,100. With a few exceptions noted below, most of the data for Medellín in the Index are based on the metropolitan area, rather than the smaller municipality of Medellín.

Medellín is ranked average overall in the Index. Its best performance is in the sanitation category, where it is the only city rated well above average, based on high rates of sanitation access and wastewater treatment, and consistently strong sanitation policies. Medellín is also above average in the air quality category, driven by relatively small levels of pollution and robust clean air policies. The city is average in transport, water and environmental governance. It falls below average in energy and CO_2, land use and buildings, and waste. Medellín leads the Index in three individual indicators — it has the lowest stock of cars and motorcycles, generates the least amount of waste per person and has the lowest levels of sulphur dioxide. Compared to cities in the lower income range (below US$8,000 in GDP per person), Medellín has the longest mass transport network, the best rate of wastewater treatment, and the highest percentage of people with access to sanitation.

Energy and CO_2: Medellín is below average in energy and CO_2. This performance is mainly due to the large amount of electricity consumed by the city compared to its economic output. Medellín uses 982 megajoules per US$1,000 of GDP, well above the Index average of 761 megajoules. Regarding energy and CO_2 policies, Medellín could improve its performance by investing in renewable energy, regularly monitoring greenhouse gas emissions, and signing up to international covenants to reduce greenhouse gas emissions. Although the city is marked down for not having any waste-to-energy projects, one is planned for 2011 (see "green initiatives" below), which will boost its performance in this area. Medellín does have relatively low CO_2 emissions from electricity consumption, at an estimated 74 kg per person versus an Index average of 202 kg. This low figure is helped by an above average share of renewable energies in the electricity mix: the city generates more than 80% of its electricity from hydropower. The Medellín region has benefited from a Kyoto Protocol programme allowing developed countries to receive carbon credits for helping developing countries lower their emissions (see "green initiatives" below).

Green initiatives: In 2004 the city-owned energy company, EPM, and the Electric Power Development Company of Japan built a hydroelectric project on the Herradura River that supplies nearly 32 megawatts to the Medellín metropolitan area. It is estimated to have cut CO_2 emissions by about 69,000 tonnes per year. The project falls under the Kyoto Protocol's "clean development mechanism", which offers carbon credits for developed countries that support emissions reduction projects in developing countries. These credits are each equivalent to 1 tonne of CO_2, which can be traded, sold or used to meet carbon emission reduction targets in other countries. EPM and the state government's local development agency are collaborating on a dam and hydroelectric plant on the Cauca River that will be the country's largest when it comes online in 2018. Capacity will be 2.4 gigawatts, and construction is expected to begin in 2013. Furthermore, EVAS, a Colombian waste disposal company, and Green Gas International, a clean energy company, have partnered on a methane-capture project at the El Guacal landfill, which receives waste from many of the municipalities in the Medellín metropolitan area. The project, which will have a capacity of 20 megawatts, is part of the Kyoto Protocol's clean development mechanism as well. It is expected to start in 2011 and last 21 years, saving an estimated 3.5 million tonnes of carbon emissions.

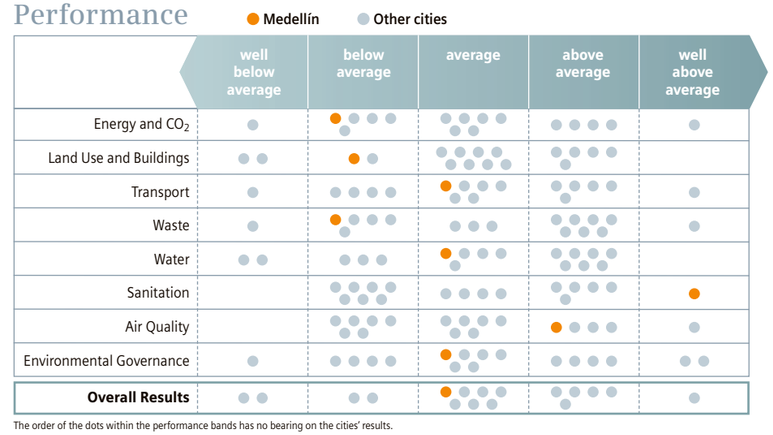
Land use and buildings: Medellín ranks below average in land use and buildings. The city is marked down for its relative lack of green spaces, at 5 square metres per person, although it scores better for its policies to protect and maintain its existing green spaces and environmentally sensitive areas. The city also gets marked down for its eco-building policies that are not as ambitious as those of other cities. For example, Medellín does not promote awareness among citizens on ways to improve energy efficiency in buildings.

Green initiatives: The Integral Urban Project (PUI) is a core component of the city's urban development plan, primarily covering land use but extending into transport as well. It started earlier this decade in the city's "Eastern-Central zone", a low-income area with many informal settlements. The city brought dwellings in line with building codes, cleaned up public spaces and improved transport links, including connecting the area to the city's tramway system, Metrocable, which links with the wider metro system (see "green initiatives" in "Transport", below). The PUI project has since been expanded with plans to improve neighbourhoods in the northwest and downtown.

Transport: Medellín ranks average in transport. The city's mass transport network extends 5.6 km per square kilometre across the metropolitan area, compared to the Index average of 5 km, and it is the longest among cities in the Index with low incomes. The network includes a large fleet of buses, a metro and tramway. While the system lacks an integrated pricing system, for which Medellín is marked down in the area of mass transport policies, the city is taking steps to encourage the public to take greener forms of transport. Medellín stands out for having the lowest stock of cars and motorcycles in the Index, at 0.07 vehicles per person. The figure is based on the municipality of Medellín, and is well below the average of 0.3 vehicles per person. And despite its low stock of cars, traffic can be chaotic. As a result city officials have implemented congestion reduction measures, such as "no-car days" and dedicated delivery times for freight. However the city still lacks a congestion charge and carpooling lanes.

Green initiatives: The city's tramway system, Metrocable, opened in 2004 as a way of connecting Medellín's least developed suburbs to the wider metro system. Furthermore, works are now underway on Metroplus, a "bus rapid tran-

Performance



The order of the dots within the performance bands has no bearing on the cities' results.

sit" (BRT) service. The BRT will be comprised of 800 new, natural gas-powered buses serving travellers in dedicated lanes. Medellín's BRT is modelled on Bogotá's TransMilenio, and the concept is spreading quickly in Latin America in various forms. The expectation is that the BRT will reduce traffic and improve air quality, since the new buses run on cleaner fuel, and at the same time many of the city's older, more polluting models will be taken out of service as part of the programme. Furthermore, the "pico y placa" ("peak and plate") programme restricts vehicles from driving in the city during peak periods for two days of the week, on a rotating basis, based on license plate numbers.

Waste: Medellín is below average in the waste category. The city generates the least amount of waste in the Index, at 252 kg per person per year, versus the Index average of 465 kg. However, the share of city waste collected and adequately disposed of, at 87%, falls short of the Index average of 96%. Moreover, Medellín's waste disposal standards and monitoring are some of the weakest in the Index. The city is also one of the least rigorous when it comes to recycling. It recycles glass, plastics and paper, for example, but not organic or electrical waste, although it does have on-site collection and central collection points.

Water: Medellín ranks average in the water category. The city has the fourth-lowest water consumption level in the Index, at 152 litres per person per day, compared to the Index average of 264 litres. Medellín is marked down for its higher-than-average water leakage rate, at 37%, compared to the average of 35%. It also has one of the lower rates of access to potable water, at 97%, just below the Index average of 98%, a figure based on the municipality. Medellín does well for its water quality policies, which include establishing a water quality code, regular monitoring of surface water quality and enforcing water pollution standards for local industry. The city could improve its water efficiency policies, however, as it lacks initiatives outlined in the Index such as water meters and tariffs, and facilities for rainwater collection.

Green initiatives: Medellín's River Sanitation Programme, which encompasses water management as well as sanitation improvements, has been recognised as a good-practice model for urban water policy by the Inter-American Development Bank. The first phase of the programme upgraded aqueduct networks and encouraged landowners along the Medellín River to adopt land preservation and water conservation practices. The local government also oversees a water management plan for the Aburrá-Medellín river basin, which includes cleaning up small tributaries and channels, and improving water quality and hydropower capacity.

Sanitation: Medellín ranks well above average in the sanitation category, and is the only city at this level in the category. In the metropolitan area, nearly 100% of people have access to sanitation services, an estimate based on official figures. The city treats 95% of its wastewater, which is considerably more than the Index average of 52%. Moreover, on these two indicators, Medellín leads the seven cities in the low-income peer group. The results suggest that the city's comprehensive plan to address water and sanitation issues is showing results (see references under "green initiatives" above, and below). Not surprisingly then, the city also performs well on sanitation policies, mainly owing to high standards for wastewater treatment, regular monitoring, and its promotion of awareness around efficient use of sanitation systems.

Green initiatives: In addition to the city's River Sanitation programme that has been ongoing since 1993, a new wastewater treatment plant is scheduled to open in late 2012 as part of the plan. Furthermore, the city is targeting 100% treatment for the wastewater it collects.

Air quality: Medellín ranks above average in air quality, and first among cities with low incomes in the Index, largely thanks to relatively robust clean air policies, as well as the lowest average daily emissions of sulphur dioxide in the Index. At only 1 microgram per cubic metre in comparison to an average of 11 micrograms, it reflects the high share of clean hydroelectric sources for so much of the city's power. In the two other air-pollutant metrics used in the Index—nitrogen dioxide and suspended particulate matter—Medellín's average daily levels are just above the Index averages. Medellín has a number of clean air policies in place, including an air quality code, regular monitoring and public awareness campaigns.

Environmental governance: Medellín ranks average in environmental governance. The city performs relatively well in environmental monitoring and public participation, but the overall governance score is brought down by weaker environmental management policies. For example, the city has a dedicated environmental authority that regularly monitors and publishes information about environmental performance, but it does not have the ability to implement its own environmental legislation. The city has conducted a baseline environmental review within the last five years, but this did not look at some specific areas such as transport, land use, human settlements, or climate change. The city authorities offer citizens a central contact point for environmental performance, and also involve citizens and stakeholder groups in decisions on projects that have major environmental impact.

Green initiatives: Recognising that it lacks the infrastructure to enforce some of its environmental regulations, the local government has started working with civilian groups to identify industrial polluters and force the companies responsible to comply with existing laws. The authorities have set up a system where citizens can report facilities that are dumping untreated industrial wastewater into the sewerage network. This initiative is a major component of the city's sustainable development plan and the local government hopes it will enable better responses and planning.

Quantitative indicators: Medellín

		Average	Medellín	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	74.4 [1, e]	2008	EIU estimate; Gobernación de Antioquia, Anuarios Estadísticos de Antioquia, Empresas Públicas de Medellín - EPM, Empresa Antioqueña de Energía - EADE; Departamento Administrativo Nacional de Estadística; International Energy Agency; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	982.1 [1]	2007	Gobernación de Antioquia, Anuarios Estadísticos de Antioquia, Empresas Públicas de Medellín - EPM, Empresa Antioqueña de Energía - EADE; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	3,001.5 [1]	2009	Departamento Administrativo Nacional de Estadística; Área Metropolitana del Valle de Aburrá
	Green spaces per person (m^2/person)	254.6	5.0 [1]	2007	Área Metropolitana del Valle de Aburrá; Departamento Administrativo Nacional de Estadística
Transport	Length of mass transport network (km/km^2)	5.0	5.6 [1]	2009	Metro de Medellín; Área Metropolitana del Valle de Aburrá. Subdirección de Movilidad y Transporte; Área Metropolitana del Valle de Aburrá
	Superior public transport networks (km/km^2)	0.13	0.08 [2]	2010	Metro de Medellin
	Stock of cars and motorcycles (vehicles/person)	0.30	0.07 [2]	2010	Secretaria de Transportes y Transito de Medellin
Waste	Share of waste collected and adequately disposed (%)	96.2	86.8 [1]	2008	Gobernación de Antioquia, Anuario Estadístico de Antioquia, Empresas Varias de Medellín
	Waste generated per person (kg/person/year)	465.0	252.3 [1]	2008	Gobernación de Antioquia, Anuario Estadístico de Antioquia, Empresas Varias de Medellín; Departamento Administrativo Nacional de Estadística
Water	Water consumption per person (litres per person per day)	264.3	152.4 [1]	2008	Gobernación de Antioquia, Anuarios Estadísticos de Antioquia, Empresas Públicas de Medellín - EPM; Departamento Administrativo Nacional de Estadística
	Water system leakages (%)	34.6	37.0 [1]	2008	UN-Water Decade Programme on Capacity Development
	Share of population with access to potable water (%)	97.5	97.0 [3]	2008	Municipalidad de Medellín
Sanitation	Population with access to sanitation (%)	93.7	99.7 [4, e]	2009	Área Metropolitana del Valle de Aburrá, Encuesta de Calidad de Vida; Departamento Administrativo Nacional de Estadística
	Share of wastewater treated (%)	51.5	94.8 [1]	2008	Gobernación de Antioquia, Anuarios Estadísticos
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	40.0 [1]	2009	Área Metropolitana del Valle de Aburrá
	Daily sulphur dioxide levels (ug/m^3)	11.4	1.0 [1]	2009	Área Metropolitana del Valle de Aburrá
	Daily suspended particulate matter levels (ug/m^3)	48.0	56.8 [1]	2009	Área Metropolitana del Valle de Aburrá

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Medellin Metropolitan Area, 2) Based on municipality of Medellin, 3) Based on municipality of Medellin. Based on households with access to potable water, 4) Based on Medellin Metropolitan Area. Proportion of population with access to sewerage

Mexico City_Mexico

Background indicators

Total population (million)	8.8
Administrative area (km^2)	1,485.0
GDP per person (current prices) (US$)	20,358.9
Population density (persons/km^2)	5,954.2
Temperature (24-hour average, annual) (°C)	17.0

Based on Mexico D.F.

With 20 million residents, the metropolitan area of Mexico City is home to one-fifth of Mexico's population. Three decades of explosive population growth from the 1960s through the 1980s transformed Mexico City into the third largest urban agglomeration in the world. The city proper constitutes about one-fifth of the total urban area, and is delineated by the Federal District, which is home to some 8.8 million residents. Mexico City's metropolitan region spreads into the neighbouring states of Mexico and Hidalgo. The Index data for Mexico City are taken from the smaller Federal District, making Mexico City the second most populous city in the Latin American Green City Index, behind São Paulo. The wider metropolitan region is the country's political, cultural and financial capital, and by far the most important engine of economic activity, producing one-third of Mexico's total GDP. Dangerous levels of air pollution in the 1990s led officials to relocate a significant portion of heavy industry away from the city. It remains an important industrial hub, but over the past two decades services have increasingly dominated the city's economic activity. Mexico City boasts the third highest GDP per capita in the Index, at US$20,400, behind Buenos Aires and Brasília. But, like many cities in the Index, income inequality remains very high.

Mexico City is also hosting the World Mayors Summit on Climate change in November 2010, which will promote the strategic importance of local communities in global climate change mitigation efforts. It is taking place ahead of the United Nations Framework Convention on Climate Change's Conferences of the Parties in Cancun, Mexico (COP 16) in November and December 2010.

Despite significant challenges posed by its large population, Mexico City ranks average overall in the Latin American Green City Index. Its strongest performance is in the area of environmental governance, where it ranks well above average, thanks to robust environmental monitoring, the wide remit of its environmental department and a high level of public participation. The city ranks above average in the categories of energy and CO_2, land use and buildings, and transport. Mexico's capital receives average rankings in the waste and water categories. However, the city's overall performance is hindered by poor outcomes in the sanitation and air quality categories, where it places below average. Its performance in air quality is a result of higher-than-average concentrations of the three air pollutants measured in the Index.

Energy and CO_2: Mexico City ranks above average for energy and CO_2, the best placement in this category among the three cities with higher incomes in the Index. The city's performance in this category is bolstered by the lowest level of electricity consumption in comparison to its economic output. The city consumes just 279 megajoules of electricity per US$1,000 of GDP, which is well below the 17-city average of 761 megajoules. Mexico City's score is further boosted by its clean energy policies and climate change action plan (see "green initiatives" below). According to the climate change action plan, around 90% of CO_2 emissions in the city result from the production, transformation, transport and use of energy. The city makes efforts to consume energy more efficiently, and has conducted a baseline environmental review of its emissions. On the other hand, CO_2 emissions are fairly high. Over 80% of the city's electricity comes from oil, coal and natural gas. Mexico City produces an estimated 15% of its electricity from renewable energy sources, though due to a lack of local data, this percentage is estimated on the basis of national figures. The city emits an estimated 318 kg of CO_2 from electricity consumption per person, well above the average of 202 kg.

Green initiatives: The city adopted its climate change action plan in 2008, with the goal of cutting CO_2 emissions by 12% — the equivalent of seven million tonnes — by 2012, and to lay the foundations for further long-term reductions. The plan is comprehensive in its ambitions. It aims to change consumption habits, attract investment and financing for greenhouse gas mitigation projects, promote technological innovation, position Mexico City as a leader in international mitigation efforts, and set guidelines for climate change policies.

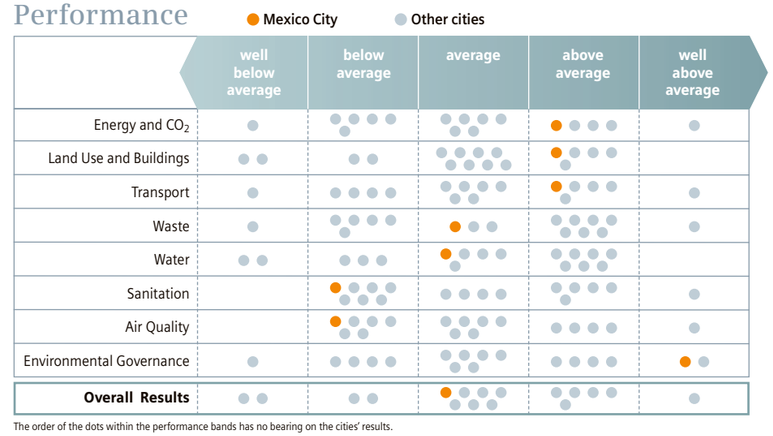
Land use and buildings: Mexico City ranks above average in land use and buildings, which is the best placement in this category for a high-income city. Its strong performance is largely attributable to its ambitious eco-building policies, which include a plan to certify buildings as environmentally sustainable. Under the programme, the city offers incentives to encourage developers to integrate emissions reduction measures in building designs. Mexico City receives a middling score for land use policies. The city's rapid population growth and increasing urbanisation have made it difficult to contain urban sprawl and conserve environmentally sensitive areas, although officials have a set of policies in place to address both problems. The city has 28 square metres of green spaces per person, and with nearly 6,000 people per square kilometre, the Federal District has the fifth highest population density in the Index.

Green initiatives: Since unveiling its "Green Plan" in 2007 (see "green initiatives" under "Environmental governance" below), the city has conserved some 13,600 hectares of environmentally sensitive areas. The city is also preparing to deploy an environmental surveillance force, which will have the technical expertise to protect conservation areas and limit the impact of informal settlements. The Green Plan also includes a reforestation programme, which calls for planting 2.5 million plants per year. In addition, there is a national "Sustainable Light" plan to replace more than 45 million incandescent light bulbs in 11 million Mexican homes with energy-saving bulbs by 2012. The initiative will save an estimated 2.8 million tonnes of greenhouse gas emissions annually.

Transport: Mexico City is above average for transport. The city's public transport network is comprised of a metro system, heavy and light rails, electric trolleybuses, and an extensive bus system. It boasts the longest superior public transport network in the Index (defined as transport that moves large numbers of passengers quickly in dedicated lanes, such as a metro, bus rapid transit or trams), at 0.33 km per square kilometre, compared to the 17-city average of 0.1 km per square kilometre. And the overall public transport network totals 5.6 km per square kilometre of city territory, just above the 17-city average of 5 km, with some 4.4 million passengers riding the network each day. However, cars remain a major form of transport and the city has one of the largest stocks of cars and motorcycles in the Index, at 0.4 vehicles per person compared to the Index average of 0.3 vehicles. Regarding transport policies, although Mexico City has a comprehensive urban mass transport policy, and is making investments in green transport, the city lacks an integrated pricing system for the public transportation system. The city has already implemented "no-car days", a park and ride system, and a traffic light sequencing system to reduce congestion and improve traffic flow, but lacks congestion charges and carpooling lanes.

Green initiatives: The city has been proactively overhauling its transport system, and has a wide-range of initiatives underway. In 2005 the city inaugurated its first "bus rapid transit" (BRT) system, with a dedicated bus lane on the Avenida Insurgentes, the city's main north-south thoroughfare. A second BRT line running east to west opened in 2007, and a third line is now under construction. Under Mexico City's integrated public transport plan for 2007-2012 and its climate change action plan, the city has launched several additional initiatives to expand the public transportation network and promote alternatives to cars. Works are currently underway on a 12th metro line. In early 2010, Mexico City introduced a public rental bike scheme

Performance



The order of the dots within the performance bands has no bearing on the cities' results.





known as "Ecobici", which provides around 1,200 public bikes at 86 docking stations. In addition, the city has a compulsory transportation system for children going to school, reducing the number of trips by parents in private cars.

Waste: Mexico City ranks average in the waste category. The city collects and adequately disposes of all of its waste, according to official sources. However, its score in this category is lowered by the amount of waste the city generates: at 489 kg per person per year, this is above the Index average of 465 kg. According to the city's Environmental Agenda for 2007 to 2012, 60% of the city's waste is inorganic, and just under half is generated by the residential sector. All waste is sent to the Bordo Poniente landfill. The facility is, however, close to reaching maximum capacity, presenting the city with a significant challenge in the years to come. The city's performance in the waste category is also weighed down by its collection and disposal policies. The enforcement of industrial waste standards is insufficient; only about half of all industries comply with the existing norms. Patchy monitoring of illegal waste disposal, including littering and illegal dumping, is also a critical issue. Although thousands of waste pickers perform an important waste selection service, their activities are not regulated comprehensively.

Green initiatives: The city has introduced monetary incentives for firms that use biodegradable materials in their packaging. In mid-2010 the city approved a ban on free plastic bags in shops. The measure will start in 2011, when services and retail businesses are expected to have biodegradable options in place. Sellers that fail to comply will face hefty fines.

Water: Mexico City ranks average for water. The city consumes an estimated 178 litres of water per person per day, well below the 17-city average of 264 litres. However, the city has a high rate of water system leakages, at 37% versus the average of 35%. The Federal District's waterworks company has established standards for key pollutants in drinking water and also enforces industrial water pollution standards. However, Mexico City has some of the least ambitious water sustainability policies in the Index. About 63% of the water supply comes from local sources, including the Mexico Valley and Lerma aquifers, and external sources from the Balsas and Cutzamala basins supply the remaining 37%. But the water supply is under tremendous pressure in Mexico City, owing to overexploitation and contamination of local sources. Although the city has a water efficiency policy and promotes conservation, it lacks many measures to use water resources more efficiently, such as water meters or rainwater collection.

Green initiatives: To reduce water consumption, the city has raised water tariffs, although prices remain heavily subsidised, by anywhere between 65% and 95% depending on the neighbourhood. The city also has a programme to replace 10,000 km of water pipes per year, in an effort to reduce system leakages. The Federal District government has set an example for the city by announcing a goal to reduce its water consumption by 20%.

Sanitation: Mexico City ranks below average for sanitation. An estimated 99% of residents have access to sanitation, according to official sources, yet the city only treats 13% of its wastewater. This is considerably below the 17-city average of 52%, although the city is taking steps to improve its wastewater treatment performance (see "green initiatives" below). As a result of a longstanding lack of investment, sanitation infrastructure is out of date and damaged. Although wastewater treatment standards are good and monitoring takes place, the city's plan to promote environmentally sustainable sanitation services remains patchy.

Green initiatives: In 2009 the government finished building two new wastewater treatment plants at San Pedro Atocpan and Lago de Texcoco, and a third plant is currently under construction. The city has instituted on-site monitoring to ensure that businesses comply with existing standards.

Air quality: Mexico City ranks below average in the air quality category despite having made significant improvements in recent years. The city no longer tops the list of the world's most polluted cities, as it did in the early 1990s. This is the result of two decades of new measures to combat air pollution, such as investing in high-tech monitoring equipment, training experts, and working on a consensual long-term plan across all levels of government and with city residents. Yet the city's score is lowered by still higher-than-average levels of the three pollutants evaluated in the Index—sulphur dioxide, nitrogen dioxide and suspended particulate matter. Mexico City's geography is a hindrance too. It is surrounded by a ring of high peaks and volcanoes, which block the winds that might otherwise disperse pollutants naturally.

Green initiatives: The city's clean air programme, PROAIRE, has 89 measures to improve air quality, including bi-annual vehicle checks, strict emissions limits and regulations to remove the most polluting vehicles from the roads. Between 2007 and 2009, more than 35,000 taxis — out of a total fleet of more than 110,000 — were replaced by less-polluting taxis, and 20,000 were removed altogether. Mexico City has also been replacing its fleet of old microbuses with cleaner, more efficient vehicles. As of 2009, 839 of the older buses had been removed from the city's streets and replaced with clean-burning ultra low sulphur diesel fuel. The city says this measure will also reduce CO_2 emissions by 80,000 tonnes a year. Furthermore, the city has instituted voluntary audits for industrial polluters that have led to reductions of about 3,000 tonnes of air pollution emissions per year.

Environmental governance: Mexico City ranks well above average in environmental governance, one of only two cities at this level in the category. Worrying levels of air pollution in the early 1990s pushed environmental issues to the top of the public agenda, and over the past two decades the city has made significant progress to improve its performance. Its rank is bolstered by the environmental secretariat's proactive approach to environmental management.

The city's monitoring programme is the best in the Index, along with Rio de Janeiro. It also has the capacity to implement its own environmental legislation. Public participation in environmental projects is also high.

Green initiatives: In mid-2007, city authorities unveiled a 15-year, cross-departmental "Green Plan" lasting until 2021.

The US$1 billion plan, supported by the World Bank and the United Nations, contains 26 strategies and 113 specific action points to improve the city's sustainability. When progress was last reviewed in mid-2009, three-quarters of the action points had been started and 7% had been completed.

Quantitative indicators: Mexico City

		Average	Mexico City	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	318.3 [1,e]	2008	EIU estimate; Instituto Nacional de Estadística y Geografía; International Energy Agency; Consejo Nacional de Población; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	279.1 [2]	2008	Instituto Nacional de Estadística y Geografía; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	5,954.2 [2]	2009	Consejo Nacional de Población
	Green spaces per person (m^2/person)	254.6	28.4 [2]	2009	Environmental Secretariat of Mexico DF
Transport	Length of mass transport network (km/km^2)	5.0	5.6 [2]	2009	Departamento de Transporte, Mexico D.F.; Consejo Nacional de Población
	Superior public transport networks (km/km^2)	0.13	0.33 [2]	2010	Transparencia DF , Servicios de Transportes Electricos S.A. , Metro DF
	Stock of cars and motorcycles (vehicles/person)	0.30	0.40 [2]	2008	INEGI
Waste	Share of waste collected and adequately disposed (%)	96.2	100.0 [2]	2010	Programa de Gestión Integral de los Residuos Sólidos para el Distrito Federal 2010
	Waste generated per person (kg/person/year)	465.0	489.0 [2]	2010	Programa de Gestión Integral de los Residuos Sólidos para el Distrito Federal 2010
Water	Water consumption per person (litres per person per day)	264.3	178.0 [2, e]	2010	Sistema de Aguas de la Ciudad de México (Información elaborada por la Dirección Técnica)
	Water system leakages (%)	34.6	37.0 [2]	2010	Sistema de Aguas de la Ciudad de México (Información elaborada por la Dirección Técnica)
	Share of population with access to potable water (%)	97.5	98.0 [2]	2010	Sistema de Aguas de la Ciudad de México (Información elaborada por la Dirección Técnica)
Sanitation	Population with access to sanitation (%)	93.7	98.9 [3, e]	2007	Secretaría de medio ambiente y recursos naturales
	Share of wastewater treated (%)	51.5	12.9 [2]	2008	Comisión Nacional del Agua
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	60.0 [2]	2009	Secretaría del Medio Ambiente (Información elaborada por la Dirección General de la Gestión de la Calidad del Aire)
	Daily sulphur dioxide levels (ug/m^3)	11.4	13.0 [2]	2009	Secretaría del Medio Ambiente (Información elaborada por la Dirección General de la Gestión de la Calidad del Aire)
	Daily suspended particulate matter levels (ug/m^3)	48.0	51.0 [2]	2009	Secretaría del Medio Ambiente (Información elaborada por la Dirección General de la Gestión de la Calidad del Aire)

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Mexico D.F. Based on national electricity composition, 2) Based on Mexico D.F., 3) Based on Mexico D.F. Proportion of population with access to sewerage

Monterrey_Mexico

Background indicators

Total population (million)	4.0
Administrative area (km²)	3,177.0
GDP per person (current prices) (US$)	15,220.6
Population density (persons/km²)	1,254.5
Temperature (24-hour average, annual) (°C)	22.0

Based on Monterrey Metropolitan Area

Monterrey, with 4 million residents in the metropolitan area, is the capital of the Mexican state of Nuevo León, and the third most populous city in the country after Guadalajara and Mexico City. The data for Monterrey in the Latin American Green City Index comes mainly from the metropolitan area or statewide figures, rather than the smaller city of Monterrey, which has a population of 1.1 million. Monterrey's economy has prospered in recent years, boosted in part by the 1994 North American Free Trade Agreement between Mexico, Canada and the US. A range of big-name multinational companies have set up base there, and some large firms with a strong Latin American presence have also chosen Monterrey as a location for operations. However, the economy is still dominated by carbon-heavy manufacturing: steel, glass, cement and auto parts are among the major industries. The strong economy results in the fourth highest GDP per person in the Index, at US$15,200.

Monterrey is ranked average overall in the Index. Its best results are in the categories of waste, water and sanitation, with above average performances. The city shows particularly strong results for the amount of green spaces per person in the city, and it has the lowest rate of water system leakages in the entire Index. Indeed, the city won an international award in 2010 for its decade-long efforts on reducing leakages. Monterrey is average in two categories — energy and CO_2, and land use and buildings — and below average in transport, air quality and environmental governance. The city's overall environmental performance should improve during the next five years, however, as an ambitious statewide climate change action plan comes fully into effect. The plan includes several initiatives to reduce CO_2 emissions from many different sources in the city.

Energy and CO_2: Monterrey ranks average in energy and CO_2. The city emits an estimated 723 kg of CO_2 from electricity consumption, considerably higher than the Index average of 202 kg. Consuming 848 megajoules of electricity per US$1,000 of GDP, Monterrey also exceeds the Index average of 761 megajoules. One of the contributing factors to Monterrey's relatively high CO_2 emissions and electricity consumption is the region's climate, which, at the extremes, can reach as high as 44° Celsius in the summer and as low as -12° Celsius in the winter. This substantially increases the use of air-conditioners and heaters. An extensive and relatively energy-inefficient manufacturing base in Monterrey may also be a factor in driving up CO_2 levels from electricity consumption. And Monterrey, like other Mexican cities in the Index, only produces 15% of its electricity from renewable energy sources, versus the Index average of 64%. Environmental authorities seem to recognise the need for action, however, with Monterrey scoring very well for its energy and climate change policies. The city has had a recent baseline environmental review of greenhouse gas emissions. It also regularly monitors its emissions and publishes the findings. Monterrey is one of only four cities in the Index that converts local waste by-products to energy. And the city is covered by a comprehensive climate change action plan (see "green initiatives", below).

Green initiatives: The state government's climate change action plan, which covers Monterrey, calls on the city to reduce CO_2 emissions significantly during 2010-2015. The report was developed by the Monterrey Institute of Technology and Higher Education, in cooperation with the federal and state government. The plan proposes numerous measures to reduce CO_2 emissions in buildings, transport, and waste disposal, among others (see "green initiatives" in specific categories, below). In 2003, the state government entered into a joint venture with Bioeléctrica de Monterrey, a private company, to open a US$17 million electricity-generation facility, "BENLESA". The facility uses solid, non-hazardous waste as a renewable source of energy, by burning methane in landfills. The project supplies all of the electricity to run the city's two-line metro system and 45% of the city's electricity used for public lighting. The goal is to supply 100% of public lighting electricity by 2012. Local authorities say the project has cut CO_2 emissions by 1.2 million tonnes since starting operations.

Land use and buildings: Monterrey is average in the land use and buildings category. The city has the third highest amount of green spaces in the Index, at 750 square metres per person, a figure from 2005, due to a lack of more up-to-date data. Monterrey's performance for green spaces is partly helped by having a relatively low population, but the city also has strong land use policies. Monterrey scores particularly well for green spaces protection and urban sprawl containment. In terms of eco-buildings policies, Monterrey's local authorities are marked down for not setting green standards for public building projects.

Green initiatives: The state's climate change action plan includes a US$2.5 million residential programme to replace energy-inefficient lighting with LEDs, and electrical appliances with more energy-efficient equivalents.

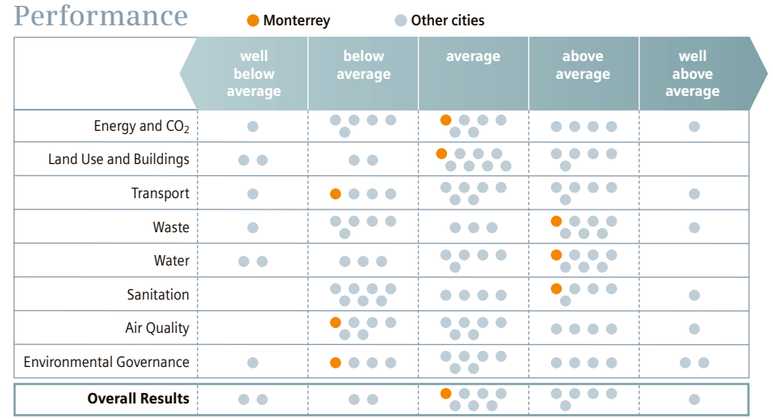
It also includes a US$3.5 million plan to install solar heaters and energy-efficient air conditioning devices. Furthermore, the state has budgeted US$2.3 million to build "eco-industrial parks", which utilise energy-efficient design and limit emissions. In addition, there is a national "Sustainable Light" plan to replace more than 45 million incandescent light bulbs with energy-saving bulbs in 11 million Mexican homes by 2012. The initiative will save an estimated 2.8 million tonnes of greenhouse gas emissions annually.

Transport: Monterrey is below average in transport, a ranking explained mainly by the city's relatively short mass transport network in relation to its area. Although the system is dominated by an extensive bus network, and supplemented by a two-line metro, the metropolitan area's relatively wide administrative boundary means the length in the Index registers at an estimated 0.8 km per square kilometre, compared to the Index average of 5 km per square kilometre. Monterrey receives relatively high marks when it comes to urban mass transport policy, despite the complexity of managing transport across multiple municipalities in the metropolitan area. Monterrey is marked up for having an integrated pricing system for public transport and for taking steps to reduce emissions from mass urban transport. However, the city receives low marks for congestion reduction policies. The city has so far failed to introduce measures such as "no-car days", carpooling lanes, and park and ride systems.

Green initiatives: The statewide climate change action plan calls for the construction of a 27 km "bus rapid transit" (BRT) system, and initial work has already begun. The plan also foresees a new light rail line, which is expected to increase the current capacity of the transit network by more than two-thirds to 600,000 passengers per day.

Waste: Monterrey ranks above average in the waste category. The city scores well for managing to collect and dispose of all of the waste it generates, an estimate based on collection rates

Performance



The order of the dots within the performance bands has no bearing on the cities' results.

throughout the state. At the same time, Monterrey also produces a relatively low amount of waste per person per year — 317 kg versus the Index average of 465 kg. Regarding waste disposal policies, Monterrey scores well for enforcing and monitoring industrial hazardous waste standards. The city has some recycling services in place, with central collection points and the ability to recycle organic waste, glass, plastics and paper. The city also has an integrated policy aimed at reducing, reusing and recycling waste.

Green initiatives: The city of Monterrey has implemented a recycling programme in 500 neighbourhoods that collects organic and non-organic waste on different days of the week.

Water: Monterrey ranks above average in the water category. The city's strong overall performance is underpinned by the most efficient water system in the entire Index — it loses a comparatively low 21% of its water flow through leaks, considerably better than the Index average of 35%. In 2010, the Inter-American Development Bank awarded Monterrey its "Latin American water prize" for the city's efforts to reduce leaks over the past decade (see "green initiatives" below). Water consumption in Monterrey, at an estimated 228 litres per person per day, is also lower than the Index average of 264 litres. An estimated 95% of Monterrey's population has access to potable water, a figure based on access across the state as a whole, which is slightly below the 17-city average of 98%. The city scores well for measuring key pollutants in surface and drinking water. It also has water meters and tariffs, but is marked down for lacking other efficiency measures covered in the Index, such as rainwater collection facilities, separate pipes for non-drinking water, hosepipe bans and recycling grey water.

Green initiatives: Monterrey has reduced leakages in its water system from an estimated 32% in 1998 to 21% by 2008, through a comprehensive, internationally recognised water management programme. This ongoing effort has involved checking and replacing valves, upgrading pipes, installing pressure gauges and household meters, leak detection and eliminating illegal connections. In 2010, the city's state-run Drainage and Water Service of Monterrey (SADM) finished "Monterrey V". This US$237 million plan further im-proved the water and sanitation systems, which included the building of 73 km of new water delivery pipelines and six pumping stations throughout the metropolitan region. The city is set to improve its water system even further, since the state climate change action plan has budgeted US$2 million to upgrade infrastructure and modernise residual water treatment plants across the state.

Sanitation: Monterrey is above average in the sanitation category. Ninety-five percent of its population has access to sanitation, according to official figures based on access across the state as a whole. But the city is one of only two in the Index — Brasília is the other — that manages to treat 100% of its wastewater, well above the average of 52%. These impressive figures are the result of significant investment in the metropolitan region's sanitation capacity over the past 15 years. Since 1995, the state government has built four wastewater treatment plants to serve the Monterrey metropolitan area, and has just finished the "Monterrey V" project, which has a significant sewerage element (see "green initiatives" below). The city has relatively strong results on sanitation policies as well, particularly for regularly monitoring sanitation facilities, setting minimum standards for wastewater treatment, and for publicly promoting the efficient use of sanitation systems.

Green initiatives: The sanitation component of the state's US$237 million "Monterrey V" programme (see also "green initiatives" in the "water" section, above) includes new sewerage lines and wastewater collectors, and has increased wastewater treatment capacity from 9,000 litres per second to 13,500 litres per second.

Air quality: Monterrey ranks below average in air quality. This result reflects higher-than-average sulphur dioxide and suspended particulate matter levels, which are driven in part by the presence of heavy industry in the city. Levels of particulate matter, at 77 micrograms per cubic metre, are among the highest in the Index, and well above the average of 48 micrograms. Authorities recognise the need for action, reflected in the city's positive results on clean air policies. It regularly monitors air quality around the city, including each of the pollutants covered in the Index, and informs citizens about the dangers of household pollutants.

Environmental governance: Monterrey ranks below average in the environmental governance category. It has a dedicated environmental department that oversees policy, but its powers are shared with the state government, which has a strong influence on policy, and has taken the lead on climate change, for example. In the Index, Monterrey is one of only five cities marked down for not regularly monitoring and publishing information on its overall environmental performance.

The city has, however, conducted a baseline environmental review with-in the last five years, covering water, waste, air quality, transport, energy and climate change.

Quantitative indicators: Monterrey

		Average	Monterrey	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	722.7 [1, e]	2008	EIU estimate; Instituto Nacional de Estadística y Geografía; International Energy Agency; Consejo Nacional de Población; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	847.5 [2]	2008	Instituto Nacional de Estadística y Geografía; Gobierno de Nuevo León; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	1,254.5 [2]	2009	Marco Geoestadistico Municipal, INEGI 2007, Consejo Nacional de Población
	Green spaces per person (m^2/person)	254.6	749.8 [2]	2005	Instituto Nacional de Estadística y Geografía; Consejo Nacional de Población
Transport	Length of mass transport network (km/km^2)	5.0	0.8 [3, e]	2009	Gobierno de Nuevo León; Instituto Nacional de Estadística y Geografía; Consejo Nacional de Población
	Superior public transport networks (km/km^2)	0.13	0.02 [4]	2010	TransMetro y MetroBús, STC Metrorrey, Despacho de Transmetro y Metrobús
	Stock of cars and motorcycles (vehicles/person)	0.30	0.36 [4]	2008	INEGI
Waste	Share of waste collected and adequately disposed (%)	96.2	100.0 [5]	2008	Secretaría de medio ambiente y recursos naturales
	Waste generated per person (kg/person/year)	465.0	316.9 [6]	2008	Instituto Nacional de Estadística y Geografía
Water	Water consumption per person (litres per person per day)	264.3	228.5 [7, e]	2008	Instituto Nacional de Estadística y Geografía
	Water system leakages (%)	34.6	21.0 [2]	2008	Comisión Nacional del Agua
	Share of population with access to potable water (%)	97.5	95.2 [5, e]	2007	Secretaría de medio ambiente y recursos naturales
Sanitation	Population with access to sanitation (%)	93.7	95.2 [8, e]	2007	Secretaría de medio ambiente y recursos naturales
	Share of wastewater treated (%)	51.5	100.0 [5]	2008	Comisión Nacional del Agua
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	33.1 [2]	2009	Gobierno de Nuevo León
	Daily sulphur dioxide levels (ug/m^3)	11.4	14.0 [2]	2009	Gobierno de Nuevo León
	Daily suspended particulate matter levels (ug/m^3)	48.0	76.6 [2]	2009	Gobierno de Nuevo León

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Monterrey Metropolitan Area. Based on composition of energy sources used in electricity production in Mexico, 2) Based on Monterrey Metropolitan Area, 3) Based on Monterrey Metropolitan Area. The figure on bus routes used for this indicator does not include all bus routes, but only the length of roads covered by at least one bus route. The length of bus routes was not available, 4) Based on Municipality of Monterrey, 5) Based on Nuevo León, 6) Based on Monterrey Metropolitan Area. Based on annual collection of municipal waste, 7) Based on Monterrey Metropolitan Area. Based on daily water extraction, 8) Based on Nuevo León. Based on access to sewerage

Montevideo_Uruguay

Background indicators

Total population (million) [1]	2.0
Administrative area (km^2) [2]	525.5
GDP per person (current prices) (US$) [1]	6,417.3
Population density (persons/km^2) [2]	2,546.7
Temperature (24-hour average, annual) (°C) [3]	16.0

1) Based on Montevideo Metropolitan Area, 2) Based on Departamento de Montevideo, 3) Based on Montevideo City

Montevideo is the capital of Uruguay and the country's economic and financial centre. With a population of 2 million in the metropolitan area, it is Uruguay's biggest city, but still one of the least populous among the 17 cities in the Latin American Green City Index. Data included in the Index are based on a combination of the metropolitan area and the smaller Montevideo City, which has a population of 1.3 million. Montevideo stands on the estuary of the River Plate, and is home to the country's main port, a conduit for the bulk of Uruguay's meat, dairy and grain exports.

The city has an older downtown area, near the port, which contains the main university and government offices, and a newer area, towards the coast, which houses the city's burgeoning logistics and high-tech sectors. Economically, the metropolitan area generates a GDP of US$6,400 per person, which is the fifth-lowest in the Index and below the average of US$11,100.

Montevideo is ranked below average overall in the Index. Its best result is for environmental governance, where it ranks above average, due particularly to its efforts in monitoring the city's environment and publicly releasing the results. In the transport category, the city sees an average performance, but its result in this category is bolstered by a strong public transport policy, an integrated pricing system for mass transit and promoting green transport. The city ranks below average in five other categories — energy and CO_2, waste, water, sanitation and air quality — for the most part because of relatively less ambitious policies than other cities in the Index. However, Montevideo does score particularly well for generating one of the smaller amounts of waste among the 17 cities, and it has some of the best water quality policies in the Index.

Energy and CO_2: Montevideo ranks below average in energy and CO_2. The city scores well for CO_2 emissions from electricity consumption, at an estimated 80 kg per person across the metropolitan area, which is significantly below the Index average of 202 kg. Almost 90% of Montevideo's electricity comes from renewable sources, with most of that from hydropower. Electricity consumption compared to economic output is much more than the average, however, at an estimated 1,100 megajoules per US$1,000 GDP, compared to the 17-city average of 760 megajoules. The city's relatively high energy consumption is due partly to generous public subsidies for electricity, especially for medium-sized and large businesses, although the national energy company, UTE, has in the past year started to implement tariff differentiations to encourage more energy efficiency among customers (see "green initiatives" below). Montevideo has policies on clean energy and climate change in place, but they could be strengthened. For example, the city's climate change action plan covers only energy, but not other areas like water, sanitation, waste, transport or buildings. On the other hand, Montevideo has signed up to international covenants to reduce greenhouse gases.

Green initiatives: The national energy utility, UTE, has implemented different tariffs for residential customers, including a dual tariff for peak and non-peak hours. There is also a "minimal use tariff" currently covering 150,000 households that have committed to using less than 170 kilowatts per month in exchange for a lower bill. A variant of this system is planned for commercial users, but no concrete plans exist at the moment. In addition, the Uruguay national government is promoting wind energy and it has overseen a few pilot projects, one of which is supplying electricity for Montevideo's street lights. Another project initiated by the national government is a 2 megawatt wind farm that will have the capacity to supply 20% of the city's public electricity. It is expected to start operations at the end of 2010. The city itself is now in the planning stage of developing its own larger wind farm within city limits, although officials have not yet announced the capacity or costs.

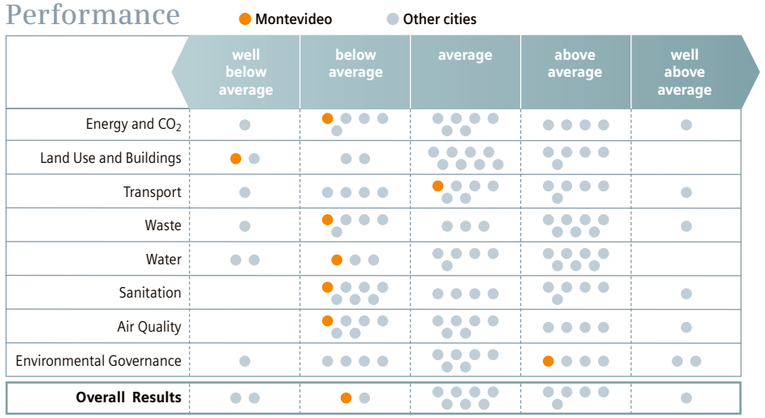
Land use and buildings: Montevideo is well below average for land use and buildings, largely because of comparatively weak policies on eco-buildings and land use. For example, the city has partial codes covering eco-standards in new buildings, but it does not yet have incentives in place for businesses and households to lower their energy use. The city's performance in this category is also weighed down by having

one of the lower population densities in the Index — at 2,500 people per square kilometre, compared to the average of 4,500 people per square kilometre — and fewer green spaces than most Index cities, at 9 square metres per person. Most of Montevideo's green spaces are parks set aside in the 19th century and the beginning of the 20th century, and the city's approach to green spaces has traditionally been to protect existing areas, rather than create new ones. This approach is set down in the city's current land use plan, in force since 1998, which says construction activity must protect and improve existing green areas. A new, more comprehensive system of protection is in the planning stages (see "green initiatives" below), which will also involve measures that should boost the amount of green spaces in the future.

Green initiatives: Montevideo is currently developing a more comprehensive urban sustainability plan for 2010 to 2020 that will encompass wetlands, beaches and the rural environment, along with green spaces. Regarding green spaces specifically, the plan aims to recover existing areas in the city's urban core that have suffered from a lack of maintenance and to expand green areas in outlying neighbourhoods. The city also has an educational programme, called "Montevideo Verde", to publicly promote the importance of green spaces conservation among residents. The first events took place in 2009, and they include guided tours of most of the city's parks and other environmentally sensitive areas such as wetlands. In one part of the programme, for example, botanists lead groups of children in planting vegetation in parks.

Transport: Montevideo ranks average in the transport category. The mass transport network extends 1.9 km per square kilometre across the metropolitan area, compared to the Index average of 5 km per square kilometre. Montevideo lacks a metro, so mass transport in the city consists mainly of fleets of older buses. Central roads tend to be congested, although traffic flows more freely than in most Latin American

Performance



The order of the dots within the performance bands has no bearing on the cities' results.





capitals. The city also has one of the smaller stocks of cars and motorcycles in the Index, at 0.16 vehicles per person versus the Index average of 0.3. The city has a comprehensive urban mass transport policy, including an integrated pricing system and dedicated bus lanes.

Green initiatives: Montevideo's "Mobility Plan 2010-2020" aims to reduce car use through measures such as promoting public transport and increasing the number of pedestrian-only areas in the urban centre. An important part of the plan is to extend public transport from the urban centre to peripheral areas through exclusive bus lanes.

Construction began on the first of these bus corridors in 2009, and is expected to be finished in the first half of 2011. Also in 2009, the city started building an exclusive cycle route that runs parallel to a main city street. The bike lane runs along the Camino Carrasco, and the city has plans for building a second route on General Flores as one of the first steps in the decade-long Mobility Plan.

Waste: Montevideo is below average in the waste category. It scores well for generating one of the lower amounts of waste in the Index, at 303 kg per person per year across the metropolitan area, much better than the average of 465 kg. The city is marked down for only collecting and disposing of an estimated 85% of its waste, compared to the 17-city average of 96%. In general Montevideo's policies covering waste disposal and recycling can be improved. For example, the city has environmental standards covering landfills and incineration sites, as well as for disposing industrial hazardous waste, but these are only partially monitored and enforced. Montevideo has been proactive about the disposal of special waste, however, by establishing an on-site collection scheme that will accept electronic equipment and other large household items.

Green initiatives: The municipality and the national government agreed to build Montevideo's first landfill for hazardous industrial waste, which is scheduled to be finished by the end of 2010. Furthermore, the city has launched an educational programme for children and young adults about proper waste disposal in public places. The initiative includes a television advertisement broadcast on local stations. The programme grew out of a previous waste disposal promotion campaign in 2008 and 2009.

Water: Montevideo ranks below average in the water category. The city scores well for water quality policies, which include relatively robust standards for surface water, regular surface water quality monitoring, and drinking water standards. The percentage of the population with access to potable water is equal to the average, at an estimated 98%. However, many cities already have achieved universal access to drinking water. The city's score is further hindered by a very high rate of water consumption — the third highest in the Index — at 375 litres per person per day across the metropolitan area, compared to the 17-city average of 264 litres. Due to Montevideo's location on an estuary of the River Plate, water supply is plentiful. And as a result, the city has been slow to adopt water sustainability policies. Montevideo is one of two cities in the Index that lacks a code aimed at consuming water more efficiently; the city has not implemented water meters, separate pipes for non-drinking water, recycling of graywater, hose-pipe bans or rainwater collection. However, it does run public awareness campaigns to encourage the rational use of water.

Green initiatives: In early 2010, OSE, the national agency in charge of delivering potable water to the city, finished a three-year project to build a sixth water pipeline connecting the country's largest potable water treatment facility to the city of Montevideo and surrounding areas. The pipeline is expected to meet the city's water needs until 2035.

Sanitation: Montevideo is below average in the sanitation category. Only an estimated 50% of wastewater is treated in Montevideo City, compared to the Index average of 52%. The percentage of residents with access to sanitation is also below the average, at an estimated 83% compared to 94%. The city scores well for its policy on monitoring on-site sanitation facilities in homes and communal areas. Although Montevideo still has much work to do, sanitary norms have strengthened in recent years and the city has ambitious goals. The government has a comprehensive plan to improve its sanitation (see "green initiatives" below), and has publicly declared its goal to be the "Latin American city with the best sanitation system".

Green initiatives: Montevideo has a US$260 million plan to provide proper sanitation to the entire city by 2020, and improve wastewater treatment. The assessment phases have ended, and works have gradually started on the plan, which foresees the construction of a new wastewater facility that will treat about 44% of the city's disposed water, and help to clean up the city's bay. It also calls for upgrading wastewater collection and transport capabilities.

Air quality: Montevideo is below average in the air quality category, a result mainly due to higher than average concentrations of nitrogen dioxide and sulphur dioxide. Relatively lax automobile emissions standards are mainly to blame, in addition to pollution from the city's port area. Montevideo's location on an estuary helps to disperse pollution, but this effect is often cancelled out by the region's humid climate, which tends to trap pollution over the city. The city's clean air policies are relatively robust, however, and officials have taken measures to tackle the problem in recent years, especially in core urban areas. Montevideo, for example, has an air quality code, regularly monitors air quality at different locations around the city (see "green initiatives" below), and informs residents about the dangers of air pollution.

Green initiatives: In 2005 Montevideo established an extensive air quality monitoring network, consisting of eight stations in different parts of the city, to monitor a wide range of pollutants. In 2008, an air quality monitoring station was set up to measure pollution in the vicinity of the La Teja refinery, located in the city's bay. The goal is to evaluate refinery emissions to improve the refinery's efficiency, and surrounding air quality. It is part of a project called ARPEL/CIDA, which is supported by the regional organisation of gas and petroleum industries and the Canadian development agency.

Environmental governance: Montevideo ranks above average in environmental governance — its best performance. It has an environmental department overseeing policy, with the ability to implement its own environmental legislation. The department's remit is somewhat limited compared to the best-scoring cities in the Index, however. Policies on waste, transport, energy and climate change, for example, are not directly monitored by the municipal environmental authority. Montevideo performs well for monitoring its environmental performance and publishing the results, and the city provides residents with a central point of contact for information about environmental projects.

Green initiatives: Montevideo is the only city in Uruguay to adhere to the principles of Agenda 21, a United Nations blueprint with guidelines for including environmental considerations when developing government policies. To this end, the city has established the "Montevideo Environmental Group", an association of non-governmental organisations, businesses and public organisations that provides oversight and tracks the city's commitment to environmental goals. It also runs workshops on environmental topics such as air quality and waste management.

Quantitative indicators: Montevideo

		Average	Montevideo	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	79.6 [1, e]	2007	EIU estimate; Instituto Nacional de Estadísticas; International Energy Agency; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	1,146.6 [2, e]	2007	EIU estimate ; Instituto Nacional de Estadísticas; International Energy Agency; Oficina de Planeamiento y Presupuesto
Land use and Buildings	Population density (persons/km^2)	4,503.0	2,546.7 [3]	2009	Instituto Nacional de Estadísticas
	Green spaces per person (m^2/person)	254.6	9.2 [4]	2007	Servicio Geomática, Intendencia Montevideo; Instituto Nacional de Estadísticas
Transport	Length of mass transport network (km/km^2)	5.0	1.9 [4]	2009	Unidad Ejecutiva Plan Movilidad Urbana, Intendencia Montevideo; Instituto Nacional de Estadísticas
	Superior public transport networks (km/km^2)	0.13	0.07 [5]	2010	Administradores de Ferrocarriles del Estado
	Stock of cars and motorcycles (vehicles/person)	0.30	0.16 [5]	2006	Estadisticas de Transporte Anuario 2007, Direccion Nacional de Tranporte
Waste	Share of waste collected and adequately disposed (%)	96.2	85.0 [4, e]	2008	El Pais
	Waste generated per person (kg/person/year)	465.0	303.0 [4]	2010	Departamento de Desarrollo Ambiental
Water	Water consumption per person (litres per person per day)	264.3	374.9 [4]	2008	Obras Sanitarias del Estado; Instituto Nacional de Estadísticas
	Water system leakages (%)	34.6	36.1 [4, e]	2008	Obras Sanitarias del Estado
	Share of population with access to potable water (%)	97.5	98.0 [6, e]	2008	Obras Sanitarias del Estado
Sanitation	Population with access to sanitation (%)	93.7	83.4 [7, e]	2009	Servicio de Estudios y Proyectos, Intendencia de Montevideo; Instituto Nacional de Estadísticas
	Share of wastewater treated (%)	51.5	50.0 [5, e]	2009	Servicio de Estudios y Proyectos, Intendencia de Montevideo
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	52.0 [5]	2009	Grupo Ambiental de Montevideo
	Daily sulphur dioxide levels (ug/m^3)	11.4	28.0 [5]	2009	Grupo Ambiental de Montevideo
	Daily suspended particulate matter levels (ug/m^3)	48.0	39.0 [5]	2009	Grupo Ambiental de Montevideo

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Montevideo Metropolitan Area. Based on electricity consumption estimates and energy sources used in electricity generation in Uruguay, 2) Based on Montevideo Metropolitan Area. Estimate based on robust analysis of the relationship between GDP, population and energy consumption in other cities in Latin America where the data were available, 3) Based on Departamento de Montevideo, 4) Based on Montevideo Metropolitan Area, 5) Based on Montevideo City, 6) Based on access to water for Uruguay due to lack of data, 7) Based on Montevideo City .Based on access to sewerage

Porto Alegre_Brazil

Porto Alegre is the capital of Brazil's southernmost state, Rio Grande do Sul. Long a magnet for foreign immigrants, the metropolitan area is now home to 4.7 million people. However, with a few exceptions noted below, data included in the Latin American Green City Index are based on figures for the city of Porto Alegre, which has 1.4 million residents. Located at the confluence of five rivers, the city has a major port that serves as a transport hub for all of southern Brazil, and contributes significantly to the local economy. In particular, agricultural products from around the state pass through Porto Alegre before being exported around the world. Services also play an important role in the city's economy, as do some heavy industries, including steel and car manufacturers.

Porto Alegre ranks average overall in the Latin American Green City Index. The city's best performance is in the waste category, where it ranks above average, thanks to a well-developed recycling programme and strong policies regarding waste collection and disposal. Porto Alegre achieves average rankings in the areas of land use and buildings, water, sanitation, and air quality. Despite its middling rank in water and sanitation, the city is one of a few in the Index that has achieved universal access to potable water and sanitation services, according to official figures. On the other hand, the city has significant room for improvement in energy and CO_2, transport, and environmental governance. It places below average in these three categories.

Background indicators

Total population (million)	1.4
Administrative area (km^2)	497.0
GDP per person (current prices) (US$) [e]	12,081.9
Population density (persons/km^2)	2,895.0
Temperature (24-hour average, annual) (°C)	20.0

Based on City of Porto Alegre, e) EIU estimate

Energy and CO_2: Porto Alegre ranks below average in energy and CO_2. Its poor performance in this category is attributable to the city's high electricity consumption, its failure to adopt a climate change action plan, and its mixed progress in clean energy policies. The metropolitan region consumes 974 megajoules of electricity per US$1,000 GDP, which is one of the highest rates in the Index and well above the 17-city average of 761 megajoules. Porto Alegre does not monitor greenhouse gas emissions and, while it is investing in developing clean and renewable sources of energy, the city earns only partial marks for its investment in waste-to-energy programmes. On the other hand, with nearly 90% of its electricity already produced from renewable sources, primarily hydropower, the Porto Alegre metropolitan region has a much stronger record in terms of CO_2 emissions from electricity. It emits an estimated 86 kg of CO_2 per inhabitant annually in the metropolitan area, considerably lower than the Index average of 202 kg. Furthermore, Porto Alegre's performance in the energy and CO_2 category will likely improve following the creation of a government body charged with guiding policy in the area of Renewable Energies (see "green initiatives" below).

Green initiatives: In September 2009 the city's environmental department launched a new agency, the Resource Centre on Renewable Energies, to promote renewable energy in Porto Alegre. The centre distributes information about renewable technologies, including details on installation costs and vendor names. The centre is also responsible for developing potential renewable energy policies.

Land use and buildings: Porto Alegre ranks average in the land use and buildings category. The population density, at 2,900 persons per square kilometre inside the city limits, falls below the 17-city average of 4,500 inhabitants. At the same time, the metropolitan region of Porto Alegre has one of the lowest amounts of green space in the Index, with only 6 square metres per person. Despite its small amount of green spaces, the city is making an effort to plant trees along city roads and in parks and to preserve native vegetation. Porto Alegre also has strict guidelines for environmental licensing aimed at protecting conservation areas, boosting its performance in land use policies. Likewise, the city performs well in the area of eco-buildings policy. It has a well-developed set of standards to guarantee the eco-efficiency of new buildings and actively promotes awareness about ways for citizens to improve energy efficiency of buildings. On the other hand, it is one of several cities in the Index that does not incentivise businesses and households to lower their energy use.

Green initiatives: While Porto Alegre lacks a comprehensive strategy aimed at improving energy efficiency in municipal buildings, the environmental secretariat has taken tentative steps in this direction, by using solar energy to heat water at one of its offices on an experimental basis. The ten solar panels will capture enough energy to heat 600 litres of water a day. The city is also building 210 houses, as part of its social housing project, with solar-powered water heaters as an alternative to electric showers, which are common in much of Brazil.

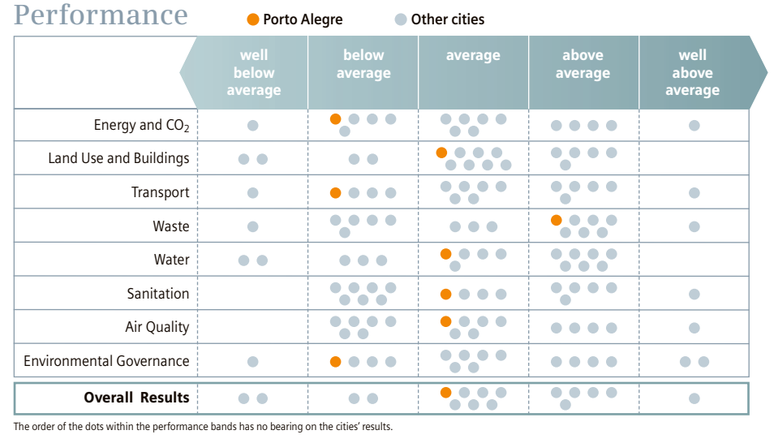
Transport: Porto Alegre ranks below average for transport. The city has a higher-than-average stock of cars and motorcycles, at 0.38 vehicles per person, compared to the 17-city average of 0.30. The length of the mass transport network is also shorter than average, at an estimated 3.6 km per square kilometre, compared to the Index average of 5 km. The city performs well, however, for urban mass transport policies, thanks to its integrated pricing system and the presence of exclusive bus lanes. The city also has a traffic management system with 40 cameras connected to a central control room, where the traffic lights are managed according to the flow of vehicles.

Green initiatives: Porto Alegre is investing US$380 million to extend the metro, adding 10 km and four stations towards the city's northern suburbs. Though long discussed, plans for a second metro line have not been specified. However, the city has unveiled a US$17 million project to construct a 1 km connection from the international airport to the metro. This so-called Aeromovel, an air-propelled train, is being financed by the federal government in preparation for the World Cup, and is scheduled to open in late 2011. Furthermore, the city is adding 40 km of bike lanes to encourage residents to use greener forms of transport.

Waste: Porto Alegre ranks above average in the waste category, its best performance in the Index. This is largely due to its waste collection and disposal policy, and a well-developed recycling and re-use programme. Recyclable material is collected twice a week, and local authorities run public information campaigns on recycling and waste reduction. Porto Alegre also does well on waste collection, gathering and disposing of 99% of the waste produced in the city limits. The city of Porto Alegre generates 345 kg of waste per person per year, compared to the Index average of 465 kg. In 1997 the city was one of the first in the country to open a managed landfill. It was closed in 2002 when it reached capacity, in favour of the privately run Recreio landfill, located 113 km outside of the city. And since 2006 the city has run a separate collection scheme for medical and other special forms of waste.

Green initiatives: In August 2010, Porto Alegre announced a pilot project to place 1,000 household waste containers around the city, in an effort to reduce the amount of waste left on streets, improve transport logistics and cut back

Performance



The order of the dots within the performance bands has no bearing on the cities' results.

on collection time. Officials plan to introduce the programme in the city centre in 2011, along with a promotion campaign.

Water: Porto Alegre ranks average in the water category. The city's water company, DMAE, loses 29% of water to system leakages, which, though high, is still one of the lowest leakage rates in the Index, and below the average 35%. The city provides potable water to all of its residents, according to official figures. The city lies on the eastern bank of the Guaiba Lake, at the convergence of five rivers, so as a result water is plentiful in Porto Alegre. Porto Alegre also performs well in water sustainability policies thanks to public awareness campaigns promoting conservation. The city's water ranking is hindered, however, by relatively high water consumption; the city consumes 313 litres per person per day, considerably more than the 17-city average of 264 litres.

Green initiatives: In 2005 the city's water company launched the "Right Water" programme to reduce the number of clandestine links to the water network and expand access to potable water in informal settlements. The city works with local residents' associations to identify and curb illegal connections, and offers grace periods and instalment plans for residents who cannot pay their water bills in full. The city says the delinquency rate has dropped from 14% a few years ago to less than 10% today.

Sanitation: Porto Alegre ranks average in the sanitation category. All of the city of Porto Alegre's residents have access to sanitation services, according to official figures — well above the 17-city average of 94%. In contrast, the city treats only 20% of this wastewater, well below the Index average of 52%. However, Porto Alegre sees the need for improvement and has comprehensive sanitation policies in place, including an ambitious goal to significantly increase the share of wastewater treated (see "green initiatives" below).

Green initiatives: In 2000 the city unveiled its comprehensive sanitation plan. The US$250 million "Pisa" project set a goal to increase wastewater treatment to 77% by 2012, although the city appears far from meeting that target. Fourteen projects are currently under way, including new wastewater treatment facilities, new pipes and effluent collectors and upgrades to existing pumping stations.

Air quality: Porto Alegre ranks average in air quality. Like many cities in the Index, road traffic is the primary source of air pollution. The city has one of the lowest concentrations of sulphur dioxide in the Index, with daily levels at an estimated 2 micrograms per cubic metre versus an Index average of 11 micrograms. Porto Alegre's daily concentration of particulate matter is 34 micrograms per cubic metre, less than the average of 48 micrograms. However, the city performs less well for nitrogen dioxide emissions, a primary cause of which is automobiles: average daily concentrations total an estimated 54 micrograms per cubic metre versus an Index average of 38 micrograms. While the city operates two monitoring stations near major intersections that measure only particulate matter and carbon dioxide emissions, the state environmental projection agency operates three monitoring stations in Porto Alegre that check for a variety of air pollutants.

Green initiatives: While many cities require cars to pass yearly emissions tests, the city of Porto Alegre instead performs random checks on trucks and buses, under its "Operation Clean Air" programme. City officials set up checkpoints along major streets and pull drivers aside for emissions tests. Vehicles that fail are impounded and owners can be fined.

Environmental governance: Porto Alegre ranks below average for environmental governance. The city hasn't conducted a baseline environmental review in the last five years, and environmental issues are split within various departments of the local government, which may hamper comprehensive action and lead to a lack of efficiency in policy implementation. However, Porto Alegre was the first major Brazilian city to establish an environmental secretariat in 1976, and the environmental department remains active in drafting legislation and guiding policy. The city also makes efforts to involve the public by guaranteeing access to environmental information.

Green initiatives: In 1989 Porto Alegre became the first city in Brazil to adopt a "participatory budget" process, which has since become a model for cities around the country. Each year the city holds a series of neighbourhood, regional and citywide meetings where residents and elected delegates vote on a wide range of spending priorities, including for environmental areas such as transport and sanitation. Regarding sanitation, for example, city officials say the process has directly resulted in the expansion of services.

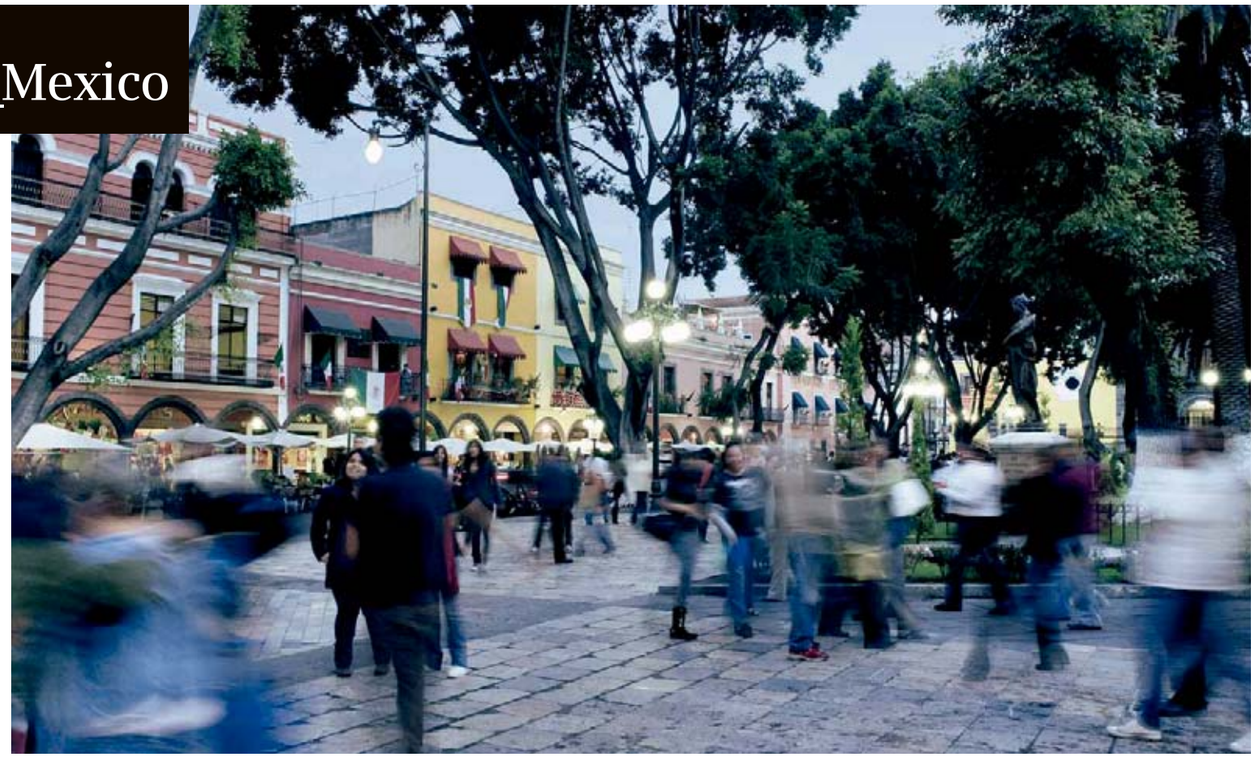
In 2009, Local Governments for Sustainability, an international association of which Porto Alegre is a member, named the city as one of five "model" cities to take part in a renewable energy initiative. With the organisation's backing, model communities develop a sustainable energy strategy. The city created the Resource Centre on Renewable Energies (see "Energy and CO_2" section above) as part of the programme, and is studying other potential projects.

Quantitative indicators: Porto Alegre

		Average	Porto Alegre	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	85.6 [1, e]	2008	EIU estimate; Balanco Energetico do RS/CEEE, Sulgas; International Energy Agency; Governo do Estado do Rio Grande do Sul; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	973.7 [2, e]	2008	Balanco Energetico do RS/CEEE, Sulgas; Fundação de Economia e Estatística; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	2,895.0 [3]	2009	Fundação de Economia e Estatística; Instituto Brasileiro de Geografia e Estatística
	Green spaces per person (m^2/person)	254.6	6.0 [4]	2008	Secretaría Municipal do Meio Ambiente; Fundação de Economia e Estatística
Transport	Length of mass transport network (km/km^2)	5.0	3.6 [4, e]	2010	Porto Alegre Sanitation Secretariat; METROPLAN
	Superior public transport networks (km/km^2)	0.13	0.02 [3]	2010	etpc Porto Alegre, Trensurb
	Stock of cars and motorcycles (vehicles/person)	0.30	0.38 [3]	2008	Denatran
Waste	Share of waste collected and adequately disposed (%)	96.2	98.6 [3, e]	2008	Departamento Municipal de Limpeza Urbana (DMLU)
	Waste generated per person (kg/person/year)	465.0	344.6 [3]	2008	Departamento Municipal de Limpeza Urbana (DMLU); Fundação de Economia e Estatística
Water	Water consumption per person (litres per person per day)	264.3	313.0 [3]	2008	Departamento Municipal de Água e Esgotos; Fundação de Economia e Estatística
	Water system leakages (%)	34.6	28.6 [3]	2009	Departamento Municipal de Água e Esgotos
	Share of population with access to potable water (%)	97.5	100.0 [3]		Departamento Municipal de Água e Esgotos
Sanitation	Population with access to sanitation (%)	93.7	100.0 [3, e]	2000	Instituto Brasileiro de Geografia e Estatística
	Share of wastewater treated (%)	51.5	20.0 [3]	2009	DMAE
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	53.8 [3, e]	2009	PROAR
	Daily sulphur dioxide levels (ug/m^3)	11.4	1.9 [3, e]	2008	PROAR
	Daily suspended particulate matter levels (ug/m^3)	48.0	34.3 [3]	2009	ECCPHA

* Where data from different years were used only the year of the main indicator is listed, e EIU Estimate, 1) Based on Porto Alegre Metropolitan Region. Based on composition of energy sources used for electricity generation in Brazil, 2) Based on Porto Alegre Metropolitan Region. GDP data for 2007, 3) Based on City of Porto Alegre, 4) Based on Porto Alegre Metropolitan Region

Puebla_Mexico



Background indicators

Total population (million) [1]	2.6
Administrative area (km^2) [1]	2,223.0
GDP per person (current prices) (US$) [2, e]	6,535.2
Population density (persons/km^2) [1]	1,185.6
Temperature (24-hour average, annual) (°C) [3]	16.0

e) EIU estimate, 1) Based on Puebla-Tlaxcala Metropolitan Area, 2) Based on State of Puebla, 3) Based on Municipality of Puebla

Located in south-central Mexico, Puebla is the capital of the state of Puebla. With 2.6 million residents, it is the fourth most populous metropolitan area in the country, and 11th largest city in the Latin American Green City Index. The data for Puebla in the Index is a mix of figures from the metropolitan area, the municipality of Puebla and estimates based on statewide statistics. The city has a strong manufacturing presence, which is dominated by automobiles, autoparts and logistics. Despite this, Puebla has the sixth lowest income in the Index, at an estimated US$6,500 GDP per capita. As in other Mexican cities, air pollution is a substantial challenge in Puebla. The problem is compounded by the city's geographical setting: it is situated in a valley surrounded by mountains and the Trans-Mexican volcanic belt.

Despite its low income, Puebla ranks average in the Index overall. The city's placement is buoyed by a particularly strong performance in the waste category, where it ranks above average thanks to a high rate of waste collected and adequately disposed, and a low amount of waste generation. The city earns average ranks in most other categories, except for in energy and CO_2, and transport, where it drops to below average. Puebla's placement in these areas is a reflection of poor policy implementation in both clean energy and urban mass transport. When measured against the six other low-income cities (those with GDP per capita below US$8,000), Puebla has the lowest rate of electricity consumption per unit of GDP, and, along with Quito, the highest rate of waste collected and adequately disposed.

Energy and CO_2: Puebla is below average in energy and CO_2. Puebla produces an estimated 15% of its electricity from renewable energy sources, though due to a lack of local data, this percentage is estimated on the basis of national figures. The low contribution of renewables to the electricity mix results in a high rate of CO_2 emissions from electricity consumption, at an estimated 242 kg per person each year, compared to the 17-city average of 202 kg. However, Puebla does well on electricity consumption per unit of GDP, at an estimated 661 megajoules of electricity per US$1,000, below the Index average of 761 megajoules and the lowest amount among cities with similar incomes. Puebla's performance in this category is hindered by its clean energy policy and efforts to adopt a climate change action plan. Its poor performance in both areas is a result of policy being driven at the state and national rather than city level. However the city has a few local initiatives to reduce the environmental impact of energy consumption, including a plan to install solar panels in parks and to upgrade lighting on city streets (see "green initiatives" below).

Green initiatives: The State of Puebla is due to publish its "Mitigation Strategy to Adapt to Climate Change" in November 2010. The strategy will outline actions to curb carbon emissions and promote sustainable urban development. At the city level, officials have identified lighting as one of the key areas to improve energy efficiency and reduce electricity consumption. In 2008 Puebla launched a US$6.2 million programme to upgrade public lighting on city streets. Puebla also installed its first solar-powered public lightning in several major city parks. Furthermore, Puebla has installed infrastructure at its main landfill to flare methane, but the final phases of the project are still being planned, before it becomes operational.

Land use and buildings: Puebla ranks average for land use and buildings. The city boasts 303 square metres of green space per person, the fifth highest amount in the Index. In recent years Puebla has made a concerted effort to improve its parks and protect green spaces (see "green initiatives" below), which boosts its performance in the area of land use policies. The city has a code aimed at containing urban sprawl, and it protects environmentally-sensitive areas from development. It also scores full marks for having green standards for public buildings. However the city does not actively promote awareness about ways for residents to improve the energy efficiency of their homes and businesses. Its performance in this category is further hindered by its low population density. With just 1,900 inhabitants per square kilometre, Puebla falls considerably below the Index average of 4,500 persons.

Green initiatives: Puebla has two main initiatives aimed at protecting, preserving and restoring its green spaces: the "Urban Reforesting Programme" and the "Green City Programme". Since 2009 the city has invested more than US$7.3 million in these initiatives, creating more than 50 acres of green spaces and planting more than 37,700 trees. Puebla also joined forces with several major Mexican companies to substitute over 1 million incandescent light bulbs with energy-efficient LED bulbs in residences around the city. In addition, there is a national "Sustainable Light" plan to replace more than 45 million incandescent light bulbs in 11 million Mexican homes with energy-saving bulbs by 2012. The initiative will save an estimated 2.8 million tonnes of greenhouse gas emissions annually.

Transport: Puebla is below average in transport. It does not have a metro system and is the only city in the Index that lacks any form of superior transport (defined in the Index as transport that moves large numbers of passengers quickly in dedicated lanes, such as a metro, bus rapid transit or tram network). Overall, Puebla's mass transport network measures an estimated 5.1 km per square kilometre across the metropolitan area, which is just slightly longer than the 17-city average of 5.0 km. The transport system is dominated by an extensive bus network, but taxis also play an important role, and they contribute to traffic congestion. Puebla's stock of cars and motorcycles is 0.24 vehicles per person, a figure based on the municipality. This is just below the Index average 0.30 vehicles, but the second highest when measured against cities with similar incomes. Puebla receives only partial marks for its urban mass transport policy because it is driven by the state rather than local government. The city also lacks an integrated pricing system for its mass transport network. On the other hand, it has taken steps to reduce emissions from mass transport. Puebla is also one of a handful of cities in the Index that has no traffic-management system in place. The city does not have traffic light sequencing or a traffic information system, nor does it have dedicated delivery times for freight. Furthermore, the city also lacks congestion-reduction initiatives in the form of carpooling lanes, "no-car days" or park and ride systems.

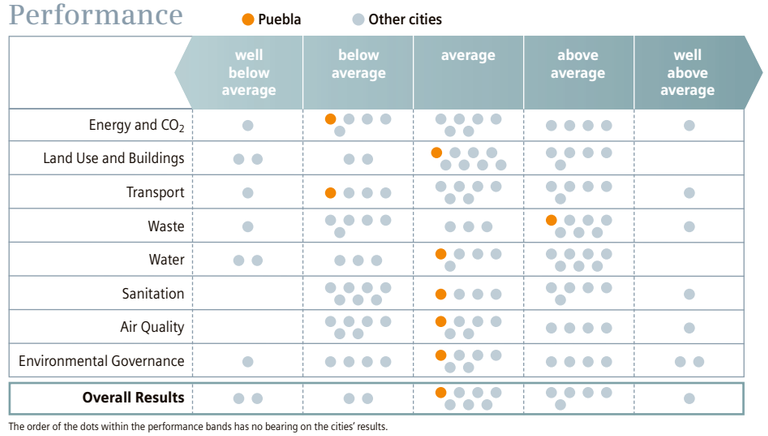
Green initiatives: Authorities are planning a "bus rapid transit" (BRT) system for Puebla, although time frames and targets have not been released publicly. The system would be modelled on a system implemented across Latin America, in which buses operate unimpeded in exclusive lanes throughout the city.

Waste: Puebla is above average in the waste category, its strongest performance in the Index. The city's strong placement is largely thanks to its comprehensive policies regarding waste collection and disposal. The city enforces strict environmental standards at its Chiltepec managed landfill and organizes separate collection and disposal of many forms of special waste, including: household hazardous waste, medical and infectious waste and chemical and pharmaceutical waste. Furthermore, Puebla has an integrated policy to encourage residents to reduce, re-use and recycle.

The city generates a relatively small amount of waste, at an estimated 310 kg per person per year compared to the Index average of 465 kg. And an estimated 100% of the waste produced in the city is collected and adequately disposed, though due to a lack of local data this estimate is based on state figures.

Green initiatives: In an effort to increase recycling rates in Puebla, a private initiative known as the "green wallet", was introduced this year.

Performance



The order of the dots within the performance bands has no bearing on the cities' results.





The programme promotes residents' participation in waste recycling and re-use through incentives and rewards. Residents get one point credited to their card for every kilogram of solid waste, including plastic, metal, glass, carton-tetra pak and electronic devices, they drop off at specific sites. Points can be exchanged for discounts and benefits in a variety of shops and institutions across the city. More than 3,000 cards have been distributed and more than 22 tonnes of waste have been collected so far in 2010.

Water: Puebla ranks average in the water category. Today, 99% of the residents of the municipality of Puebla have access to potable water, according to official figures. But the city's water supply comes from some of the most over-exploited aquifers in the country, and experts expect that the region will experience severe water shortages by 2016. Residents in the municipality consume an average of 203 litres per person each day, compared to the Index average of 264 litres. However this relatively low level of water consumption is likely more a consequence of the limited water supply than policy aimed at rational usage. On the other hand, the municipal waterworks company, SOAPAP, does promote public awareness around efficient water consumption. The city also performs well in the area of water quality policies thanks to the careful monitoring of its water supply and enforcing of water quality standards. Additionally, Puebla records a comparatively low rate of system leakages, which at 25%, are the second lowest in the Index and well below the 17-city average of 35%.

Green initiatives: In an effort to reduce system leakages and improve supply, SOAPAP has invested more than US$30 million since 2009 in infrastructure works, including repairing tanks and pumps, constructing a new 5,500-cubic-metre storage tank, and drilling 10 new water wells.

Sanitation: Puebla is average in the sanitation category. Its performance is hindered by a below average percentage of residents with access to sanitation services. Only an estimated 80% of Puebla's population has access to sanitation, the lowest in the Index and considerably below the 17-city average of 94%. Furthermore, SOAPAP treats only 43% of the city's wastewater, which is below the Index average of 52%. However, the city's sanitation rank is boosted by its extensive policies, which suggests the city is addressing the problem. SOAPAP has, in recent years, invested heavily in expanding wastewater treatment and sanitation services. The city has strict standards for wastewater treatment and regularly monitors its facilities. It also conducts outreach programmes to raise awareness about the safe and efficient use of sanitation systems.

Green initiatives: SOAPAP has several programmes under way to expand access to sanitation services, particularly in low-income neighbourhoods, and to increase wastewater treatment. For example, it has invested US$400,000 to lay 12 km of pipes to connect several low-income communities previously without access to sanitation services.

Air quality: Puebla ranks average for air quality. Transport contributes over 80% of the city's air pollutants, and the problem is compounded by its location. Puebla is situated in a valley surrounded by mountains and volcanoes, which limits dispersion. The municipality records an average daily concentration of sulphur dioxide of 15 micrograms per cubic metre versus a 17-city average of 11 micrograms. Nitrogen dioxide levels, at 40 micrograms, are just slightly above the Index average of 38 micrograms, but particulate matter concentrations, at 31 micrograms per cubic metre, fall below the Index average of 48 micrograms. Puebla has four monitoring stations, which are operated by the State Environmental Monitoring System. Air pollution levels are publicised via radio, television, newspapers and on the organisation's website.

Green initiatives: In an effort to reduce air pollution, the Puebla state Secretary of Environment and Natural Resources has outlined a series of air quality initiatives for the Puebla metropolitan region. These include automated industrial emissions control equipment in factories, the reduction of gas leaks in households, and the adoption of vapour recovery equipment at gas stations, among others. While the state has required vehicle emissions tests since 1993, the state agency also calls for the programme to be strengthened, through campaigns to raise awareness about the requirement and better surveillance of vehicles that fail to comply with the testing regulations.

Environmental governance: Puebla is average in environmental governance. While the state's Secretary of Environment and Natural Resources is active in driving environmental policy, the municipality of Puebla has its own Environmental Protection and Sustainable Development Agency (see "green initiatives" below). The agency promotes citizen and other stakeholder participation, further boosting its score. On the other hand, while many cities in the Index have conducted baseline environmental reviews covering the areas of water, sanitation, waste, air quality, transport, land use, human settlements, energy and climate change, Puebla has failed to do so, hindering its overall placement in this category.

Green initiatives: Puebla's Environmental Protection and Sustainable Development Agency was established as a decentralised agency that actively engages with and involves citizens, NGOs and the private sector. It also has an education and information department, which promotes public awareness of environmental issues through research, media campaigns and school outreach programmes.

Local NGOs such as Puebla Metropolitana, and Puebla Verde, are also working to enhance public awareness through public events and information campaigns. In addition, these organisations are lobbying the city administration to implement sustainable environmental policies.

Quantitative indicators: Puebla

		Average	Puebla	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	242.0 [1, e]	2008	EIU estimate; Instituto Nacional de Estadística y Geografía; International Energy Agency; Consejo Nacional de Población; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	661.0 [2, e]	2008	Instituto Nacional de Estadística y Geografía; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km²)	4,503.0	1,185.6 [3]	2009	Consejo Nacional de Población
	Green spaces per person (m²/person)	254.6	303.3 [4, e]	2009	Instituto Nacional de Estadística y Geografía; Consejo Nacional de Población
Transport	Length of mass transport network (km/km²)	5.0	5.1 [5, e]	2008	Secretaría de Comunicaciones y Transporte; Consejo Nacional de Población
	Superior public transport networks (km/km²)	0.13	0.00 [6]	2010	N/A
	Stock of cars and motorcycles (vehicles/person)	0.30	0.24 [7]	2008	INEGI
Waste	Share of waste collected and adequately disposed (%)	96.2	100.0 [2, e]	2008	Secretaría de medio ambiente y recursos naturales
	Waste generated per person (kg/person/year)	465.0	310.2 [2, e]	2008	Secretaría de medio ambiente y recursos naturales; Consejo Nacional de Población
Water	Water consumption per person (litres per person per day)	264.3	203.0 [7]	2009	Inf. Básica 2009 Org. Operadores/UDAPI/SOAPAP.
	Water system leakages (%)	34.6	25.1 [7]	2009	Inf. Básica 2009 Org. Operadores/UDAPI/SOAPAP.
	Share of population with access to potable water (%)	97.5	98.5 [7]	2009	Inf. Básica 2009 Org. Operadores/UDAPI/SOAPAP.
Sanitation	Population with access to sanitation (%)	93.7	79.6 [8, e]	2007	Secretaría de medio ambiente y recursos naturales; Consejo Nacional de Población
	Share of wastewater treated (%)	51.5	42.7 [2]	2008	Comisión Nacional del Agua
Air Quality	Daily nitrogen dioxide levels (ug/m³)	37.8	39.5 [7]	2009	Secretaría del Medio Ambiente y Recursos Naturales del Estado de Puebla
	Daily sulphur dioxide levels (ug/m³)	11.4	14.9 [7]	2009	Secretaría del Medio Ambiente y Recursos Naturales del Estado de Puebla
	Daily suspended particulate matter levels (ug/m³)	48.0	30.6 [7]	2009	Secretaría del Medio Ambiente y Recursos Naturales del Estado de Puebla

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on State of Puebla. Based on composition of energy sources used in electricity generation in Mexico, 2) Based on State of Puebla, 3) Based on Puebla-Tlaxcala Metropolitan Area, 4) Based on green space figures for 2005 in Puebla-Tlaxcala metropolitan zone, 5) Based on Puebla Metropolitan region, 6) Such a system does not operate in Puebla, 7) Based on Municipality of Puebla, 8) Based on State of Puebla. Total population with access to sewerage.

Quito_Ecuador

Background indicators

Total population (million)	2.1
Administrative area (km^2)	4,204.0
GDP per person (current prices) (US$) [e]	2,976.5
Population density (persons/km^2)	504.9
Temperature (24-hour average, annual) (°C)	14.0

Based on Quito Metropolitan District, e) EIU estimate

Quito is the capital of Ecuador and its second most populous city. With 2.1 million residents in the metropolitan area, it is one of the smaller cities in the Latin American Green City Index. The city is set in a high valley in north-central Ecuador, flanked by active volcanoes. Apart from being the country's administrative hub, Quito is also home to the headquarters of the majority of Ecuador's largest companies. Its economy is dominated by services, including wholesale and retail, financial services and tourism. Manufacturing, particularly auto-parts production, is also present. Quito accounts for around one-fifth of Ecuador's total GDP. The city's GDP per capita, at US$3,000 is the lowest in the Index. The data for Quito in the Index is based on the metropolitan area, with the exception of the figure for the length of the transport network, which is based on the urban area.

Quito is ranked average overall in the Index. The city's best results are for the transport, waste and air quality categories, where it ranks above average. In air quality, particularly, the city is marked up for having low concentrations of the three pollutants measured in this report, and a well developed clean air policy. The city is average in the energy and CO_2, water and environmental governance categories. Quito has room for improvement in land use and buildings and sanitation, where it ranks below average. It is, for example, one of only two cities in the Index, along with Buenos Aires, with no wastewater treatment facilities. However, Quito has the most green spaces in the Index, and there is also increasing interest within the city to implement environmental policies at the municipal level, but these have to compete against financial and administrative challenges.

Energy and CO_2: Quito ranks average for energy and CO_2. The city has the highest rate of electricity consumption in the Index, at 1,400 megajoules per US$1,000 GDP, well above the 17-city average of 761 megajoules. It achieves a middling position in the area of CO_2 emissions from electricity. Quito emits an estimated 151 kg of CO_2 per person from electricity consumption each year, below the Index average of 202 kg. According to city officials, road transport accounts for over half of the total CO_2 emissions. Like many cities in Latin America, Quito has seen a rapid rise of private car ownership in the past decade. While 52% of Quito's electricity is generated by hydropower, many other cities in the Index have an even higher share of renewables in electricity production. But Quito established a small-scale waste-to-energy project in 2007 to produce electricity from captured methane gases at its Zambiza landfill, which supplies 3,000 households with electricity. The city does not appear to be making other larger-scale investments in clean energy, which hinders its score in the area of clean energy policies. However Quito places near the top of the Index for its climate change action plan. The city monitors its CO_2 emissions and recently adopted a strategy aimed at reducing them (see "green initiatives" below). It is also marked up for having joined international covenants with emissions reduction goals.

Green initiatives: In 2009 the city adopted its local Climate Change Strategy to limit carbon emissions and reduce the environmental impact of energy consumption. The strategy includes improving greenhouse gas monitoring, strengthening oversight on energy and CO_2 issues, establishing public information campaigns, and promoting concrete CO_2 abatement policies. Abatement policies include blocking urban deforestation and promoting greenhouse gas reduction schemes at landfills.

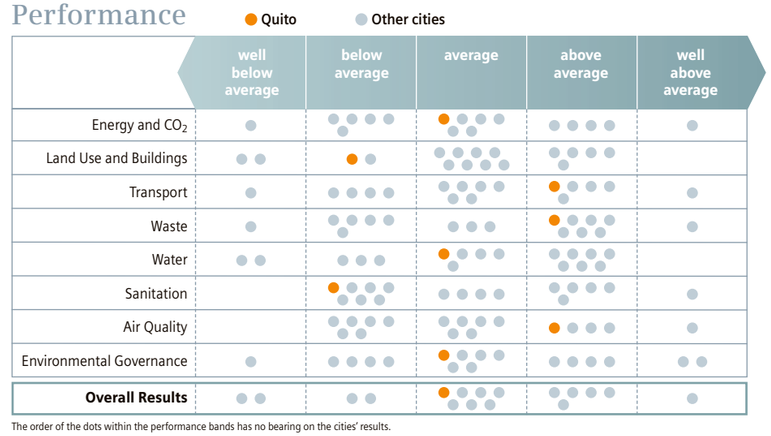
Land use and buildings: Quito is below average in land use and buildings. The city is marked up for its abundant green spaces, which include urban parks, forested areas and 25 nature reserves located within the municipality's administrative area. With almost 1,500 square metres of green spaces per person, Quito has the most in the entire Index. Its large amount of green spaces is in part due to the administrative boundaries of the city, since almost 80% of territory under the Quito City Council jurisdiction is considered non-urban. But the city has also been proactive over the last two decades in creating parks in undeveloped areas in the urban centre. Quito's performance in the overall category is, however, weighed down by a low population density, at just over 500 inhabitants per square kilometre versus an Index average of 4,500. Quito also scores poorly for its eco-buildings policies, which are lacking an environmental code for new buildings or any substantial incentives and awareness campaigns to motivate businesses and households to lower the energy consumption of buildings. Except for small energy-saving schemes in place since 2008, such as using LED light bulbs in city offices, there are no green standards for public buildings in place.

Green initiatives: Quito has an ambitious plan to protect and reforest its green spaces. The "Forestation and Reforestation Project" began in 2001, and by 2008 the programme had led to the planting of about 6 million trees, mostly native species. The latest high visibility city initiative is to employ city workers and volunteers to replant 300,000 trees lost in forest fires during summer 2009. In 2006, the city ran a tree-planting competition with neighbourhood groups in 145 districts. The "My Neighbourhood is Dressed in Trees" competition led to the planting and maintenance of 140,000 trees.

Transport: Quito ranks above average for transport. Quito started to focus on mass transport policies only in the late 1990s. The earliest project was a system of electric and diesel powered buses running on exclusive lanes, serving the most populated areas. Currently there are three dedicated bus lanes crossing the city from north to south, and transporting over 450,000 people per day. Quito's mass transport network in its urban area is an estimated 5.5 km per square kilometre, just above the Index average of 5 km per square kilometre. There are plans to expand it, but progress has been slow due to the city's complicated geography — peripheral neighbourhoods are often located in adjacent valleys — and to financing constraints. The city benefits in the Index from having the second-lowest stock of cars and motorcycles, at 0.12 per person, versus the average of 0.3 vehicles per person.

Green initiatives: Quito has a comprehensive congestion reduction policy to limit the effects of rising car ownership. In addition to restricting

Performance



The order of the dots within the performance bands has no bearing on the cities' results.





parking in some core urban areas and building exclusive cycling lanes, officials close the city centre to cars on weekends. Moreover, in 2010 Quito became the first city in Ecuador to restrict the number of vehicles coming into the city during peak hours on weekdays. The scheme is based on license plate numbers, which is similar to a measure in place in São Paulo. The city says it has reduced traffic at peak times by as much as 30% in certain areas.

Waste: Quito ranks above average in the waste category. The publicly owned metropolitan waste company, EMASEO, collects and adequately disposes of an estimated 100% of the city's waste. Quito's score is further bolstered by the relatively small amount of waste it produces. The city generates 300 kg per person per year, one of the lowest rates in the Index, and considerably below the 17-city average of 465 kg. In the past decade Quito has taken an active role in managing waste, improving collection and closing open-air dumps. The city's new landfill, located 45 km away from the urban centre, accepts hazardous, medical and infectious waste, in addition to household trash, and the city imposes strict environmental standards on the facility. So far, Quito lacks comprehensive recycling and re-use programmes, though its record here will likely improve in the coming years (see "green initiatives" below).

Green initiatives: Although the city has been slow to provide recycling services, it has plans to set up 48 central collection points between 2010 and 2012 for paper, plastic and glass bottles. In association with private businesses, the city also expects to establish 1,000 collection points for hazardous household waste, including batteries.

Water: Quito ranks average in the water category. It is one of the four cities in the Index which provides potable water to all of its residents, according to official figures. The city gets most of its fresh water from nearby mountain streams and glaciers, as well as from a few underground aquifers. Although water rationing is uncommon, Quito can suffer from low rainfall during the dry season, from June to October, which puts pressure on the city's reserves. Water consumption of 197 litres per person per day is lower than the 17-city average of 264 litres, and the water leakage rate, at 33%, is also just below the average of 35%. The city performs well in the area of water sustainability policies thanks to public awareness campaigns which encourage water conservation. On the other hand, Quito is the only city in the Index failing to enforce water pollution standards on local industry.

Green initiatives: A new US$4 million water treatment plant to the northwest of the city is due to be finished in June 2011, and will supply potable water to around 480,000 residents. The plant will also relieve supply pressures for the city's planned new international airport, which will be located nearby and expected to open at the end of 2011.

Sanitation: Quito ranks below average in the sanitation category. Even so, Quito still provides sanitation services to an estimated 97% of its residents, according to official figures, which is better than the Index average of 94%. The city is marked down, however, because it lacks wastewater treatment facilities. Efforts are under way to improve monitoring and creating a wastewater treatment strategy, but for the moment Quito's residential and industrial wastewater is dumped, untreated, into the city's two main rivers, Machángara and San Pedro.

Green initiatives: During the rainy season the city's sewage system often collapses, causing major flooding. To address this problem the city has unveiled a plan to build two back-up water collection facilities to capture excessive rainfall and avoid flooding. These facilities are set to be completed by mid-2011.

Air quality: Quito is above average for air quality. The city's placement in this category is largely due to very low average daily concentrations of the three pollutants measured in the Index. For example, the city records nitrogen dioxide concentrations at 26 micrograms per cubic metre, versus a 17-city average of 38 micrograms. And sulphur dioxide levels are also low, at 9 micrograms per cubic metre, compared to the Index average of 11 micrograms. This reflects the city's small manufacturing base and strict policies on vehicle emissions. Furthermore, Quito's below-average daily concentration of particulate matter, at 30 micrograms per cubic metre compared to a 17-city average of 48 micrograms, stems in part from its temperate weather, which substantially reduces the need for heating devices. The city also does well in informing its citizens about the dangers of air pollution. And its efficient, 24-hour air quality monitoring, which relies on automatic equipment in remote stations around the metropolitan area, further bolsters its score.

Green initiatives: In 2003 Quito became the first city in Ecuador and in the Andean community of nations, which includes Ecuador, Peru, Colombia and Venezuela, to require automobiles to pass emissions tests when they are registered. The tests happen every year for private cars and every two years for "public purpose" vehicles, such as buses and taxis. If the automobile fails, the owner must pay for upgrades to pass the test and register the vehicle. The city estimates that carbon monoxide levels have dropped 25% to 30% since the programme started.

Environmental governance: Quito ranks average for environmental governance. Quito's environmental secretariat coordinates environmental policies, and provides residents with a central contact point for information on environmental projects. In 2004 Ecuador's Ministry of the Environment granted the city environmental planning capacities and legal authority to draft environmental legislation. Quito has also made efforts to improve transparency and promote greater involvement of citizens and stakeholders in decision-making. Major projects that have an environmental impact, in particular in the areas of water, air, transportation and waste, require public participation. In 2010, for example, the municipality developed a comprehensive transport and congestion abatement strategy in collaboration with different interest groups, such as transport representatives, private-sector associations and residents. However, the city's performance in the Index is weakened by slow progress on consistent and timely environmental reviews and monitoring.

Quantitative indicators: Quito

		Average	Quito	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	151.2 [1, e]	2009	EIU estimate; Empresa Eléctrica de Quito; International Energy Agency; Insituto Nacional de Estadística y Censos; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	1,426.8 [1, e]	2009	EIU estimate; Empresa Eléctrica de Quito; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	504.9 [2]	2009	Insituto Nacional de Estadística y Censos; Programa de Educación para la Prefectura del Pichincha
	Green spaces per person (m^2/person)	254.6	1,494.7 [2]	2009	Mapa de Uso de Suelo y Cobertura Vegetal del Distrito Metropolitano de Quito; Insituto Nacional de Estadística y Censos
Transport	Length of mass transport network (km/km^2)	5.0	5.4 [3, e]	2009	Empresa Metropolitana de Movilidad y Obras Públicas; Programa de Educación para la Prefectura del Pichincha
	Superior public transport networks (km/km^2)	0.13	0.15 [3, e]	2010	Empresa Metropolitana de Movilidad y Obras Públicas
	Stock of cars and motorcycles (vehicles/person)	0.30	0.12 [4]	2009	Corporacion Municipal para el Mejoramiento del Aire de Quito, "Inventario de Emisiones 2007" and "Informe Calidad del Aire 2009"; Corporacion Municipal para el Mejoramiento del Aire de Quito, "Inventario de Emisiones 2007" and "Informe Calidad del Aire 2"
Waste	Share of waste collected and adequately disposed (%)	96.2	100.0 [2, e]	2009	Empresa Pública Metropolitana de Aseo; Secretaría de Ambiente/SIAD
	Waste generated per person (kg/person/year)	465.0	300.3 [2]	2009	Empresa Pública Metropolitana de Aseo; Insituto Nacional de Estadística y Censos
Water	Water consumption per person (litres per person per day)	264.3	197.2 [2]	2009	Empresa Metropolitana de Alcantarillado y Agua Potable; Insituto Nacional de Estadística y Censos
	Water system leakages (%)	34.6	32.7 [2]	2009	Empresa Metropolitana de Alcantarillado y Agua Potable
	Share of population with access to potable water (%)	97.5	100.0 [2]	2009	Empresa Metropolitana de Alcantarillado y Agua Potable; Insituto Nacional de Estadística y Censos
Sanitation	Population with access to sanitation (%)	93.7	96.7 [5, e]	2009	Empresa Metropolitana de Alcantarillado y Agua Potable; Insituto Nacional de Estadística y Censos
	Share of wastewater treated (%)	51.5	0.0 [6]	2010	Municipio del Distrito Metropolitano de Quito
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	25.9 [2]	2008	Corporación Para el Mejoramiento del Aire de Quito
	Daily sulphur dioxide levels (ug/m^3)	11.4	8.7 [2]	2008	Corporación Para el Mejoramiento del Aire de Quito
	Daily suspended particulate matter levels (ug/m^3)	48.0	30.3 [2]	2008	Corporación Para el Mejoramiento del Aire de Quito

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Quito Metropolitan District. Based on composition of energy sources used in electricity generation in Ecuador, 2) Based on Quito Metropolitan District 3) Based on the urban area of Quito, 4) Based on Quito, 5) Based on Quito Metropolitan District. Total population with access to sewerage, 6) Based on Quito Metropolitan District. Confirmation from Municipio del Distrito Metropolitano de Quito that currently no wastewater treatment plants exist in Quito. These are foreseen for the year 2012, 7) Based on Quito Metropolitan District GDP figures for 2004 and national GDP growth rates

Rio de Janeiro_Brazil

With 12.3 million residents, Rio de Janeiro is the second most populous metropolitan area in Brazil. Just over half of its residents live within the Rio city limits, about 6.4 million, making it the sixth most populous city in the Latin American Green City Index. All of the figures included in the Index are based on the city proper of Rio de Janeiro. Together with the wider metropolitan region, Rio generates just over 5% of Brazil's GDP; it is the second largest economy in the country, behind São Paulo. The city's commercial activities are largely dominated by tourism and services. Brazil's oil industry is based in Rio, as are the country's biggest mining company and one of the most important television networks. Recently the city has received a great influx of investments ahead of a series of high-profile events, including the UN Conference on Sustainable Development in 2012, the World Cup in 2014 and the 2016 Olympic Games. Rio is therefore in a unique position in the Index to greatly improve its urban development and environmental performance over the coming years. Investments are predominantly being made in infrastructure to accommodate an expected heavy inflow of visitors.

Background indicators

Total population (million)	6.2
Administrative area (km^2)	1,182.0
GDP per person (current prices) (US$) [e]	11,580.8
Population density (persons/km^2)	5,234.1
Temperature (24-hour average, annual) (°C)	25.0

Based on City of Rio de Janeiro, e) EIU estimate

Rio ranks above average overall in the Latin American Green City Index. The city's best placement is in the area of environmental governance, where, with Mexico City, it ranks well above average. Its impressive performance in this category is thanks to a robust record on environmental monitoring and environmental management. Rio also performs well in the energy and CO_2, and land use and buildings categories, emerging above average. The city boasts a strong clean energy policy and strictly regulates environmental standards for the construction of new buildings. Rio de Janeiro receives average ranks in the areas of transport, waste, sanitation and air quality. Its overall score is constrained, however, by a below average placement in the water category, which is due partly to having the highest rate of water system leakages in the Index. Rio's performance compares favourably when measured against the seven cities of similar incomes (those with a GDP per capita between US$8,000 and US$16,000). It is one of three mid-income cities that ranks above average overall, and has the second lowest stock of cars and motorcycles among the same peer group.

Energy and CO_2: Rio de Janeiro ranks above average in energy and CO_2. The city's performance in this category is largely due to its clean energy policies and its clear goals for the reduction of CO_2 emissions outlined in the city's climate change action plan (see "green initiatives" below). In 1988 Rio became the first city in Latin America to publish an inventory of CO_2 emissions. The city emits an estimated 73 kg of CO_2 per person from electricity usage, below the 17-city average of 202 kg. This relatively low level of CO_2 emissions is a result of a very high contribution of renewable energy to the city's electricity production. Eighty-eight percent of Rio's electricity comes from renewable sources, primarily hydropower. The city consumes 678 megajoules of electricity per US$1,000 of GDP, which is below the Index average of 761 megajoules.

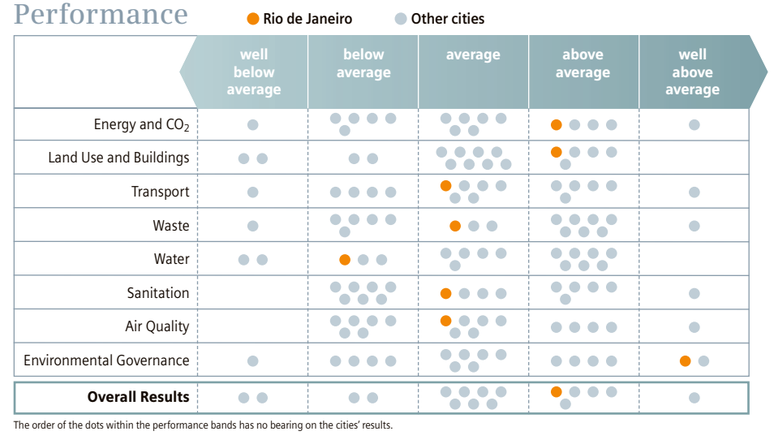
Green initiatives: In 2009 the city unveiled its comprehensive climate change programme, "Rio Sustainable". The plan foresees an 8% reduction — from 2005 levels — in the emission of CO_2 and other greenhouse gases in the city by 2012, a 16% reduction by 2016 and a 20% reduction by 2020. As part of the programme, the city conducted a full review of CO_2 emissions in collaboration with the federal university of Rio de Janeiro. The plan outlines a number of ways the city will meet its reduction targets, including the mitigation of emissions from transport and waste, the installation of energy-efficient LED lights in municipal buildings and street lights, and public awareness initiatives, among other programmes.

Land use and buildings: Rio ranks above average in the land use and buildings category. The city scores particularly well thanks to its very ambitious land use and eco-buildings policies, which are among the best in the Index. Moreover, the city, which has two of the world's largest urban forests, the Pedra Branca Natural Park and the Tijuca Forest, boasts 58 square metres of green space per person. Although the latest available data for Rio dates back to 2001, while the data for other cities is more current, this is relatively high by Index standards. The city strives to maintain its green spaces, and boasts a strict set of laws aimed at protecting these areas from development.

Green initiatives: Ahead of the 2016 Olympic Games, Rio is redeveloping the residential and commercial areas around its port. The US$200 million project involves refurbishing historical buildings, improving transport access and sanitation services, and creating cycling lanes and green spaces, including a green corridor lined by 11,000 trees. Around 30,000 people currently live in the run-down port area, and the city estimates that the neighbourhood will be home to more than 100,000 residents when the project is finished in 2016. Additionally, Rio's climate change action plan calls for the reforestation of protected areas. To achieve this, the city is investing US$15 million to plant 1,500 hectares of trees through 2012.

Transport: Rio de Janeiro ranks average in the transport category. Rio's public transport system consists of both buses and a metro, and is the longest in the Index, measuring an estimated 8.7 km per square kilometre of city territory — considerably longer than the 17-city average of 5 km per square kilometre. Its superior transport networks (defined in the Index as transport that moves large numbers of passengers quickly in dedicated lanes, such as a metro, bus rapid transit or trams) measure 0.12 km per square kilometre of city territory, just slightly longer than the Index average of 0.10 km. Rio's metro runs along two lines, extending a total of 47 km, which leaves large portions of the city served only by buses. The city's third metro line is currently under construction, scheduled for completion by 2016 (see "green initiatives" below). Rio's climate change action plan delineates goals for expansion of mass transport services, and further plans are laid out by the state transportation secretariat. According to official sources the city has 0.26 vehicles per inhabitant, which is just less than the Index average of 0.30 vehicles. This is the lowest ratio among the

Performance



The order of the dots within the performance bands has no bearing on the cities' results.




Brazilian cities in the Index. Nonetheless Rio continues to suffer from endemic traffic problems, and the city has been slow to implement congestion reduction policies. Officials say they are creating limited vehicle zones, but other measures such as "no-car days" or carpooling lanes are missing so far.

Green initiatives: The city and state transportation departments are implementing an ambitious range of projects to improve public transport ahead of the World Cup and Olympic games. The state is investing US$678 million to double the capacity of the two existing metro lines to 1.1 million passengers a day. In addition to purchasing new trains, two new metro stations are being built and existing lines extended. In 2010, the city was scheduled to start building its US$2.9 billion third metro line ("Line 4") to serve Rio's western region. The state transportation secretariat says the line will have the capacity for 230,000 passengers per day. Furthermore, by 2016 the city will have four major bus corridors, modelled after Curitiba's "bus rapid transit" (BRT) system. Rio also plans to extend cycling lanes from 140 km in 2009 to 340 km in 2012.

Waste: Rio de Janeiro ranks average in the waste category. The city generates 525 kg of waste per person per year, which is above the 17-city average of 465 kg per person per year, although it collects and disposes of nearly all of it. The city's waste is disposed in the Gramacho landfill, which is being replaced in 2011 (see "green initiatives" below).

The city earns middling scores for its policies on waste collection and disposal, and recycling and re-use. While Rio does enforce environmental standards for its landfills, its failure to dispose of household hazardous waste and chemical and pharmaceutical waste separately from regular municipal waste holds it back. Its performance in this area will likely improve, however, following the adoption of a state initiative to improve waste collection and disposal, and improve landfill standards across the entire state of Rio de Janeiro. The programme will provide municipalities a total of US$88 million each year to eradicate all of the state's open air dumps and ensure that waste is properly disposed. It also places emphasis on recycling and composting.

Green initiatives: Rio's Gramacho landfill will be closed in 2011 and replaced by a new one currently under construction at Seropédica. The US$47 million state-of-the-art facility will cut CO_2 emissions by 1.4 million tonnes each year by capturing methane gasses, and will also have the capacity to generate biogas.

Water: Rio de Janeiro ranks below average in the water category, largely due to high water system leakages and an above-average water consumption rate. Rio loses 58% of its water to leakages, the highest percentage in the Index and well above the already high 17-city average of 35%. The state waterworks company, Nova Cedae, estimates that 15% of the city's total water supply is lost to illegal connections in both informal settlements and large apartment blocks, and is investing heavily to expand water services in order to tackle this problem (see "green initiatives" below). Rio consumes 301 litres of water per person per day, compared to the Index average of 264 litres. Although the city does promote public awareness about efficient water consumption and encourage rational use with water tariffs, Rio earns only partial points in the area of water efficiency policy, because it lacks separate pipes for non-drinking water and does not recycle graywater. According to official data, nearly all of Rio's residents have access to potable water, and nearly 80% of this is supplied by the world's biggest water treatment plant, Guandu, a facility that produces 43,000 litres of potable water per second.

Green initiatives: Nova Cedae, the state waterworks company, is investing US$58 million per year to stop illegal connections to the city's water supply. The company also now supplies potable water to 111 of the city's informal settlements to reduce the need to connect illegally. Additionally, schools in Rio teach water conservation as part of the curriculum.

Sanitation: Rio de Janeiro ranks average in the sanitation category. An estimated 83% of Rio's residents have access to sanitation, which is one of the lowest rates in the Index and well below the average of 94%. In contrast, Rio treats an estimated 85% of its collected wastewater, considerably more than the Index average of 52%. New treatment facilities currently under construction will further improve Rio's performance. Rio's sanitation performance is also weighed down by a poor score for sanitation policies, primarily because it lacks a plan to promote environmentally sustainable sanitation services. The city fares better, however, in terms of wastewater treatment standards.

Green initiatives: Rio's largest initiative to improve sanitation, ongoing since 1994, is the Guanabara Bay Depollution Programme. At a cost of US$793 million, the programme involves the construction of 1,248 km of effluent collectors, 28 km of drains, eight wastewater treatment facilities and the expansion of sanitation services to 139,000 households. The programme is designed to address all aspects of the bay's environmental performance. It also includes works to improve flood control and the supply of potable water and waste collection for residents who live near the bay, though 90% of the budget has been allocated to sanitation.

Air quality: Rio de Janeiro ranks average in the air quality category. The city's traffic-choked streets are the main source of pollution, followed by pollution derived from municipal waste. Rio's rugged topography prevents the dispersion of pollutants and high temperatures exacerbate the problem. Rio city has the highest incidence of nitrogen dioxide in the Index, with average daily levels at 58 micrograms per cubic metre, versus the 17-city average of 38 micrograms. However, thanks to Brazil's extensive ethanol programme, levels of sulphur dioxide are much lower at 4 micrograms per cubic metre, well below the Index average of 11 micrograms. Levels of particulate matter are also low, at 24 micrograms per cubic metre versus the Index average of 48 micrograms.

Green initiatives: The state of Rio de Janeiro requires yearly emissions tests for all licensed cars, and vehicles that exceed emissions limits are not allowed on state roads. Furthermore, the city is testing 15 so-called B20 buses that run on diesel with a blend of 20% biodiesel. The city aims to have 8,500 B20 buses in operation by 2016. Authorities say the full fleet of B20 buses will reduce CO2 emissions by 148,000 tonnes and particulate matter by 3,300 tonnes per year.

Environmental governance: Rio ranks well above average for environmental governance, its best placement in the Index. This is mainly because of the efficient network of municipal and state-level institutions dedicated to environmental monitoring, management and enforcement. The city has a strong record for monitoring air, water, waste, sanitation, transport, land use, human settlements, energy and green spaces, including urban forests. Rio also engages residents and NGOs on environmental projects. Non-governmental stakeholders have, for example, played a significant role in drafting plans for infrastructure development ahead of the 2016 Olympics. Rio has a designated environmental authority that oversees and implements all aspects of environmental policy. The authority collaborates closely with other city departments, including housing, transportation, science and technology, and urban planning.

Quantitative indicators: Rio de Janeiro

		Average	Rio de Janeiro	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	73.0 [1, e]	2009	EIU estimate; Light; International Energy Agency; Instituto Brasileiro de Geografia e Estatística; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	677.8 [1]	2007	Light; Instituto Brasileiro de Geografia e Estatística; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	5,234.1 [1]	2009	Instituto Brasileiro de Geografia e Estatística
	Green spaces per person (m^2/person)	254.6	58.0 [1]	2001	Secretaría Municipal de Meio Ambiente
Transport	Length of mass transport network (km/km^2)	5.0	8.6 [1]	2009	Secretaría de Transportes; MetroRio; Confederação Nacional do Transporte; Instituto Brasileiro de Geografia e Estatística
	Superior public transport networks (km/km^2)	0.13	0.12 [1]	2010	Secretaria dos Transportes Metropolitanos
	Stock of cars and motorcycles (vehicles/person)	0.30	0.26 [1]	2010	Denatran
Waste	Share of waste collected and adequately disposed (%)	96.2	98.6 [1, e]	2008	Secretaría Municipal de Meio Ambiente; Companhia Municipal de Limpeza Urbana
	Waste generated per person (kg/person/year)	465.0	525.2 [1]	2008	Secretaría Municipal de Meio Ambiente; Instituto Brasileiro de Geografia e Estatística
Water	Water consumption per person (litres per person per day)	264.3	301.3 [1]	2008	Sistema Nacional de Informações sobre Saneamento;Instituto Brasileiro de Geografia e Estatística
	Water system leakages (%)	34.6	57.7 [1]	2008	Sistema Nacional de Informações sobre Saneamento
	Share of population with access to potable water (%)	97.5	98.4 [1]	2007	Instituto Brasileiro de Geografia e Estatística
Sanitation	Population with access to sanitation (%)	93.7	83.4 [2, e]	2007	Instituto Brasileiro de Geografia e Estatística
	Share of wastewater treated (%)	51.5	85.3 [1, e]	2008	Sistema Nacional de Informações sobre Saneamento
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	57.7 [1]	2009	Instituto Estadual do Ambiente
	Daily sulphur dioxide levels (ug/m^3)	11.4	3.5 [1]	2009	Instituto Estadual do Ambiente
	Daily suspended particulate matter levels (ug/m^3)	48.0	24.0 [1]	2009	Instituto Estadual do Ambiente

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on City of Rio de Janeiro, 2) Based on City of Rio de Janeiro. Total population with access to sewage.

Santiago_Chile

Background indicators

Total population (million)	6.8
Administrative area (km²)	15,403.2
GDP per person (current prices) (US$)	7,721.1
Population density (persons/km²) [1]	10,920.7
Temperature (24-hour average, annual) (°C)	14.0

Based on Santiago Metropolitan Area,
1) Based on Gran Santiago

Santiago is Chile's administrative and financial capital, and the country's most populous city, with 6.8 million residents in the metropolitan area. With a few exceptions noted below, all data included in the Latin American Green City Index are based on the Santiago metropolitan region. The region is a booming financial centre, generating about two-fifths of Chile's economic output. The city serves as the Latin American hub for many multinational companies, as well as the base for most Chilean conglomerates. It is also home to some of the region's most modern retail centres. City administration across the metropolitan area is divided into 52 "communes", each with its own mayor. An "Intendant", appointed directly by Chile's president, heads up the metropolitan regional government, which is responsible for harmonising multiple local and national policies on the environment and other municipal issues.

Santiago ranks average overall in the Index. Its best result is in the transport category, where it is the only city to rank well above average. Santiago's score in this category is bolstered by a substantial overhaul and influx of investment in the transport network, and well-developed policies in this area. Santiago also places above average in the areas of waste, water and sanitation, thanks largely to its policies aimed at improving services and reducing environmental impact. The city receives average ranks in land use and buildings, air quality and environmental governance. The city has the most room for improvement in the energy and CO_2 category, where it places well below average, due to its high level of electricity consumption and CO_2 emissions from electricity.

Energy and CO_2: Santiago ranks well below average for energy and CO_2. The city has the second highest rate of electricity consumption compared to its economic output among the 17 cities, at 1,200 megajoules per US$1,000 of GDP, which is considerably more than the average of 761 megajoules. Santiago also has higher-than-average CO_2 emissions from electricity consumption, at an estimated 463 kg per person per year, compared with the average of 202 kg, although it should be noted that Santiago's figure is from 2005. Many of Santiago's policies regarding energy and climate change are only partial. For example, it lacks a comprehensive strategy to reduce the environmental impact of energy consumption, and its climate change action plan covers water, buildings and energy; but not sanitation, waste or transport. Santiago has signed up to international covenants to reduce greenhouse gases and is making efforts to reduce waste in transmission and consume energy more efficiently. However, rather than pioneering its own energy policies, the city follows those set down by the national environmental commission, Conama, which has now been replaced by the new Ministry of Environment, created in October 2010.

Green initiatives: Santiago's state-owned metro company has several initiatives to cut CO_2 emissions and reduce electricity consumption by 35 gigawatts per year, which equals the electricity consumed by about 19,400 households. The company is implementing an automated train control system that improves energy efficiency, and is also switching to more efficient lighting in stations. These and other initiatives are expected to reduce greenhouse gas emissions by 17,000 tonnes per year. In 2009 Chile's national energy commission announced a programme to subsidise the purchase of high-efficiency electric motors by the industrial sector. The commission is introducing 6,000 new motors through 2010, which will cut CO_2 emissions by an estimated 2,600 tonnes a year. Furthermore, the commune of Vitacura, one of the independent administrative areas within the Santiago metropolitan region, has said it will become the first carbon-neutral municipality in Latin America in 2010 by purchasing carbon credits to offset 1,500 tonnes of CO_2 emissions.

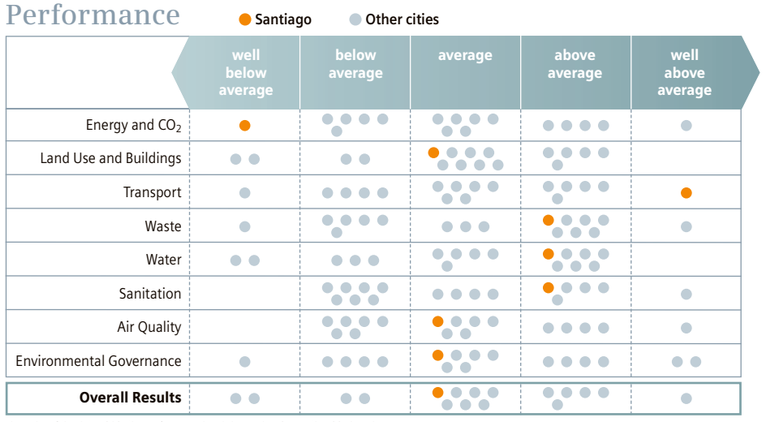
Land use and buildings: Santiago ranks average for land use and buildings. The city has the second highest population density in the Index, at 10,900 people per square kilometre, a figure based on a smaller boundary within the metropolitan area, referred to as "Gran Santiago". This figure is well above the 17-city average of 4,500 people per square kilometre. Santiago has 26 square metres of green spaces per person, a figure also based on Gran Santiago, and one of the lower amounts of green spaces in the Index. Santiago has some of the strongest policies in the Index to limit urban sprawl and protect environmentally sensitive areas. The city has been slow, however, to adopt energy efficiency standards in public buildings, and neither has the city adopted a code establishing eco-efficiency standards on new private buildings.

However, following the devastating earthquake that struck central-southern Chile in February 2010, which damaged or destroyed many buildings in Santiago, the government is now backing the use of solar energy in new buildings, and may introduce tax incentives for homeowners to use solar panels, which should help boost its score in this category.

Green initiatives: The "Santiago Metropolitan Regulation Plan", which outlines the city's overall strategy for coping with population growth to 2030, includes initiatives aimed at increasing green spaces. The plan calls on private developers to transform 3,900 hectares of city area into public parks and green spaces in exchange for accessing another 5,700 hectares for development. It also includes plans to revitalise three city parks and to plant more trees along major roads, which will be supported by the national forestry department.

Transport: Santiago ranks well above average for transport, the city's best performance in the Index and the only city to achieve this high rank. The city's public transport system is underpinned by a metro and a "bus rapid transit" (BRT) system, which are further supported by a large fleet of feeder buses. Santiago's overall network extends to an estimated 5.1 km per square kilometre, just about in line with the Index average of 5 km. But its superior public transport network (defined in the Index as transport that moves large numbers of passengers quickly in dedicated lanes, such as a metro, bus rapid transit or trams) extends an estimated 0.22 km per square kilometre, which makes it the fourth longest in the Index. It should be noted that the data in the Index for transport are based on Gran Santiago. In 2007, the city brought all bus operators under one umbrella organisation and standardised routes. Authorities have also reduced the total number of buses from 7,000 to 4,500 and are gradually replacing older vehicles with lower-emission models. The city's metro has undergone almost continuous expansion since opening in 1975, and it currently carries more than 2.3 million passengers per day on five lines

Performance



The order of the dots within the performance bands has no bearing on the cities' results.




covering roughly 90 km. In addition to overhauling its mass transport system, the city has also adopted several traffic management measures to reduce congestion, including traffic light sequencing, a traffic information system, "no car days" for vehicles without catalytic converters, and some toll roads. Santiago has one of the smallest stocks of cars and motorcycles in the Index, at just 0.14 vehicles per person, compared to the 17-city average of 0.3, a figure based on Gran Santiago.

Green initiatives: In 2010 the city started building its sixth metro line, which will cover 12 stations along a 15 km route when it opens in 2014. Furthermore, Providencia, a commune within the metropolitan area, started a bicycle rental scheme in 2009, complemented by substantial investments in bicycle lanes. Users can rent a bicycle for up to one day, picking it up and dropping it off in specially designated areas.

Waste: Santiago is above average in the waste category, a strong performance driven by robust waste disposal policies. Each of the city's 52 communes is individually responsible for managing waste collection and disposal, and their approaches vary. Some communes have banded together to found their own collectively controlled company, while others have contracted separately with a private firm, KDM. The system is relatively efficient, since together the communes collect and adequately dispose of an estimated 99% of the city's waste. Santiago complies with strict national guidelines governing its many landfills — open air dumps are illegal in Chile — as well as the disposal of hazardous waste. The city generates a relatively large amount of waste, however, at 563 kg per person per year, compared with an Index average of 465 kg.

Green initiatives: The commune of Santiago has teamed up with four charities to encourage community participation in recycling. There are 39 central collection points for residents to voluntarily deposit recyclable materials, including paper, plastics, batteries and glass. The charities keep the proceeds they earn from collecting and transferring the materials to recycling plants. The commune has also launched residential recycling collection in 80 buildings in the city. Residents voluntarily separate household waste, and deposit recyclable materials in special containers. Several other communes around the metropolitan area have similar programmes.

Water: Santiago is above average in the water category. Nearly 99% of Santiago's population has access to potable water, according to official sources. It also has a lower-than-average percentage of leaks, at an estimated 30%, which is still high but compares favourably to the Index average of 35%. Since Chile privatised the country's water services in 1998, Spanish-owned Aguas Andinas has provided Santiago's water. The company regularly monitors the quality of its drinking water, a programme enforced by the national environmental agency. There are challenges associated with one of the city's water sources, the Mapocho River, which is contaminated by sewage and waste from copper mining upstream (see "green initiatives" in the "Sanitation" category, below), but the city has a robust policy for governing industrial pollution.

Green initiatives: Upon privatisation of water services in 1998, and a subsequent rise in water prices, the national government introduced a direct subsidy for low-income households, in order to guarantee access. The country's provincial governments pay between 25% and 85% of the water bills for the poorest fifth of the population, and are then reimbursed by the national government. In 2004 the national government also introduced a programme to pay for the first 15 cubic metres of water used by families living in extreme poverty. Furthermore, to guarantee the sustainably of Santiago's Mapocho River, Aguas Andinas is conducting a major decontamination project (see "green initiatives" under "Sanitation" below).

Sanitation: Santiago is above average in the sanitation category. An estimated 97% of Santiago's residents have access to sanitation services, according to official sources, which is higher than the Index average of 94%. The city treats an estimated 73% of its wastewater, according to 2003 data, which is much higher than the 17-city average of 52%. And the city's wastewater treatment performance is likely to have improved since 2003, thanks to a national initiative aimed at treating all of its wastewater by 2012, a target the city appears well on track to meeting (see "green initiatives" below). Strong regulations have also driven improvements in wastewater treatment. The national body overseeing sanitation has powers to impose heavy fines on the private companies providing sanitation services when standards are not met.

Green initiatives: As part of a wider plan to improve sanitation in the region, the private company Aguas Andinas is scheduled to finish a US$350 million wastewater treatment plant by 2012, which will allow the city to treat all of its wastewater. In 2007 Santiago's regional environmental authority, Corema, commissioned another project, also managed by Aguas Andinas, to stop the flow of untreated wastewater into the Mapocho River, a major source of water for the city. Under the plan, the company decommissioned 21 pipes that previously discharged untreated wastewater into the river.

Air quality: Santiago ranks average in air quality. Tackling air pollution is a national priority, and Santiago has the strongest clean air policies in the Index, along with Curitiba. Because the city often experiences critical air pollution levels, Santiago has introduced an emergency environmental protection plan that forces industry to shut down polluting engines on days when air pollution is deemed too high; similar restrictions are placed on vehicles (see "green initiatives" below). Also, the use of chimneys in homes is forbidden. The city therefore receives top marks particularly for its air quality code and monitoring efforts, and air quality has improved through these emissions control measures. But the city's valley setting, bordered to the east by the Andes mountains, means air is trapped over Santiago for much of the year, and pollution remains relatively high. Average daily concentrations of particulate matter, for example, are among the highest in the Index, at 66 micrograms per cubic metre, compared with the 17-city average of 48 micrograms.

Green initiatives: Chile's national health ministry has a regional office, which monitors air pollution in the metropolitan area. When pollution reaches critical levels, authorities limit the number of vehicles entering the city according to licence plate numbers. Also, Santiago has a long-standing policy of using trees along streets and in parks specifically in order to reduce levels of particulate matter in the air. A 2008 study in the Journal of Environmental Management found that this strategy costs around US$8,000 for every 1 tonne reduction in suspended air particles, which is cheaper than several types of conversion to cleaner fossil fuels, although this could change in the future if prices for conversion come down.

Environmental governance: Santiago ranks average for environmental governance. The city has a strong record on citizen participation, thanks to initiatives overseen at the national level (see "green initiatives" below). The newly created national ministry of environment now serves as a central contact point for information on environmental performance and projects. Santiago's score in this category is hindered by its limited ability to implement its own environmental legislation. With 52 different communes, city governance can be complicated, so officials often take the lead from the national government on environmental policy.

Green initiatives: The ministry of environment has a formal process to encourage public input on all projects with an environmental impact. Residents, non-governmental organisations and other stakeholders are regularly invited to express opinions to influence policy.

Quantitative indicators: Santiago

		Average	Santiago	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	463.3 [1, e]	2005	EIU estimate; Insitituto Nacional de Estadísticas; International Energy Agency; Intergovernmental Panel on Climate Change
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	1,247.0 [1]	2005	Insitituto Nacional de Estadísticas; Banco Central de Chile; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km^2)	4,503.0	10,920.7 [2]	2009	Instituto Nacional de Estadísticas; Foreign Investment Committee
	Green spaces per person (m^2/person)	254.6	26.1 [2]	2009	Comisión Nacional del Medio Ambiente; Instituto Nacional de Estadísticas
Transport	Length of mass transport network (km/km^2)	5.0	5.1 [3, e]	2009	Metro de Santiago; Ministerio de Transporte; Grupo CB
	Superior public transport networks (km/km^2)	0.13	0.22 [3, e]	2010	Jefe de Estaciones de Trenes Metropolitanos, S.A., Metro de Santiago
	Stock of cars and motorcycles (vehicles/person)	0.30	0.14 [2]	2010	Instituto Nacional de Estadisticas
Waste	Share of waste collected and adequately disposed (%)	96.2	98.9 [1, e]	2008	Comisión Nacional del Medio Ambiente
	Waste generated per person (kg/person/year)	465.0	563.1 [1]	2008	Comisión Nacional del Medio Ambiente; Instituto Nacional de Estadísticas
Water	Water consumption per person (litres per person per day)	264.3	243.0 [1]	2009	Superintendecia de Servicios Sanitarios; Instituto Nacional de Estadísticas
	Water system leakages (%)	34.6	30.3 [1, e]	2008	Superintendecia de Servicios Sanitarios
	Share of population with access to potable water (%)	97.5	98.6 [1]	2008	Superintendecia de Servicios Sanitarios; Instituto Nacional de Estadísticas
Sanitation	Population with access to sanitation (%)	93.7	97.1 [4, e]	2008	Superintendecia de Servicios Sanitarios; Instituto Nacional de Estadísticas
	Share of wastewater treated (%)	51.5	73.2 [1, e]	2003	Superintendencia de Servicios Sanitarios
Air Quality	Daily nitrogen dioxide levels (ug/m^3)	37.8	41.0 [1]	2009	Comisión Nacional del Medio Ambiente
	Daily sulphur dioxide levels (ug/m^3)	11.4	10.0 [1]	2007	Comisión Nacional del Medio Ambiente
	Daily suspended particulate matter levels (ug/m^3)	48.0	66.0 [1]	2009	Comisión Nacional del Medio Ambiente

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on Santiago Metropolitan Area, 2) Based on Gran Santiago, 3) Based on Gran Santiago area, 4) Based on Santiago Metropolitan Area. Total population with access to sewerage.

São Paulo_Brazil

Background indicators

Total population (million)	11.0
Administrative area (km^2)	1,509.0
GDP per person (current prices) (US$)	15,090.2
Population density (persons/km^2)	7,314.5
Temperature (24-hour average, annual) (°C)	19.6

Based on City of São Paulo

A teeming megacity with 20.7 million residents, São Paulo is Brazil's most populous metropolitan area. With 11 million people living inside the São Paulo city limits, the city is also the most populous in the Latin American Green City Index. All data included in the Index is based on city figures, except for data on electricity consumption and CO_2 emissions from electricity consumption, which are based on the metropolitan area. São Paulo grew over the past century as a dynamic industrial hub, but its economy has been transformed in recent decades and is now dominated by services. Today it is Brazil's economic and financial capital, and a major centre for multinational companies operating in Latin America, though several big industries remain in the periphery of the city, including car manufacturers. São Paulo generates around 12% of the country's GDP and has the fifth highest GDP per person in the Index, at US$15,100. Long a magnet for both Brazilians and foreign immigrants, São Paulo has over the past century experienced a massive population explosion that has led to rapid and often chaotic urbanisation.

Despite the massive challenges posed by the size of its population, São Paulo ranks above average in the Latin American Green City index. The city's strongest performance is in the energy and CO_2 category, where it places well above average. This impressive placement is a result of very low CO_2 emissions from electricity consumption and one of the most robust climate change action plans in the Index. São Paulo places above average in all other categories with the exceptions of air quality and environmental governance. It ranks average in both categories due to the lack of a comprehensive clean air policy and a low level of public participation in environmental projects. São Paulo is, however, taking proactive steps to improve its environmental performance, receiving high scores for government policies in many categories.

Energy and CO_2: São Paulo ranks well above average in energy and CO_2. With all of its electricity generated by hydropower plants, São Paulo is unique in the Index for having an estimated zero CO_2 emissions from electricity usage. This is considerably better than the 17-city average annual emissions rate of 202 kg per person per year. São Paulo also has some of the most comprehensive clean energy and climate change policies in the Index (see "green initiatives" below). In 2005 the city conducted a full inventory of CO_2 emissions which showed that transport was the largest single source of the city's emissions, followed by waste disposal. The São Paulo metropolitan region consumes 553 megajoules of electricity per US$1,000 of GDP, well below the Index average of 761 megajoules.

Green initiatives: In 2009 São Paulo officials adopted an ambitious, comprehensive climate change policy, which commits the city to reduce CO_2 and other greenhouse gas emissions by 30% of 2005 levels by 2012. The city also established a climate change committee to monitor progress. The city says it is has made impressive strides to meeting this goal and has already reduced emissions by 20%. This rapid reduction is a result of two waste-to-energy conversion plants. The city closed operations at its two main landfills, Bandeirantes and São João, in 2007 and 2009, respectively, and installed thermoelectric power plants at both facilities. By capturing and burning methane, the landfills supply a total of 350,000 megawatt hours per year, and will cut CO_2 emissions by 11 million tonnes through 2012.

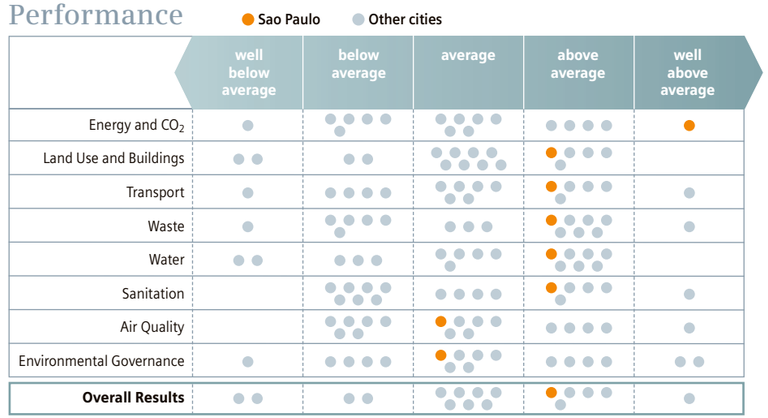
Land use and buildings: São Paulo ranks above average in land use and buildings. The city proper has the fourth highest density in the

Index, at 7,300 inhabitants per square kilometre, considerably higher than the 17-city average of 4,500 inhabitants per square kilometre. The city also has robust eco-buildings policies, thanks to a local law requiring that all new buildings include solar panels for hot water, and new energy-efficiency standards that came into effect in 2009 (see "green initiatives" below). The city has 55 square metres of green spaces per person — a middling result among the 17 cities in the Index. With the exception of a few parks, São Paulo's dense inner city is relatively void of green spaces, but the city's result in this area would likely improve if the metropolitan area had been included. The city has significant room for improvement in the area of land use policy, with only partial efforts to contain urban sprawl and protect environmentally sensitive areas.

Green initiatives: In 2009 São Paulo adopted Agenda 2012, which established a set of 223 short- and medium-term goals for the city. While the agenda covers a wide range of areas, from political transparency to social inclusion, among others, the initiative sets a series of goals in the area of land use and buildings. These include constructing 50 new neighbourhood parks and three parks along the Tietê River, in addition to planting 800,000 trees. Agenda 2012 also includes an initiative, run by the city's housing department, to install infrastructure and upgrade housing in 81 flood-prone informal settlements, expected to affect 75,000 families. The city is also in the process of upgrading housing, installing basic infrastructure and establishing waste recycling programmes in what were two of São Paulo's largest informal settlements, Heliopolis and Paraísopolis, as well as in other areas. As a result, these former settlements have evolved into low-income neighbourhoods. Regarding buildings, a 2009 law requires all new municipal buildings to meet energy-efficiency standards and that existing buildings be retrofitted with technology to improve energy efficiency and to mitigate their environmental impact.

Transport: São Paulo ranks above average in the transport category, an impressive placement

Performance



The order of the dots within the performance bands has no bearing on the cities' results.




for a city widely known for its endemic traffic problems. And indeed, the city has one of the largest stocks of cars and motorcycles in the Index — 0.44 vehicles per person, compared to the 17-city average of 0.30. However, São Paulo is trying to limit the effects of the city's deeply entrenched car culture with comprehensive congestion-reduction policies. These include regulations limiting the number of cars entering the city centre and limited vehicle zones (see "green initiatives" below). Despite progress the city still lacks other congestion reduction measures, such as carpooling lanes, congestion charges and park and ride systems, which would boost its score in this category. To further alleviate chronic congestion and encourage the use of public transport, the city and state are working together on a US$18 billion plan calling for new metro lines, new bus terminals, and improved traffic control and signalling by 2020. São Paulo's metro is modern and relatively efficient but its coverage is limited to some 69 km and four main lines. The city is building a fifth line, but progress has been slow. Nevertheless, the city's superior transport network (defined in the Index as transport that moves large numbers of passengers quickly in dedicated lanes, such as metro, bus rapid transit or tram networks) is the fifth longest superior transport network in the Index. It measures 0.21 km per square kilometre of city territory, which is twice the 17-city average of 0.10 km. Bus transport remains the most common form of public transport and the city boasts an extensive bus network, which, unlike the metro, covers all areas of São Paulo. Overall, the mass transport system within the city limits measures 7.5 km per square kilometre, well above the Index average of 5 km.

Green initiatives: Officials prohibit 20% of the city's cars from entering a large portion of central São Paulo during peak hours of each work day. Restrictions are based on license plate numbers. For example, cars with license plates that end in specified digits are prohibited from entering the zone on certain days. Violators are subject to heavy fines and repeat offenders can lose their licenses. And in another move to reduce congestion, the city has since 2007 been widening a ban on heavy vehicles on certain high-volume avenues during peak hours.

Waste: São Paulo ranks above average in the waste category. According to official figures, São Paulo collects and adequately disposes of all of the waste produced in the city limits. Two private contractors collect residential and household waste, as well as recyclable materials. The waste is disposed of in two managed landfills. The city has a strong record in waste collection and disposal policies thanks to strict enforcement of environmental standards on its landfills and careful monitoring of the disposal of hazardous waste by industry. Despite its well-managed waste disposal programme, São Paulo produces 550 kg of waste per inhabitant per year, above the Index average of 465 kg.

Green initiatives: São Paulo's "Ecopoint" initiative is reducing the illegal dumping of large waste items on city streets. The city has central collection points for residents to dispose, free of charge, items that do not fit in residential bins, up to one cubic metre in volume, such as furniture, tree cuttings and construction waste. The city has 38 collection centres and will open 10 more by the end of 2010.

In the first six months of 2010 the city says it collected 57,400 cubic metres of waste that otherwise would have been left on the streets. By 2012 the city aims to have 96 stations in operation, which will offer access to a majority of the population.

Water: São Paulo ranks above average in the water category. The city performs particularly well in water quality policies thanks to close monitoring by the statewide water company, Sabesp. São Paulo consumes an average of 220 litres of water per person per day, according to official figures, slightly below the 17-city average of 264 litres. But the city appears committed to lowering consumption even further, having installed water meters in most residential buildings. Nearly all of the population living within the city limits has access to potable water, according to official sources. São Paulo loses 31% of its water to system leakages, which, though high, is below the 17-city average of 35%.

Green initiatives: Sabesp, the statewide water company, has prioritised the elimination of leaks and illegal connections to the water network. It has therefore increased the number of inspectors and adopted new technology that helps it monitor all of the water in the system, spotting major leaks quickly and forecasting water consumption levels based on outdoor temperatures. Furthermore, Sabesp has an ongoing initiative called "PURA", to promote conservation in São Paulo through public information campaigns and water-saving technology. Using best practices developed in collaboration with the Polytechnic University of São Paulo, Sabesp works with institutions such as schools, hospitals and prisons to encourage conservation, repair leaks and install water conservation equipment. Sabesp says it has reduced water consumption in its own administrative offices by 72% and in municipal schools by 38%.

Sanitation: São Paulo ranks above average in the sanitation category. Ninety-nine percent of São Paulo's residents have access to sanitation, an estimate based on official figures, which is better than the 17-city average of 94%. The city does not do as well on the percentage of wastewater treated, but still better than the average, at 75% versus 52%. This means a large amount of untreated wastewater is still dumped into the city's main water source, the Tietê River. Sabesp, the state water company, closely monitors toxin levels in wastewater at treatment facilities, but São Paulo is one of the few cities in the Index that fails to monitor on-site treatment facilities, like septic tanks, in homes and communal areas.

Green initiatives: The city is in the third and final phase of its long-term, US$1 billion sanitation expansion and improvement programme. By building 580 km of new effluent collectors and other infrastructure improvements, the city expects to be able to treat wastewater from an additional three million people in the metropolitan area when the project finishes in 2015. This would be a 41% improvement in capacity.

Air quality: São Paulo ranks average in the air quality category. Its average daily emissions of sulphur dioxide and suspended particulate matter are well below the 17-city averages. Average daily nitrogen dioxide levels, however, are worse than average, at 47 micrograms per cubic metre compared to 38 micrograms, which can be attributed primarily to the prevalence of automobiles — the main source of air pollution in São Paulo. The city has significant room to improve its clean air policies relative to other cities in the Index. In São Paulo, for example, air quality policies are coupled with wider initiatives to reduce traffic congestion, which is an important step given the impact cars have on the city's air quality. However, top-performers in this category have policies that specifically target all forms of air pollution.

Environmental governance: São Paulo ranks average in environmental governance. While the city has a designated environmental department, the level of policy implementation is limited and the level of public participation has remained relatively poor. Furthermore, responsibilities for transportation, water and sanitation are split between the city and state, causing some fragmentation in policy. However, the environmental department budget has tripled between 2004 and 2009, to about US$ 220 million, demonstrating the city's renewed interest in environmental projects.

Quantitative indicators: Sao Paulo

		Average	Sao Paulo	Year*	Source
Energy and CO_2	CO_2 emissions from electricity consumption per person (kg/person)	202.2	0.0 [1, e]	2009	EIU estimate; AES
	Electricity consumption per US$ GDP (megajoules per thousand US$ GDP)	760.7	552.7 [2]	2007	AES; Instituto Brasileiro de Geografia e Estatística; Economist Intelligence Unit
Land use and Buildings	Population density (persons/km²)	4,503.0	7,314.5 [3]	2009	Instituto Brasileiro de Geografia e Estatística
	Green spaces per person (m²/person)	254.6	54.7 [3]	2009	Secretaría de Meio Ambiente; Instituto Brasileiro de Geografia e Estatística
Transport	Length of mass transport network (km/km²)	5.0	7.5 [3]	2009	SPTrans
	Superior public transport networks (km/km²)	0.13	0.21 [3]	2010	SPTrans, Secretaria dos Transportes Metropolitanos
	Stock of cars and motorcycles (vehicles/person)	0.30	0.44 [3]	2010	Denatran
Waste	Share of waste collected and adequately disposed (%)	96.2	100.0 [3]	2009	Prefeitura de Sao Paulo
	Waste generated per person (kg/person/year)	465.0	550.0 [3]	2009	Prefeitura de Sao Paulo – "Informacoes Gerais Portal da Prefeitura de Sao Paulo"
Water	Water consumption per person (litres per person per day)	264.3	220.5 [3]	2007	SABESP; Instituto Brasileiro de Geografia e Estatística
	Water system leakages (%)	34.6	30.8 [3]	2007	SABESP
	Share of population with access to potable water (%)	97.5	99.2 [3]	2007	SABESP; Instituto Brasileiro de Geografia e Estatística
Sanitation	Population with access to sanitation (%)	93.7	99.1 [4, e]	2009	SABESP; Instituto Brasileiro de Geografia e Estatística
	Share of wastewater treated (%)	51.5	75.0 [3]	2007	SABESP
Air Quality	Daily nitrogen dioxide levels (ug/m³)	37.8	47.0 [3]	2009	Companhia Ambiental do Estado de São Paulo
	Daily sulphur dioxide levels (ug/m³)	11.4	4.0 [3]	2009	Companhia Ambiental do Estado de São Paulo
	Daily suspended particulate matter levels (ug/m³)	48.0	33.0 [3]	2009	Companhia Ambiental do Estado de São Paulo

* Where data from different years were used only the year of the main indicator is listed, e) EIU Estimate, 1) Based on São Paulo Metropolitan Region. All electricity for São Paulo comes from hydro, therefore no CO_2 emissions, 2) Based on São Paulo Metropolitan Region, 3) Based on City of São Paulo, 4) Based on City of São Paulo. Total population with access to sewerage.

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