African Green City Index

Assessing the environmental performance of Africa’s major cities

A research project conducted by the Economist Intelligence Unit, sponsored by Siemens
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A panel of global experts in urban environmental sustainability advised the Economist Intelligence Unit (EIU) in developing the methodology for the African Green City Index. The EIU would like to thank the panel for their time and valuable insight.

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

David Wilk joined the Inter-American Development Bank (IDB) in early 2001 as an urban environmental senior specialist, with extensive international experience in the fields of land use and environmental planning, watershed management, sustainable urban transport, and environmental assessment of urban and regional infrastructure projects. At IDB, Mr Wilk led the development of the Environment Strategy and Policy (2003), the Sustainable Energy and Climate Change Initiative (SECCI) and the SECCI Funds (2007-08). More recently, Mr Wilk spearheaded the Climate Change Strategy (2011), a number of climate change policy-based loans in Mexico and Peru, and technical assistance programs for institutional strengthening and technical support for climate change adaptation and mitigation throughout Latin America and the Caribbean. He is part of the Sustainable and Emerging Cities Platform that will promote sustainable actions and climate resilience in mid-size cities in the region.

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 re-elected as president. Ms Ortega was a member of the executive committee of the United Nations Advisory Council on Local Authorities (UNACLA) from 2000 to 2007 and received the UN Habitat Scroll of Honour Award in 2000. She was recently elected member of the board of directors of Clean Air Initiatives-Asia (CAI-ASIA).

Hiroaki Suzuki
Lead Urban Specialist and Eco² 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 Eco² team leader. Mr Suzuki is the main author of “Eco² 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 strategically integrated 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 blueprints for new districts. He is the lead author of the upcoming UN Habitat Guide for City Leaders on Urban Planning. Mr Vaggione was part of the team of the city of Madrid that received the World Leadership Award in 2007. Between 2007 and 2010 he served as the secretary general of the International Society of City and Regional Planners (ISOCARP), a professional organisation of planners from 70 countries.

Sebastian Veit
Senior Climate Economist African Development Bank

Sebastian Veit is senior climate economist at the African Development Bank. He is currently serving as the specialist on energy, environment and climate change in the bank’s West Africa Region, based in Dakar. While at the organisation he has focused on green growth strategies in Africa and renewable energy issues. In 2007 Mr Veit 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.

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 devoting a large part of his professional career to helping urban poor communities, he initiated UN Habitat’s Best Practices and Local Leadership Programme as a means to help cities and urban communities learn from each others’ success stories in meeting the social, economic and environmental challenges arising from rapid urbanisation. He was subsequently appointed senior policy and strategic planning adviser of UN Habitat, and spearheaded a major institutional reform plan. To help implement that plan, he was asked in January 2009 to lead 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. Mr You was recently appointed as a member of the board of the African Medical Research Foundation (AMREF).
Africa’s urban transition – approaching a tipping point

Africa is the world’s second-largest continent in the world, a distinction it has held for several decades. It started with a low absolute number of city dwellers, however, so even after large percentage increases in urban migration, it still remained mostly rural. That balance is starting to shift and the continent is approaching a tipping point. The number of urban residents more than doubled in the last two decades to over 412 million and they currently account for 40% of Africa’s population, according to the United Nations Population Division.

Within the next decade there will be more urban residents in Africa than in any other continent except Asia. And by 2050 the total number of those living in the continent’s growing cities is expected to double again to 870 million, at which point half of all Africans will live in urban areas. Growth will be particularly strong south of the Sahara. Lagos and Kinshasa, currently the 21st and 29th most populous cities in the world, will by 2050 have vaulted to 11th and 12th place, respectively, easily surpassing Africa’s current largest city, Cairo. In percentage terms, medi-

African Green City Index

um-average rates will grow even faster. In the next ten to 15 years the populations of Dar es Salaam and Nairobi could double, and Addis Ababa is expected to grow by over 60%. More generally, according to UN Habitat*, cities in sub-Saharan Africa with a current population of 1 million or more will grow at an average rate of 3.2% over the next ten years. The only exceptions are the South African cities and Congo-Brazzaville (capi-

tal of the Republic of Congo).

Such expansion would be difficult to manage even with the best urban governance, yet too often African cities suffer from unplanned sprawl. The region has the highest proportion of city dwellers in informal settlements in the world. Infrastructure is stretched to its limits, with an urgent need for more reliable supplies of electricity and water, and services such as waste management and sanitation. According to UN Habitat’s recent report on the state of African cities, “Almost a single African government can afford to ignore the ongoing rapid urban transition. Cities must become priority areas for public policies.”

With African governments focusing on so many urgent challenges – from health and security to unemployment and inequality – some may question whether they have the time or resources to devote to the daunting project of improving urban environments. However, those involved intimately with the continent’s development over the years say that action on environmental sustainability must go hand-in-hand with solutions to the continent’s social and economic problems. “Sustainable development policies at the city level in Africa are far too often a ‘nice-to-have option,’” says Nicholas Yau, chairman of the Steering Commit-

tee of UN Habitat’s World Urban Campaign, in an interview for this report. “These policies will ultimately determine Africa’s capacity to ensure sustainable development for society as a whole.”

The African Green City Index, a research pro-
ject conducted by the Economist Intelligence
Unit, sponsored by Siemens, seeks to give gov-
ernments and other stakeholders in the region insight and understanding into these pressing environmental challenges. To do so, it measures and assesses the environmental performance of 15 major African cities across a range of criteria, and highlights green policies and projects that other cities can learn from.

This report presents the most important find-
ings and highlights from the Index. It is divided into five parts. First, it examines the overall key findings. Second, it looks into the key findings from the eight individual categories in the Index: energy and CO2, land use, transport, waste, water, sanitation, air quality and environmental governance. Third, the report presents the highlights of a variety of green initiatives under way across the continent. 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, chal-

lenges 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: Evaluating cities with limited data

The 15 cities selected for the African Green City Index are capital cities as well as leading business centres chosen 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. Some large popula-

What the Index measures: Evaluating cities with limited data
# Results

## African Green City Index

### Overall results

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<tr>
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### Category results

#### Energy and CO₂

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#### Transport

| Luanda              |              |         |               |                    |
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#### Water

| Addis Ababa         |              |         |               |                    |
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#### Sanitation

| Addis Ababa         |              |         |               |                    |
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#### Environmental governance

| Addis Ababa         |              |         |               |                    |
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## Results

### African Green City Index

**Overall results**

**Energy and CO₂**

**Transport**

**Water**

**Air quality**

**Sanitation**

**Environmental governance**
Overall key findings

There is no single leader in the Index. Six cities score above average, with South African and North African cities outperforming the rest.

None of the 15 cities in the Index placed in the highest possible band of “well above average”, suggesting that even the best-performing cities in the continent have room to improve their environmental footprint. Among the six “above average” cities, two groups, those from South Africa and those from North Africa, perform better than sub-Saharan cities (excluding South Africa), for reasons set out below.

South African cities: good with governance

Three of the six above average cities are South African – Cape Town, Durban and Johannesburg. On quantifiable metrics such as electricity consumption, waste generation and water consumption, none of them perform very well and indeed they have among the highest CO2 emissions from electricity in the Index, mainly because they remain highly dependent on coal to produce electricity.

But they more than make up for drawbacks on consumption with consistently strong environmental policies – the Index’s qualitative assessments of the strategies, codes and plans to monitor and improve the urban environment. Cape Town, for example, has established a comprehensive Energy and Climate Change Action Plan to improve green performance in many of the eight Index categories. In land use particularly, it places well above average for the strength of its policies to contain urban sprawl and protect green space. Durban and Johannesburg also generally perform well for environmental policies. As the city portraits in this report demonstrate, when it comes to governance, the South African cities have strong local structures in place. While in many of the North African and sub-Saharan African cities policy is run from afar at the national or provincial level, South African cities have strong local structures in place. While in many of the North African and sub-Saharan African cities policy is run from afar at the national or provincial level, South African cities have city departments, often under the direction of a city council, to directly oversee and implement policies at the urban level.

Africa experts say South Africa’s attention to environmental policies can be attributed mainly to its level of economic development. Carole Rakodi, Africa specialist and professor emeritus at the University of Birmingham’s School of Government and Society, notes that the environmental challenges of South African cities are starting to resemble those more familiar in Western countries. "They have working services and can solve the most basic problems – water supply, waste management, human health, that whole round of things that go together," she says. "Now they are starting with the next round of sustainability problems." These include the need for more environmentally conscious resource consumption, smarter planning, limiting the reliance on dirty fossil fuels and increasing recycling.

Professor David Simon, head of the geography department at the University of London, and expert on urban sustainability in Africa and other developing regions, adds that stronger environmental policies have been a key part of the post-Apartheid reforms. "South African cities have been able to use the political capital of post-Apartheid reconstruction to address the environmental problems that were part of that legacy," he says. These problems included deliberately designing black townships on the peripheries of cities, far away from basic municipal services.

North African cities: Connecting residents to water and power

Although North African cities do nearly as well as South African ones in overall performance, their strengths are different. In policy terms, they tend to do slightly worse. In the environmental governance category, for example, all of the South African cities score above average and all of the North African ones are average. However, regarding access to services North African cities tend to do better. The two above average cities in the Index from North Africa, Casablanca and Tunis, are very strong on access to services. Casablanca and Tunis, for example, are very strong on access to electricity, potable water and sanitation, with rates approaching 100%.

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Overall results: South African and North African cities lead the Index

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<tr>
<th>City</th>
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- **South African cities**: Cape Town, Durban, Johannesburg
- **North African cities**: Casablanca, Tunis
- **Sub-Saharan cities**: Dar es Salaam, Maputo, Luanda, Lagos, Pretoria, Accra, Cairo, Alexandria, Addis Ababa, Pretoria, Durban, Johannesburg, Tunis

Overall, the Index shows that there is significant room for improvement in environmental policy and practice across the continent. With the exception of a few high-performing cities, most African cities are yet to fully embrace sustainable urban development strategies.

In conclusion, the Index highlights the need for a concerted effort across all African cities to address environmental challenges and move towards a more sustainable future. While some cities are making progress, much remains to be done, particularly in terms of reducing dependence on fossil fuels and improving access to clean water and electricity.
African and South African cities. Dar has enormous challenges that are in a different league from North face social, economic and environmental problems. Maputo, were even "well below average". They Africa) except Accra finished better than "average. None of the sub-Saharan cities (excluding South Africa) have among the highest percentage of their populations living in informal settlements, at an estimated 70% for Maputo and an estimated 10% for Dar, compared with the Index average of 38%.

Most sub-Saharan African cities struggle in the Index, reflecting different challenges compared with their neighbours in the north and south.

In a different league
None of the sub-Saharan cities (excluding South Africa) except Accra finished better than "average" overall. Two cities, Dar es Salaam and Maputo, were even "well below average". They face social, economic and environmental problems that are in a different league from North African and South African cities. Dar has enormous environmental challenges to overcome, particularly in waste and sanitation. In the absence of regular waste collection, many residents simply burn their waste. And although more than half of the population has access to some form of sanitation, only an estimated 7% of households are connected to the sewer system and only an estimated 10% of sewage is treated before being released. Likewise, in Maputo a significant percentage of the population lacks access to basic services for water, waste management or sanitation. These two cities also have among the highest percentage of their populations living in informal settlements, at an estimated 70% for Maputo and an estimated 68% for Dar, compared with the Index average of 38%.

Africa specialists confirm that these issues exist across the sub-Saharan region to varying degrees. Mr Rakodi notes that for many cities in sub-Saharan Africa, "city governments on the whole lack autonomy and, even when they have it, city politics are unstable and shaky."

Brown versus green
In the sub-Saharan region, the environmental emphasis is on the so-called "brown agenda", which focuses on human health and poverty reduction, as distinguished from the "green agenda", which looks to improve the sustainability of ecosystems. The two agendas should go hand in hand, as Mr You of UN Habitat's World Urban Campaign (see interview, page 20) and others have pointed out, but Mr Simon of the University of London notes that the immediate demands of survival in sub-Saharan cities tend to prevent a focus on sustainability. "One reason why environmental issues are often not prioritised by political elites is that, by definition, sustainabil- ity is a long-term issue, requiring investment now for a longer-term benefit in a resource-constrained environment. If you have a queue outside your office with people struggling to meet basic needs of food, shelter, and water, those sorts of immediate priorities trump long-term ones."

In addition, the climate change agenda is sometimes viewed with suspicion when it comes from outside Africa. Still, the effects of climate change on Africa – from impacts on crop production to natural disasters – could be devastating in the long term, and the challenge will be to find the right balance between addressing immediate and longer-term problems.

Good performance in the Index is strongly correlated with fewer people living in informal settlements. What explains the link?

Among the 15 index cities, the average percentage of the population living in informal settle- ments is nearly 40%, but this includes a wide range, from an estimated 15% in Casablanca to an estimated 70% in Maputo. It turns out that there is a strong correlation in the Index between a city's environmental performance and the percentage of residents living in informal settlements. In brief, the fewer residents in a city living informally, the better the city performs.

The impact of wealth on environmental performance is unclear
One possibility is wealth. In other Green City Indexes, there is a frequent connection between higher per capita GDPs and better environmental performance. Unfortunately, consistent data on per capita GDP was unavailable across the 15 African Index cities. Still, South African cities have fewer informal settlements on the whole than in the rest of the continent, which seems to indicate a relationship between wealth and the presence of informal settlements. But UN Habitat reports that North African cities have made strides in reducing the numbers of informal urban dwellers through more effective policies, independent of economic growth. So, at least, the link between the presence of informal settlements and wealth is unclear at this point.

In fact, in cities in the developing world, increasing wealth does not necessarily solve environmental issues, and can indeed often lead to more sustainability challenges, especially with regard to resource control. While institutional frameworks and governance need resources, "say Mr Omuya of the University of Nairobi, "the reverse is true: the presence of resources will automatically lead to better management of environments, is not true ... As cities in Africa have grown and become richer, their environments have degenerated." Anton Cartwright, an economist at the African Centre for Cities in Cape Town, agrees: "The notion that you can grow your way from poverty to green- ness is questionable," he says. "Wealth does make the provision of formal water and sanitation services affordable, but this is a small pro- portion of greenness. For the rest, in Africa,
more affluence currently correlates with more emissions, more urban sprawl, lower density, more cars.”

Governance is key
The Index suggests another factor may be at work: good governance. Experts say the institutional ability to run a city efficiently and intelligently matters more than wealth or the level of economic development. This idea is powerful on a continent where many cities may wait decades for the kind of wealth levels common in other regions of the world, but where environmental challenges cannot wait.

Dr Joan Clos, Executive Director of UN Habi-
tat and former mayor of Barcelona, suggests that institutional capacity is the first step: “The cities need political institutions that can take the lead in urban planning and design” he says. “Once you have that, investment, job creation and improving quality of basic services for citi-
zens will come.”

“Governance is key, and more importantly, for the way the city plans and approaches ‘infor-
mal’,” says Mr Omenya. He adds that there are regional differences for how African cities cope with informal settlements: South Africa has rela-
tively well planned informal settlements. In West African cities, they are mainly undisputed tribal lands, which the owners are able to upgrade themselves and which receive basic infrastructure and services. Eastern Africa, on the other hand, tends to have informal settle-
ments set on public land. These are targets for eviction rather than upgrades, and as Mr Omenya adds, “they hardly attract good policy and programmatic interventions.”

The cutting edge of policy: Blurring the lines between informal and formal neighbourhoods
Current thoughts on informal settlements take the idea of “upgrades” even further, actually eliminating the distinction in the city between “formal” and “informal”. Indeed, it is often diffi-
cult to distinguish between the two in some places, as cities begin to deliver municipal ser-
tices to these neighbourhoods. “Planning and governance in African cities no longer sees this dichotomy as relevant,” Cartwright says. And

Action for today:
Low-cost priorities to aid urban sustainability
Although some environmental strategies do cost money, certain policies – such as obtaining energy from existing landfill sites or providing legal protection for waste pickers – cost relatively little but can make an immediate difference. What low-cost improvements would be most beneficial for African cities?

“It is about policies and programmes,” says Mr Omenya of the University of Nairobi. “For example, power consumption can be limited by having good controls on development. Good planning can en-
sure that in areas with adequate daylight solar power can be used to remove domestic consumers from the national grid. Good planning and development controls can ensure that rainwater harvesting takes place and people are not traveling long distances across the city, polluting the environment in their wake. Currently-planning seems to overly support unsustainable consumption.” He suggests the following policies should be low-cost priorities for African cities:

➔ Slum upgrading policies
➔ Rainwater harvesting
➔ Effective public transport policies that promote non-motorised transport
➔ Open-space systems, conservation of urban greenery and buffer zones
➔ Waste management policies
➔ Development control, planning and land use policies
➔ Domestic clean energy policies promoting, for example, solar energy

To improve urban environmental governance, political power needs to be decentralised, but in many regions of Africa, the reverse is happening.

Experts agree that decentralisation of power from the national to the local level is crucial for effective planning, but the path to get there is difficult. Mr Simon says one of the elements of success can be political will. He notes that Lagos State has been active in improving urban infra-
structure and the environment. Lagos State – the state is in effect the metropolitan govern-
ment – in particular has a growing reputation for addressing “things which were in a parlous state, in particular relating to sanitation, envi-
ronmental aesthetics, and remediation general-
ly. There has been dramatic change.” Indeed, for sub-Saharan cities, adds Susan Parnell, profes-
sor at the African Centre for Cities at the Univer-
sity of Cape Town, “the big error is to assume that they are not powerful. They have control over some of the most critical levers of change, sometimes unwittingly, things like land use management.”

Unfortunately, according to Edgar Pieterse, director of the African Centre for Cities at the University of Cape Town, there is a trend towards national governments taking more authority over decisions about cities. “In many countries there has been a recentralisation of functions; and very seldom, except for South Africa, has there been adequate fiscal decentralisation to match functional devolution,” he says. “This goes to the heart of the governance question.”

The Index raises many questions about the future challenges of sustainability in Africa, from providing basic services to poor residents, to upgrading and integrating informal settlements or even working to give the “green” agenda the same priority as other pressing necessities. But experts agree that addressing the green agenda – and convincing public officials that they need to address it along with the other issues they face – will be the crucial task in the years to come. “Urban sustainability is not a luxury; it is a time bomb,” Mr Omenya says. “The issues of poverty, under-development and governance are now becoming increasingly urbanised. This is where the battle for progress in African coun-
tries must be located.”

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**Percentage of residents living in informal settlements by overall result bands**

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<td>60%</td>
<td>35%</td>
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<tr>
<td>Arabic Kuala Lumpur</td>
<td>69%</td>
<td>70%</td>
<td>35%</td>
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Energy and CO₂

The results in energy and CO₂ highlight the varying levels of economic development on the continent, particularly between South Africa and the other sub-Saharan African cities in the Index. The performance of the four South African cities (Cape Town, Durban, Johannesburg and Pretoria) is held back because CO₂ emissions from electricity consumption are substantially higher than in the other 11 cities and they have among the highest per capita electricity consumption figures in the Index. However, they perform much better for energy policies. It should be noted that due to data limitations, this category was only able to take into account energy in the form of electricity, and had to exclude power sources such as diesel generators, for example, or liquid fuels, which are prevalent in many African cities.

➔ The average amount of CO₂ emissions from electricity consumption for the South African cities is 3 tonnes per person, more than five times the figure for the other seven cities in sub-Saharan Africa (Accra, Addis Ababa, Dar es Salaam, Lagos, Luanda, Maputo and Nairobi). This reflects the differences in sourcing electricity. South Africa is mainly dependent on coal, while the other cities largely rely on natural gas and hydropower.

➔ On policy, however, South African cities are among the best performers. Johannesburg, the only South African city to finish above average in the category, combines high policy scores with the lowest electricity consumption among the four South African cities.

➔ All of the seven sub-Saharan cities (excluding South Africa) in the Index have very low levels of electricity consumption. On average, they consume 2.3 gigajoules per person annually compared with 9.9 gigajoules for the other eight cities in the Index. This, combined with the widespread use of hydropower in these countries (on average 69% of electricity generation), leads to low CO₂ emissions. On average cities emit 49 kg of carbon per person from electricity each year.

➔ The four North African cities have relatively high electricity consumption and access levels, with much of their electricity generated through natural gas. This combination puts their resultant annual CO₂ emissions from electricity consumption at 57 kg per person on average. Their policies are also relatively weak: none of these cities obtains full marks for any energy policy indicator.

➔ In general, exact data for CO₂ emissions is lacking since they are not directly measured. CO₂ figures for the Index had to be estimated.

Land use

African Index cities have had some success in maintaining green space but are generally marked down for low-density sprawl and the significant numbers of residents living in informal settlements.

➔ On average the 15 African Index cities have 74 square metres of green space per person, which is nearly double the figure for the Asian index, at 39 square metres, but less than the figure for the Latin American Index, at 255 square metres per person.

➔ In some cases, this may be more a result of good fortune than policy. Only eight of the 15 African Index cities receive full marks for their green space protection policies. And only three of the five cities with the most green spaces in the Index have these policies. In addition, only four get full marks for protecting environmental-sensitve areas. Without more stringent policies, population growth is likely to threaten their green space.

➔ Urban sprawl is an issue in African Index cities. The 15 cities have an average population density of about 4,600 people per square kilometre. Cairo, at 19,100 people per square kilometre, is the densest city in the African Index, and without it, the average density falls to 3,500 people per square kilometre. In contrast, the 22 major cities evaluated in the Asian Green City Index have an average population density of 8,200 people. And only four African cities receive full marks for policies to address urban sprawl.

➔ A more pressing problem is when sprawl takes the form of informal settlements. Even though every city in the Index has some sort of slum redevelopment policy, on average 38% of Index city populations remain in informal settlements. According to UN Habitat, Africa as a whole has the most people living in informal settlements in the world. The organisation also reports that North African cities have made substantial progress in reducing the percentages in recent decades. For example, Casablanca has the lowest figure for the entire Index, at an estimated 15%. But dramatic population growth expected for sub-Saharan Africa threatens to exacerbate the situation in many cities.

Transport

Given the resources needed to build and maintain a public transport network, it is no surprise that many African Index cities do not have extensive advanced systems such as metro lines. The Index shows that cities could improve in policy areas though, for example by establishing more initiatives to reduce traffic congestion. It should be noted that the public in African cities relies extensively on private transport – taxis and private minibuses, for example, and these forms of transport could not be included in this category due to lack of data.

➔ On average the 15 African Index cities have 2.7 kilometres of public transport (official bus lines) per square kilometre. They also have an average of 0.07 kilometres of superior transport networks, defined as metros, trams or bus rapid transit lines. This is shorter than in the Latin American Index, at 0.1 km per square kilometre, and Asia, at 0.2 km.

➔ A related difficulty is a lack of consistency in mass transport policies. No city has a completely integrated pricing system for its public transport system. Only Cairo gets full marks for investments to reduce emissions from urban mass transport. And just three cities – Cape Town,
Congestion reduction measures such as car-pooling lanes, no-car days or toll roads are mostly missing. Only park-and-ride schemes have been adopted by seven of 15 cities and traffic light sequencing is present in 12 Index cities.

Waste
African cities vary widely in figures for waste generation and many cities could benefit from more active policies. However, there are hopeful signs in the area of recycling.

> Waste production figures vary between 160 kg per capita each year in Addis Ababa and more than 1,000 kg in Pretoria. On average, residents of African Index cities generate 408 kg of waste per capita. This figure is less than the Latin American Index average of 445 kg, but more than the Asian Index average, at 375 kg. However, comparisons across continents should be treated with caution because in Africa it is often unclear to what extent figures include waste produced in informal settlements.

> Recycling is becoming more common on the continent. None of the participating cities include collection or central collection points, and one more city, Dar es Salaam, has plans for central collection points. Plastics are recycled, or soon will be, in 14 Index cities, paper in 13 cities and glass in 11.

> Waste policies, such as an overall waste management strategy or environmental standards for landfills, are less widespread. Just Alexandria, Cairo and Cape Town get full marks for having a strategy aimed at reducing, reusing and recycling waste in place, and only Alexandria – the one city in this category to finish well above average – regulates waste pickers (residents who informally scavenge for recyclables and reusable items).

Water
Water consumption is relatively low in African cities. But this is likely a reflection of factors such as more limited access to piped water and high prices, which are issues for most cities in the index. On a policy level, cities’ codes covering water quality and conservation could be strengthened.

> African Index cities consume on average 187 litres per person per day, less than in the Latin American Index, at 264 litres or the Asian Index, at 278 litres.

> The average level of access to potable water in the African cities is 91%, although the definition of access for Africa does not necessarily mean water piped directly to households or a 24-hour supply, and can include access to a communal tap, for example.

> Leakage rates are high, at 30%, although not as high as for the Latin American Index, at 35%. The average for the Asian Index was 22%. It is unclear to what extent leakages or unaccounted-for water in informal settlements are taken into account in the African city data.

> Strong water policies are not widespread. For example, only seven of 15 cities receive full marks for improving surface water quality; just five get full marks for monitoring water quality, and only two fully enforce water pollution standards for local industries.

> Robust water efficiency initiatives, such as public promotion of conservation or grey water recycling, are also not very common. The exception is metering or tariffs, which are in place or planned for 14 of the 15 Index cities.

Sanitation
Sanitation access rates vary widely, from an estimated 49% in Maputo to an estimated 99% in Casablanca. In addition to the need to improve access, in general most cities face challenges in implementing sanitation codes and policies as well as treating wastewater before discharging it.

> On average 84% of residents of African Index cities have access to sanitation, although as with access to potable water, definitions of access to sanitation do not always include household connections to the sewerage system.

Air quality
There are no emissions data in many African cities, so unlike in previous Green City Indexes, the air quality category in the African Green City Index is evaluated only on the basis of policies. Regarding these regulations, the more developed cities in South Africa tend to be more active, while in much of sub-Saharan Africa, air quality appears to receive relatively little attention from governments.

> All cities in South Africa finish above average in this category, with each gaining full marks for their air quality codes and pollution monitoring, and all being one for setting standards for specific pollutants.

> Six of the seven sub-Saharan cities (excluding South Africa) are not covered by an air quality code and five of the seven do not conduct monitoring.

> The four North African cities are slightly less active than South Africa, but Casablanca and Tunis are still above average and the other two, Cairo and Alexandria, fall into the average band in this category.

> Comprehensive, comparable data on air quality was not available to include in the African Green City Index. Yet individual studies and evidence from experts suggest that even when policies are in place African cities face huge challenges in actually reducing pollution, which often reaches unhealthy levels.

Environmental governance
Environmental policy in African Index cities tends to be set at the national, state or provincial level, instead of at city level, which means that in general environmental issues receive less attention than if they were overseen locally. The four South African cities are notable for their relative independence to manage the environment at the urban level. In general, good air pollution codes in place, execution of those policies can be lacking.

> Eleven of 15 Index cities are covered by a dedicated environmental department, although this is often a national or state-level body. Where these departments exist, they usually have a wide remit typically covering most or all of the environmental areas evaluated in the Index.

> Five cities publish environmental performance data regularly, and five cities have also completed wide-ranging baseline environmental reviews. Efforts in these areas in the remaining cities are partial or non-existent.

> All but one city involve citizens, although this is generally on a non-governmental level. Some cities have very limited monitoring or do not monitor these areas.

> There is also a lack of enforcement of the existing policies. For example, only Tunis has regular monitoring of on-site treatment facilities in homes or communal areas, whereas ten cities have very limited monitoring or do not monitor these sites.

> Figures on the share of wastewater treated were not available throughout the 15 African cities, but in several cities only a small percentage of the sewerage is treated before being discharged into the rivers or sea.

The type of access also varies widely across the Index cities. For example, only seven of 15 cities receive full marks for improving surface water quality; just five get full marks for monitoring water quality, and only two fully enforce water pollution standards for local industries.
“Far from a nice-to-have option”: Green policies are central to economic and social progress in African cities

An interview with Nicholas You, sustainable urban development 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, based in Nairobi, 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 African Green City Index. He spoke to the EUI 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”.

African Green City Index

Green policies are central to economic and social progress in African cities

Africa faces many complex and difficult challenges. In this context, urban environmental sustainability could be seen as “nice-to-have” or even irrelevant until other more pressing problems are solved. Given the continent’s many challenges, how much attention should officials give to urban environmental sustainability? Is Africa the most rapidly urbanising region in the world. It is undergoing a radical transformation in the way it uses land, water and energy, as well as food production, consumption and distribution. This transformation requires a concerted set of social, economic and environmental policies that places the city and urbanisation at the centre of the agenda. Drought and flooding may or may not be directly caused by human activity, but the resulting famine, human displacement and impoverishment are a direct consequence of poor planning and risk management; inadequate infrastructure and services; inefficient markets and regulatory mechanisms; just to mention a few. These urban functions are critical to sustainable development in both the cities and rural environments. Sustainable development policies at the city level in Africa are far from being a “nice-to-have option”. These policies will ultimately determine Africa’s capacity to ensure sustainable development for society as a whole.

Although wealth is important for environmental performance, what kinds of initiatives or activities can other income cities undertake to improve their environmental performance? In economic terms, cities in lower income countries have the most to gain from adopting environmentally sound and sustainable policies and practices. Such initiatives can substantially reduce waste, improve efficiency, and create jobs and income-generating opportunities. A typical example is waste recycling and reuse. In many cities in developing countries, this is carried out by scavengers working and living in deplorable conditions. The right mix of policies, participation and empowerment could result in win-win situations whereby waste is recycled into usable products; methane is captured to produce green energy; and the scavengers no longer have to work in life-threatening conditions.

Are there any practical policy improvements in Africa that can make a large impact without costing too much money? One of the most compelling policy initiatives that is transforming the lives of millions of people as we speak is mobile banking in Kenya. The regulatory authorities in Kenya have had the foresight to allow Kenyans to transfer money, for a nominal fee, through mobile phones. This has made transactions accessible to millions of people who were excluded by conventional banking practices. This initiative has procured innumerable social and economic benefits for all, and at minimal cost. One can only hope that lessons learned from this policy initiative, in terms of deregulation and empowerment, will be applied to other sectors such as energy and water.

In other regions covered by the Green City Index series (e.g., Europe, Asia, the Americas) more wealth is linked to better environmental performance. In the African Green City Index, however, where income levels are well below other parts of the world, there seems to be a strong link rather between good governance and environmental performance. To what extent do you think that good governance is related to improving the environment in Africa’s cities? Wealth creation and governance go hand-in-hand, and as we have seen in other regions, as societies become wealthier, people demand better quality of environment. While many countries in Africa are experiencing appreciable rates of economic growth, this is largely the result of those countries having adopted more liberal and pro-business policies within the last decade. This “dividend” will not last forever. In order to sustain economic growth and ensure equitable benefits of that growth, better governance is required. There should be no distinction between improving urban environmental sustainability, lifting people out of poverty and empowering people to take part in decisions affecting their livelihoods.

How can African cities make their consumption more sustainable as they grow richer? It is about consuming more intelligently, with less waste and less energy intensity. Rapid growth has many potential advantages, especially in African cities which have yet to create the infrastructure they need for today and tomorrow. Proper planning and well-informed technology choices – including the full benefits of smart growth, smart infrastructure and smart well – could allow these cities to leapfrog mature societies. But smart technologies also require smart systems, including better governance.

Informal settlements clearly affect a city’s environmental footprint and some cities in the African Green City Index have more than half of their populations living informally. Yet by their nature, informal settlements are not well covered by statistics. 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. Milton Santos, one of the most advanced thinkers of his time, said poverty is the worst form of pollution. In formal settlements are living proof that we are not planning our cities well.

Often statistical agencies and city autho- rities report high levels of access to basic services, such as potable water, waste collection and sanitation, when the situa- tion on the ground may be very different because of the presence of informal settlements. What are the challenges in 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 may rightly say “100% coverage”, while the city as a whole may drop down to 70%. The Green City Index is comparative within a region, that is, comparing African cities with each other, the distortion won’t be that serious. If we compare across regions, for example, between Africa and Asia, we have to be a little more careful. Let me give you an example. A slum in Nairobi has piped water supply to within 50 metres of households. People theoretically have access to piped water supply, but when the water is only switched on at certain times of the day, you begin to see that people are queuing up for water for hours. There is a gender issue as well. Most of the people in the queue are older women and young girls. If young girls are waiting to fetch water, they are not going to school, which leads to a snowball effect. Another example: slums in Nairobi may have one toilet for 200 people – a statistic that will say they have access to sanitation.

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 buildings and services in informal settlements, as opposed to removal and demolition. Several communities with their own social, cultural and economic networks. A lot of the reason why people don’t move from the informal settle- ment is because it provides them with access to jobs, or services they would otherwise have to pay considerably more for. Also, in terms of location, they are ideal. Most slums start at 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 of informal settlements is also asking people to move from a neighbourhood where they’ve lived for a good part of their life, if not their whole life.

What can national governments in Africa do to support cities in their efforts to achieve environmentally sustainable growth? The most important step that national governments in Africa should take is the formulation of a national urban policy. They should also give a dedicated government ministry the responsibility for executing the policy. For the moment only a handful of African countries have adopted urban development policies and, even in some of those countries, the responsibility for monitoring, reporting and implementation remains split between different government entities. The result is poor coordination and poorly in- formed decision making.

What are the most important steps that cities in Africa 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 of each other. We must look at the city or the metro region as a whole. Competing jurisdictions are one of the biggest obstacles to sustainable urbanisa- tion. Most metropolitan areas cut across multiple jurisdictions, with different elected bodies and local government structures. You could be busy trying to green your city, but half of the popula- tion that depends on your city may fall under different planning and regulatory regimes, and service providers that are engaged in establish- ing the next shopping mall, the next golf course, the next exurb. The city is a living organism, that organism needs to be managed as a single entity, and just like any living organism, it needs to develop holistically.
Energy and CO2: Reducing the carbon footprint in Cape Town

Cape Town’s below average score in the energy and CO2 category comes in part from the second highest rate of electricity consumption in the Index, but even more from the type of energy it uses to meet this demand: 93% of the city’s electricity comes from coal. The result is that Cape Town’s annual per-capita emissions from electricity consumption, at an estimated 4,099 kg, are more than four times the Index average of 984 kg. To a large degree the causes of Cape Town’s problems are beyond its control. Eskom, the company that dominates South Africa’s electricity consumption, at an estimated 4,099 kg, is considering applications to build 40 more wind farms in the province.

Best green initiatives

African Green City Index

State Environmental Protection Agency has established a Carbon Credit Centre to deal with carbon credit consultations, transactions, applications and trading, and also to promote potential clean energy deals.

Pretoria: During the past two years the city has installed more than 12,000 solar water heaters in a number of communities in the metropolitan area through an investment by the national Department of Energy. As well as reducing energy consumption and associated emissions, the water heaters have no cost apart from their initial installation and are popular among lower-income households.

Land use: Combining social, economic and environmental revitalisation in Johannesburg

Ten years ago the heart of Johannesburg had many dangerous, dilapidated neighbourhoods and business generally stayed away. Since then a dramatic turnaround has taken place in no small part due to the work of the Johannesburg Development Agency (JDA). The city set up the agency in 2001 with the remit to regenerate decayed inner city areas, and promote economic development and quality of life. The agency’s work has integrated urban environmental improvements with social and economic development. Environmentally, the agency’s efforts are helping to curb urban sprawl by drawing residents back to the rehabilitated city centre. In these central neighbourhoods, the city has built new mixed-income houses, has increased access to municipal services and extended the public transport network, including bus rapid transit.

The JDA has brought together a wide range of stakeholders and city departments on its projects. In particular, it has focused on using the existing assets of neighbourhoods in order to create a vibrant city. The regeneration in the Constitution Hill neighbourhood, for example, used the new home of the country’s Constitutional Court as an anchor. The Jeppestown Station Precinct Project created a more secure area friendly to pedestrians, revived an existing transport interchange and drove business to the local market. Perhaps the best known JDA project was the transformation of Newtown, an inner-city area that had the feel of a derelict wasteland. At first, steps the agency boosted the sense of security in the neighbourhood by installing closed-circuit television cameras and refurbishing public buildings. It continued by improving access through projects such as the now iconic Nelson Mandela Bridge. In addition, more than 2,000 housing units have been built or are planned. The core of the redevelopment is an investment in culture, refreshing the historic Market Theatre and Constitution Hill neighbourhood, for example, attracting visitors to Museum Africa, the country’s national history museum. The JDA’s efforts are creating urban neighbourhoods that are attractive to business as well as to individuals. In 2009 it estimated that the Constitution Hill and Newtown projects had each received around US$300 million in private investment after regeneration efforts began.
The city master plan calls for Addis Ababa: Highlights from other cities:

Addis Ababa: The city master plan calls for the recovery of existing city parks and the establishment of new ones. The most significant new green space will be a pedestrian linear park winding some 5 km through the city centre.

Casablanca: In the past two years officials have been running pilots throughout the metropolitan area to test the viability of “urban agriculture”, which incorporates green space into urban centres and provides another food source and Research.

Dar es Salaam: The Aga Khan Foundation, an international non-governmental organisation, is trying to introduce traditional Swahili building methods, which include using shade and breezes to cool buildings, and using local mud and thatch instead of imported steel and glass. Although these will be difficult to realise on a large scale, some of the principles of Swahili architecture can help show the way for superior and greener new developments.

Transport: Investing billions in the public transit network in Cairo

Traffic in Cairo has a bad reputation. Roughly 80% of intersections in central Cairo and Giza are saturated, the city has a high accident rate, especially among pedestrians, and public transport is under-developed by international standards. However, Cairo is above average among the 15 cities in the African Green City Index for the length and relative sophistication of its metro system. The city has the only substantial metro system. And the national government, which oversees environmental policy in Egypt, is trying to address its transport problems through investments and new policies.

To begin with, the metro is in the middle of a US$3.7 billion extension that will create two east-west lines to complement the existing ones that run broadly north-south. Construction of phase one of a third line began in 2006 and a second phase started in 2009. The first phase is due to open in January 2012. The ministry of transport expects that when the second phase is complete within the next two years, the capacity of the whole metro system will rise from 2.5 million passengers daily to 4.5 million. Moreover, the government is upgrading and extending the nearly century-old tram system and this may involve connections with the metro. Buses will also see improvement. Egypt has received funding for the Urban Transport Infrastructure Development Project from the World Bank. Initially, this will involve replacing the existing energy inefficient buses with 1,100 compressed natural gas ones. The first 200 of these took to the road in June 2010, with the rest scheduled to appear by 2012.

Finally, the Carbon Finance Vehicle Scraping and Recycling programme aims to get near-by 50,000 taxi drivers with vehicles more than 20 years old to replace them with new ones. So far the scheme has been very successful, with 20,000 vehicles replaced in 2009 alone. This is the first transport programme in the world to be registered with the UN Framework Convention on Climate Change’s Clean Development Mechanism. There is no one solution to making Cairo’s transportation sustainable, but progress on a wide number of fronts should slowly help.

Johannesburg and Pretoria: The high-speed train line, the Gautrain, which links downtown Johannesburg to Pretoria, is already operational and work is underway on one final station. For Pretoria, the new service offers a long-awaited alternative to driving between the cities and will greatly reduce the amount of traffic.

Tunis: The city is investing US$2 billion in public transport network improvements. In November 2008 the city completed a 6.8 km extension to the light rail network in the south of the city and a 5.3 km western extension was completed in December 2009. Two further extensions are also under way. An additional suburban network is planned by 2016. The city also has plans to introduce 14 new bus rapid transit corridors, totalling 90 km.

Lagos: In March 2008 bus rapid transit was introduced by the Lagos State government in conjunction with the private sector. This was promoted as an affordable, reliable and safe means of travelling while significantly reducing congestion on the city’s roads. The buses, running in dedicated lanes, can reduce journey times by 30%. In 2010 there were 220 buses in operation. In its two years of operation 120 million passengers have used the system, reducing carbon emissions by an estimated 13%.

Waste: Lagos turns waste into wealth

Before 2005 the amount of waste piling up on the streets of Lagos regularly led commentators to talk of a crisis. The situation has improved to such an extent that when former US President Bill Clinton came to the city in April 2011, he praised the great strides that the state government had made in this area.

The challenge of waste management remains, but the government has been actively implementing a new strategy through its rebranded department, the Lagos Waste Management Authority (LAWMA). Under LAWMA’s waste-to-wealth programme, waste is treated not only as a problem but as a potential asset. As a result, currently around 10% of the city’s waste is converted to other uses. Programs include recycling facilities that turn 30 tonnes a day of plastic and nylon waste into shopping bags, among other items. A paper waste processing plant recycles 10 tonnes of waste daily.

The effort has only just begun. The state government hopes to nearly triple the rate of waste conversion to 35% by 2015. It recently announced that it would be setting up 1,000 recycling banks around the city. To deal with what residents leave in these containers, a new recycling facility will be built in cooperation with the Clinton Climate Initiative. When complete, it will be able to
recycle or compost 300,000 tonnes of solid waste annually. By tackling waste aggressively, Lagos has become not only a better place to live, but a more sustainable one.

Highlights from other cities:

Cape Town: The city has a number of ongoing initiatives and plans to reduce waste generation. For example, it is running a pilot scheme in some suburbs to have residents separate waste from recyclables before collection. There is also an internet-based Integrated Waste Exchange website, which allows businesses and the public to exchange potentially useful waste materials. The city has also published a detailed Smart Living Handbook encouraging residents to reduce, reuse and recycle waste in their homes.

Maputo: In 2007 the city piloted a waste management project in informal settlements that lack paved roads. The city contracted with a local waste management project in informal settlements that lack paved roads. The city contracted with a management company to collect household waste on the informal sites, which allows businesses and residents to separate waste from recyclables.

Lydec, the city’s private contractor in charge of water and sanitation services, has upgraded the city’s water network and improved the supply of drinking water to a number of sectors. It has also implemented a programme to improve the wastewater network and eliminate the discharge of waste into the sea.

Durban: In 2000 the city’s water service launched a sewage education programme in a bid to reduce damage to the city’s sewerage network. The campaign, which includes toolkits, road shows and street theatre performances, appears to have had a positive impact, with blockages in the system down significantly. Durban’s water department was invited to create a toolkit to be used in urban Kenya and then possibly elsewhere on the continent.

Highlights from other cities:

Cairo: The Aga Khan Trust for Culture has under- taken a programme to rehabilitate water and sanitation facilities in the Darb al-Ahmar quarter of Cairo’s Old City. The sewerage system, which previously did not reach all the houses, has been extended, and lead pipes have been replaced.

Durban: Already among the Index leaders in sanitation and emphasising the importance of access to uninterrupted water supply in the city, Durban has created toolkits that advise businesses and individuals on how to reduce their carbon footprints. It also runs a Facebook page intended to engage a broader spectrum of local residents. The initiative in being implemented in conjunction with Sustainable Cities, a Canadian non-governmental organisation, and the PLUS Network, a network of 35 cities in the US, Canada, South America and around the world sharing experiences in sustainability planning.

Highlights from other cities:

Accra: As part of Ghana’s participation in the UN Convention on Climate Change, the national environmental protection agency is preparing a national greenhouse gas inventory report that will identify greenhouse gas emissions from the different sources between 1990 to 2006. Work on the inventory began in 2008 and the report is expected to be released in late 2011. The results of the study will be used to develop a national climate change mitigation strategy.

Dakar: In 2007 the city piloted a waste management project in informal settlements that lack paved roads. The city contracted with a local waste management project in informal settlements that lack paved roads. The city contracted with a management company to collect household waste on the informal sites, which allows businesses and residents to separate waste from recyclables.

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Environmental governance: Imagining a more sustainable Durban: Durban, already among the Index leaders in environmental governance thanks to its large environmental management department, is also blazing trails by engaging civil society to build a long-term vision for the city. To that end, the city council introduced the Imagine Durban initiative on integrated, long-term planning. Imagine Durban is a comprehensive programme aimed at improving all aspects of life in the city from safety, accessibility and culture to environmental sustainability.

A wide range of goals have already been set in collaboration with citizens, non-governmental organisations and other civil society players. These include a 20-year target to become a zero-waste city and a goal to become carbon-neutral by 2050. Imagine Durban has developed toolkits that advise businesses and individuals on how to reduce their carbon footprints. It also runs a Facebook page intended to engage a broader spectrum of local residents. The initiative is being implemented in conjunction with Sustainable Cities, a Canadian non-governmental organisation, and the PLUS Network, a network of 35 cities in the US, Canada, South America and around the world sharing experiences in sustainability planning.
The African Green City Index measures the environmental performance of 15 major African cities and their commitment to reducing their environmental impact. Cities were chosen with a view to representing major African countries, and include capital cities or leading business capitals selected on the basis of size, geographical spread and data availability. In cases where there was a significant lack of data relating to a city, the city was omitted from the ranking, as was the case with Algiers, for example.

The Economist Intelligence Unit (EIU) developed the methodology in cooperation with Siemens. An independent panel of international experts in the field of urban sustainability provided important insights and feedback on indicator selection. The methodology builds on the work of previous Green City Indexes (Europe, Germany, Latin America, Asia, and US and Canada) and aims to closely follow their structure. However, to be applicable to Africa, the EIU has adapted the methodology to accommodate variations in data quality and availability, and environmental challenges specific to the region.

The Index scores cities across eight categories – energy and CO₂, land use, transport, waste, water, sanitation, air quality and environmental governance – and is composed of 25 individual indicators. Twelve of the indicators are based on quantitative data and aim to measure how a city currently performs – for example, its level of CO₂ emissions from electricity consumption, proportion of population living in informal settlements, level of waste production and access to sanitation. The remaining 13 indicators are qualitative assessments of each city’s policies, regulations and ambitions – for example, its commitment to reducing the environmental impact of energy consumption, development of green spaces and conservation areas, reducing congestion, and recycling waste.

Data collection
A team of contributors from the EIU collected data between April 2010 and May 2011. Whenever possible, the data were taken from publicly available official sources, such as national or regional statistical offices, local city authorities, local utilities companies, municipal and regional environmental bureaux, and environmental ministries. The data are generally for the year 2009-2010, and where not available, from previous years.

Data quality
The EIU made every effort to integrate the most recent and most comparable figures. The data providers were contacted in cases where uncertainties arose regarding individual data points. Despite all these steps, the EIU cannot rule out having missed an alternative reliable public source or more recent figures.

However, in comparison with other Green City Indexes, the availability and comparability of data across cities was far more limited in Africa. For example, in the air quality category, sufficient data on levels of air pollutants such as sulphur dioxide and nitrogen dioxide were not available for all 15 cities, and therefore could not be included in the Index category “air quality.” Figures for access to electricity, potable water and sanitation were taken primarily from UN Habitat’s State of African Cities report 2010. This source did not include data for all cities in the Index, and in this case other reliable, verifiable sources were used (these are included in the data tables within each city portrait). According to UN Habitat, some attempt was made to include “access” figures for informal settlements, but these remain estimates based on sampling. It is unclear and could not be determined whether the other published sources made an attempt to include informal settlements. In the end, the EIU made the judgment that including the best available data on access was necessary in an environmental index of African cities, even if the definition of access and access within informal settlements for each source was not exactly or uniformly defined. Definitions of access in Africa do not imply convenient access or quality, and certainly do not necessarily imply piped supplies to every home. The EIU has reflected this in the city portraits. The EIU found that cities use varying definitions for some of the data points. This applies in particular to definitions on green spaces, population living in informal settlements and water leakage. In all instances the team of researchers sought to standardise the definition used for the indicator to its maximum extent. However, the EIU cannot rule out that some differences may still exist amongst the data used.
In some cases where there were data gaps the EIU applied theoretically robust techniques to calculate estimates. Regarding the indicator on CO2 emissions, for example, the EIU used international CO2 coefficients provided by the UN Intergovernmental Panel on Climate Change to estimate the CO2 emissions produced by the city’s electricity consumption. The national electricity generation mix – as recorded by the International Energy Association – was generally used as a proxy for the city-level electricity generation mix.

Scoring of 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 scoring zero. In some cases, reasonable benchmarks were inserted to prevent outliers from skewing the distribution of scores. In these cases, cities were scored against either an upper or a lower benchmark or both. For example, the EIU introduced an upper benchmark of 10,000 inhabitants per square kilometre for the indicator ‘population density’ to prevent Cairo – a significant outlier – from skewing the distribution of scores. Qualitative indicators were scored by EIU analysts with expertise in the city in question, based on objective scoring criteria that consider cities’ targets, strategies and concrete actions.

Index construction
The Index is composed of aggregate scores of all of the underlying indicators. It is first aggregated by category – creating a score for each area of infrastructure and policy (for example, energy and CO2 emissions) – and finally, overall, based on the total of the category scores. To create the category scores, each underlying indicator was aggregated according to an assigned weighting. The indicators receive the same weighting within the respective categories. The category scores were then re-estimated onto a scale of zero to 100. To build the overall Index scores, the EIU assigned even weightings to each category score, that is, no category was given greater importance than any other. The Index is essentially the sum of all category scores, re-estimated to 100. This equal weighting reflects feedback from the expert panel.

Owing to concerns that the availability and quality of data are not sufficient enough to allow a detailed ranking of Index results, the African Green City Index results are presented in five performance bands. The cities were assigned to the five groups based on their underlying scores. These bands are built around the mean score and the standard deviation. The standard deviation is a statistical term which describes to what extent approximately 68% of the values differ from the mean. The bands are defined as follows:

Well above average: Cities score >1.5 times the standard deviation above the mean
Average: Cities score between 0.5 times the standard deviation below and 0.5 times the standard deviation above the mean
Well below average: Cities score >1.5 times the standard deviation below the mean

Clusters
In order to conduct a deeper analysis of city trends, the 15 cities in the Index were clustered based on population, area and density. These included:

Population: “small population”, with a population below 3 million; “mid population”, with a population between 3 million and 5 million; and “high population”, with a population exceeding 5 million inhabitants.

Area: “small area”, with an administrative area smaller than 500 square kilometres; “medium area”, with an administrative area between 500 and 2,000 square kilometres; and “large area”, with an administrative area larger than 2,000 square kilometres.

Density: “low density”, with a population of fewer than 2,000 people per square kilometre; “medium density”, with a population between 2,000 and 5,000 people per square kilometre; and “high density”, with a population of more than 5,000 people per square kilometre.

List of categories, indicators, and their weightings in the African Green City Index

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Type</th>
<th>Weighting</th>
<th>Description</th>
<th>Normalisation technique*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population and CO2</td>
<td>Access to electricity</td>
<td>Quantitative</td>
<td>25%</td>
<td>Percentage of households with access to electricity</td>
<td>Min-max</td>
</tr>
<tr>
<td></td>
<td>Electricity consumption per capita</td>
<td>Quantitative</td>
<td>25%</td>
<td>Total electricity consumption, in GJ per inhabitant (1 GJ = 277.8 kWh)</td>
<td>Zero-max</td>
</tr>
<tr>
<td></td>
<td>CO2 emissions from electricity consumption per capita</td>
<td>Quantitative</td>
<td>25%</td>
<td>CO2 emissions, in kg per capita</td>
<td>Zero-max</td>
</tr>
<tr>
<td>Clean energy policy</td>
<td>Quality</td>
<td></td>
<td></td>
<td>Measure of a city’s efforts to reduce carbon emissions associated with energy consumption</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td>Land use</td>
<td>Population density</td>
<td>Quantitative</td>
<td>25%</td>
<td>Population density, in persons per km²</td>
<td>Zero-max; upper benchmark of 10,000 persons per km² inserted to prevent outliers</td>
</tr>
<tr>
<td></td>
<td>Population living in informal settlements</td>
<td>Quantitative</td>
<td></td>
<td>Percentage of the population living in informal settlements</td>
<td>Zero-max</td>
</tr>
<tr>
<td></td>
<td>Green spaces per capita</td>
<td>Quantitative</td>
<td></td>
<td>Sum of all public parks, recreation areas, greenways, waterways, and other protected areas accessible to the public, in metres squared per inhabitant</td>
<td>Zero-max; upper benchmark of 150 m² per person inserted to prevent outliers</td>
</tr>
<tr>
<td>Transport</td>
<td>Public transport network</td>
<td>Quantitative</td>
<td>33%</td>
<td>Consists of two equally weighted sub-indicators: (1) Length of superior transport network, including bus rapid transit, trains, light rail and subway, in km per km² of city area. (2) Length of mass transport network, including dedicated public and private bus routes, in km per km² of city area.</td>
<td>15 km superior transport network: Zero-max; to prevent outliers upper benchmark of 0.2 km² inserted; 25 km mass transport network: Zero-max</td>
</tr>
<tr>
<td></td>
<td>Urban mass transport policy</td>
<td>Quantitative</td>
<td>33%</td>
<td>Measure of a city’s efforts to create a viable mass transport system as an alternative to private vehicles.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td></td>
<td>Urban mass transport policy</td>
<td></td>
<td></td>
<td>Measure of a city’s efforts to create or sustain a viable mass transport system as an alternative to private vehicles.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td></td>
<td>Urban mass transport policy</td>
<td></td>
<td></td>
<td>Measure of a city’s efforts to create or sustain a viable mass transport system as an alternative to private vehicles.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td></td>
<td>Waste generated per capita</td>
<td>Quantitative</td>
<td>33%</td>
<td>Total annual volume of waste generated by the city, including waste not officially collected and disposed, in kg per capita per year.</td>
<td>Zero-max</td>
</tr>
<tr>
<td></td>
<td>Waste collection and disposal policy</td>
<td>Quantitative</td>
<td>33%</td>
<td>Measure of a city’s efforts to improve or sustain its waste collection and disposal system to minimise the environmental impact of waste.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td></td>
<td>Waste recycling and reuse policy</td>
<td>Quantitative</td>
<td>33%</td>
<td>Measure of a city’s efforts to reduce, recycle and re-use waste.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td>Water</td>
<td>Access to potable water</td>
<td>Quantitative</td>
<td>20%</td>
<td>Proportion of population with access to potable water.</td>
<td>Min-max</td>
</tr>
<tr>
<td></td>
<td>Water consumption per capita</td>
<td>Quantitative</td>
<td>20%</td>
<td>Total water consumption, in litres per person per day.</td>
<td>Min-max; cities that consume between 50-100 l/cap宜居点 capacity score full points; cities that consume less than 20 l/cap宜居点 score zero points because their consumption levels are below the UN standard for basic subsistence-level water requirements.</td>
</tr>
<tr>
<td></td>
<td>Water system leakages</td>
<td>Quantitative</td>
<td>20%</td>
<td>Share of water lost in transmission between supplier and end-user, excluding illegally sourced water or on-site hacky systems, in terms of total water supplied.</td>
<td>Zero-max</td>
</tr>
<tr>
<td></td>
<td>Water quality policy</td>
<td>Quantitative</td>
<td>20%</td>
<td>Measure of a city’s policy towards improving the quality of surface water.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td></td>
<td>Water sustainability policy</td>
<td>Quantitative</td>
<td>20%</td>
<td>Measure of a city’s efforts to manage water sources efficiently.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Population with access to improved sanitation</td>
<td>Quantitative</td>
<td>50%</td>
<td>Share of the total population either with direct connections to sewers, or access to on-site sanitation.</td>
<td>Min-max</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Sanitation policy</td>
<td>Quantitative</td>
<td>50%</td>
<td>Measure of a city’s efforts to reduce pollution associated with inadequate sanitation.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Clean air policy</td>
<td>Quantitative</td>
<td>100%</td>
<td>Measure of a city’s efforts to reduce air pollution.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Environmental management</td>
<td>Quantitative</td>
<td>33%</td>
<td>Measure of the extentiveness of environmental management undertaken by the city.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Environmental monitoring</td>
<td>Quantitative</td>
<td>33%</td>
<td>Measure of the city’s efforts to monitor its environmental performance.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
<tr>
<td>Public participation</td>
<td>Public participation</td>
<td>Quantitative</td>
<td>33%</td>
<td>Measure of the city’s efforts to involve the public in environmental decision making.</td>
<td>Scored by EIU analysts on a scale of 0 to 10</td>
</tr>
</tbody>
</table>
Accra is Ghana’s capital city. Stretching along the Atlantic coast, the city covers just 200 square kilometres, which is the smallest administrative area among the 15 cities in the African Green City Index. Accra’s estimated population of 2.3 million (extending to some 4 million square kilometres, which is the smallest administrative area among the 15 cities in the African Green City Index. Accra’s estimated population of 2.3 million (extending to some 4 million people) makes the city the second densest in the Index, behind Cairo. Although Ghana is viewed as one of sub-Saharan Africa’s development success stories, many challenges remain for its capital. The city suffers from what UN Habitat calls an “urban divide” between the rich and poor, especially when it comes to accessing affordable housing and municipal services. Urbanisation was more sudden and rapid than Ghana’s post-colonial government predicted, and as a result the city was unprepared to meet the surging demand for housing and services. Despite the visible challenges, Accra ranks above average overall in the Index. The city’s standout category is environmental governance, where it ranks well above average relative to its peers, with strong scores for environmental management, monitoring and public participation. Other strong areas are air quality and sanitation, where it ranks above average, bolstered by air quality promotion and monitoring, and a robust policy aimed at promoting sanitation. Energy and CO2 is another above average category for Accra, driven by a high rate of renewable electricity and low electricity consumption, but limited supplies and steep prices partly explain the city’s relatively low consumption. Accra’s weakest category is transport, where it ranks below average, largely because of underdeveloped infrastructure and policies.

**Energy and CO2: Above average**

An estimated 49 kg of CO2 is emitted per person in Accra through electricity consumption, well below the Index average of 984 kg. The relatively low CO2 emissions are due in part to a heavy reliance on renewable energy. Nearly three-quarters of Accra’s electricity comes from hydropower. Electricity consumption per capita, at 2.6 gigajoules, is less than half the Index average of 6.4 gigajoules. However, supply limitations and high prices partly explain the relatively low usage. An estimated 84% of households have access to electricity, equal to the Index average, though residents in the city’s numerous informal settlements typically pay three times more for electricity than do residents in wealthier neighbourhoods. Several projects are underway to increase Ghana’s power-generation capacity. The national government has contracted with a Chinese company to build a new source of hydroelectric power – the Bui dam on the Black Volta River in the northwest region. The dam is scheduled for completion in 2013 and is expected to produce 1,000 gigawatt-hours per year. Following the discovery of natural gas fields, the national government is also diversifying away from hydropower; the majority of power generation increases in the coming years will come from gas-fired power plants.

**Transport: Below average**

Public transport is extremely limited in Accra and the city’s inhabitants rely heavily on private vehicles, primarily tro-tros (minivans). Some buses operate infrequently but few people use them, opting instead for smaller and more nimble vehicles to weave through the city’s congested traffic. A lack of dedicated routes also limits the appeal of buses, although plans are in place to build a bus rapid transit route (see “green initiatives” below).

**Green initiatives:** Although the national government’s main renewable priority is hydropower, the state-owned power company, the Volta River Authority (VRA), has also initiated a project to generate 100 megawatts of wind and solar power by the end of 2011 through the installation of solar plants in three northern regions and a coastal wind farm.

**Overall result**

The order of the dots within the performance bands has no bearing on the cities’ results.
are few in number and often difficult to reach. Over the past few years, local groups have stepped up their demands for improved waste collection and disposal. In response, in 2010 the national government reaffirmed its commitment to increasing the private sector’s role in handling waste and sanitation, and the private sector is making investments to improve the city’s waste management system (see “green initiatives” below).

Green initiatives: The private waste collection company operating in Accra has nearly completed construction of a multi-million dollar waste processing plant in the city that will handle 1,200 tonnes of solid waste per day for sorting, recycling and composting. The plant is expected to be operational by March 2012.

Water: Average
An estimated 80% of Accra’s residents have some form of access to potable water, compared with the index average of 91%, and only about 40% have a supply piped into their homes. Just under a third of the water supply is lost due to leakages in the system, which is equal to the Index average. Rapid urbanisation combined with underinvestment in infrastructure has meant that many people must purchase water separately for washing and drinking from private and community service producers. These private vendors distribute water through various mechanisms: sachets (treated water in half-litre plastic sachets), which are sold in shops and on the streets, tanker services, which directly sell water to households from tanker trucks, and domestic vendors, who purchase water from tankers and resell it to households in smaller 15-litre to 20-litre containers. The price and quality of water provided by these various merchants is not regulated, and water bought this way can cost five to ten times more than piped water. Accra’s consumption rate, at 121 litres per person per day, is below the Index average of 187 litres, but the lack of supply is a clear factor. Regarding policies, the city has not embarked on any public promotional campaigns to encourage greater water efficiency. Accra has a relatively high level of water scarcity relative to other cities in the index, leading it to source water from less sustainable sources such as bottled water. Accra is marked up in the Index, however, for having some measures in place to conserve water, such as regulations limiting the amount of water that can be taken from local lakes and rivers.

Green initiatives: The national government is investigating strategies to increase the distribution of piped water in Accra. In 2006 the European Commission spearheaded a five-year, to sanitation facilities earn Accra an above average weighting in this category. Accra is covered by a code outlining strategies and policies to manage sanitation in the city, and the national government works with local agencies to implement the policies. The code is backed by public awareness campaigns around the efficient and hygienic use of sanitation systems. An estimated 88% of the city’s population has access to some form of sanitation, more than the index average of 84%. However, there is still much work to be done in improving the city’s sanitation facilities. Accra’s sewer system only covers a tiny part of the city, around the government ministries and central market. Moreover, the vast majority of the wastewater treatment plants associated with the sewer system either are not functional or are operating below capacity. Indeed, although Accra performs generally well in some of the policy areas covered in the Index, it is marked down for its monitoring of wastewater treatment plants. In addition, a strategy to increase sanitation coverage over the next five to ten years.

Air quality: Above average
Unlike the majority of Index cities, Accra informs citizens about the dangers of air pollution. Air monitoring is also relatively rigorous. Checks are made at various locations throughout the city for levels of nitrogen dioxide, suspended particulate matter, suspended fine particulate matter and carbon monoxide. The transport sector, primarily consisting of the tro-tros, is the dominant source of air pollution in Accra. Authorities take air pollution seriously, particularly from the transport sector, and are taking steps to tackle the problem (see “green initiatives” below). The city benefits from the location of major industrial plants in the geographical city of Tema, about 30 kilometres east of Accra.

Green initiatives: In 2006 the national Environmental Protection Agency (EPA) conducted an assessment of carbon dioxide emissions from the transport sector. On the basis of this study, the agency drafted a plan for an annual vehicle certification regime that would include CO2 emissions. The EPA is exploring collaborations with private companies in order to implement the plan. In addition, the government’s bus rapid transit project aims to reduce air pollution from the transport sector.

Environmental governance: Well above average
Accra is the only city in the Index to place well above average in the environmental governance category. The city’s local government works in partnership with the national EPA to implement environmental policies. The city’s assembly has the power to implement environmental-related regulations, and has a relatively wide remit, encompassing all the main categories monitored by the Index, including sanitation, land use, informal settlements and waste management. In addition, each of those main categories has been subject to a baseline review within the last five years. Accra provides public information on environmental projects and performance. The city also has a process to involve non-governmental organisations and other stakeholders in public meetings on projects that have a major environmental impact.

Green initiatives: One of Ghana’s most noteworthy environmental initiatives is its participation in the UN Convention on Climate Change. As part of this process, the EPA is preparing a national greenhouse gas inventory report, which will identify greenhouse gas emissions from 1990 to 2006. Work on the inventory began in 2008 and the report was expected to be released in late 2011. The results of the study will be used to develop a national climate change mitigation policy.
Addis Ababa
Ethiopia

Addis Ababa is the capital city of Ethiopia. It has one of the smallest administrative areas in the African Green City Index, covering 500 square kilometres. Combined with Addis Ababa's estimated population of 2.7 million, it is one of the densest cities in the African Green City Index, alongside Cairo and Accra. Unlike most other African cities, Addis Ababa has no colonial heritage; rather it was founded by the Ethiopian Emperor Menelik II in 1886 on a mineral spring. Today it is the headquarters for the African Union, an organisation promoting a united Africa, a continent in which Addis Ababa achieves above average ranks in terms of land use, sanitation, air quality and environmental governance. Challenges here are an underdeveloped public transport network, one of the lowest sanitation access rates in the Index and limited policies to improve air quality.

Energy and CO2: Well above average
Addis Ababa's performance in this category is driven by very low rates of electricity consumption and CO2 emissions from electricity. Electricity consumption per capita is among the lowest in the Index, at 1.8 gigajoules, compared with the overall average of 6.4 gigajoules. Estimated CO2 emissions per capita from electricity consumption are 16 kg per capita, versus the Index average of 984 kg. Nearly 90% of Addis Ababa's electricity is produced from renewable energy sources, the bulk of which is hydropower. An increase in dam construction is ensuring cheaper electricity to Addis and an estimated 97% of its households have access to electricity. Prime Minister Meles Zenawi is particularly proud of the proposal for the Renaissance Dam on the Nile, which he claims will supply enough electricity to Addis to become a "green industrial city". However, critics say that Ethiopia's rush to hydropower may falter because of the difficulty in keeping prices affordable for consumers. Blackouts and brownouts are less common than in other African cities, but some 85% of Addis residents still cook meals using wood fire.

Green initiatives: Although most of the city's renewable efforts are focused on large hydro projects, a small-scale pilot is under way to provide solar street lights in Addis Ababa. A US-based private company has won a contract from the city to operate the pilot, which was set to begin in January 2011 with the replacement of ten street lights in the city.

Transport: Below average
Underdeveloped public transport infrastructure and policy shortcomings account for Addis Ababa's performance in this category. The city's separate poor and rich like a "sunny-side up egg", according to experts, but Addis is more like "scrambled egg". The city is razing slums and building apartment blocks in their place. Some 70,000 housing units are being offered under a government-sponsored lottery in which winners pay subsidised prices for new flats.

Green initiatives: The city master plan calls for reforestation of surrounding mountains, the recovery of existing city parks and the creation of new parks. The most significant new green space will be a pedestrian linear park winding some 5 km through the city centre. In addition, the master plan calls for the planting of indigenous trees along other rivers and streams in the city, and the establishment of urban agriculture, with households and neighbourhoods composting organic waste. Regarding buildings, one of the city's most important initiatives is an attempt by the Ethiopian Institute of Architecture, Building Construction and City Development (EIABC) to develop green building codes. Supported by the Swiss Federal Institute for Technology, the EIABC has contracted local private developers to design cheap and green building materials. In particular, the organisation focuses on substituting Chinese-imported steel and glass with local stone, wood and adobe (a mix of sand, clay and straw) to cut building costs by up to a third, and raise environmental and aesthetic standards.

Performance

<table>
<thead>
<tr>
<th></th>
<th>Addis Ababa</th>
<th>Other cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and CO2</td>
<td>well above</td>
<td>below average</td>
</tr>
<tr>
<td>Land use</td>
<td>average</td>
<td>above average</td>
</tr>
<tr>
<td>Transport</td>
<td>below average</td>
<td>average</td>
</tr>
<tr>
<td>Waste</td>
<td>below average</td>
<td>well average</td>
</tr>
<tr>
<td>Water</td>
<td>well above</td>
<td>average</td>
</tr>
<tr>
<td>Sanitation</td>
<td>well above</td>
<td>average</td>
</tr>
<tr>
<td>Air quality</td>
<td>well above</td>
<td>average</td>
</tr>
<tr>
<td>Environmental governance</td>
<td>below average</td>
<td>above average</td>
</tr>
</tbody>
</table>

Overall result

For cities in the Index, the order of the dots within the performance bands has no bearing on the cities' results.
public transport system relies heavily on Addis Ababa, the state-owned bus company, which has a fleet of more than 500 buses, complemented by 12,000 private minibuses. The length of the city’s mass transport network is not far behind the Index average – an estimated 2.2 km per square kilometre, versus the Index average of 2.7 km. But the system itself is outdated and unable to meet demand. Addis Ababa is also one of five Index cities yet to build any form of super-rapid public transport, such as subways, trams, light rail or bus rapid transit lines. Addis benefits from a relatively cohesive culture, with income disparity lower than in many other African cities. This means that the city’s office workers are more likely to travel to work on public transport than in other African cities. For example, some 40% of commuters use the Arbesa buses. By 2020, according to city projections, it will be serving 6 million customers in and around Addis. In addition, Addis Ababa does have a relatively sophisticated traffic management system, but has yet to introduce any car-pooling lanes, no-car days or other congestion reduction initiatives. The city also drops points for not taking any steps to reduce emissions from mass urban transport, as well as failing to encourage citizens to take greener forms of transport.

Green initiatives: Addis has seen major Chinese-funded investment in its city roads – an amount estimated at over US$1 billion by 2015. Traffic congestion has eased with the completion of the Chinese-backed Goetta Interchange on the city’s planned ring road. Additionally, plans are under way to build a light rail line, expected to transport 20,000 passengers a day, though no concrete dates for this project have been announced.

Waste: Average Addis Ababa generates the least waste in the Index, at 160 kg per person, on average, per year. Although much lower than the Index average of 408 kg, the city still suffers to cope. There is only one main landfill site, at Koshe-Repi in southwest Addis, which dates back to the 1960s. City-wide waste collection is absent, instead, city’s neighbourhods (“kebeles”) are responsible for collecting rubbish. This is done in partnership with private companies, but collection costs remain high. In policy area, Addis Ababa is one of only three cities in the Index that does not encourage proper waste management by citizens, failing to impose basic measures such as bans on littering and making waste dumping illegal. Collection points for recyclable material are also absent. Addis Ababa fares slightly better in the collection and disposal of special waste, having facilities to cope with chemical and pharmaceutical rubbish. As with the majority of cities in the Index, Addis Ababa has no collection and disposal facilities for household hazardous waste.

Green initiatives: The Ethiopian government acknowledges the problem and has plans to gradually replace automobiles in the city with electric-powered cars, using tax incentives, although details are limited.

Air quality: Below average Air quality in Addis Ababa is widely regarded as among the poorest in Africa, largely because of air entrapped by the mountains, heavy traffic and high emissions from older vehicles. Studies by the Ethiopian Forum for the Environment show that more than 65% of the vehicles on the road in Addis are over 15 years old – many are Russian Lada cars that form the majority of Addis’s taxi fleet. The burning of rubbish and open fires is another contributor. The city has relatively weak air quality policies to improve the situation – there is no code to improve air quality, for example, nor any monitoring of air pollutants.

Green initiatives: The Ethiopian government acknowledges the problem and has plans to gradually replace automobiles in the city with electric-powered cars, using tax incentives, although details are limited.

Environmental governance: Below average While Addis Ababa has a department dedicated to green issues and policy implementation, it fails to meet any of the criteria set by the Index for either environmental monitoring or public participation. No baseline environmental review has been conducted in the last five years, and no information has recently been published on environmental performance and progress. Addis Ababa is also the only city in the Index that does not involve citizens, non-governmental organisations or other stakeholders in decision-making surrounding projects of major environmental impact. Despite its environmental department, the city of Addis has only limited control of its environmental future. It serves as a loyal arm of the national government. However, given the government ambition to limit imports and improve efficiencies, and the communal nature of the city, there are good prospects for improved environmental governance. The bigger challenge for the city will be translating laws into meaningful enforcement, especially laws regulating state-run enterprises and ministries that are not used to oversight.
Alexandria, Egypt

Alexandria is the second most populous city in Egypt after Cairo. Located between the Mediterranean Sea and Lake Mariout, Alexandria has a population of 4.4 million across a metropolitan area covering 2,300 square kilometres. This makes it one of the least densely populated cities in the African Green City Index. Alexandria has grown significantly in the past 40 years, spurred on by rural-urban migration. It is home to 40% of Egypt’s industry, which is investing in numerous projects (see Green initiatives below) as a result of the strategy, including a policy to ensure the protection of coastal areas and a pollution abatement project.

Transport: Average

Of all cities in the Index, Alexandria has the most comprehensive traffic management measures in place, including traffic light sequencing and traffic information systems, among others. It is also relatively strong on congestion reduction measures, including pedestrian zones. But it is marked down in the Index for a relatively underdeveloped public transport network. At just under 1 km per square kilometre, Alexandria's superior transport network – defined in the Index as comprising subways, trams, light rail or bus rapid transit lines – consists of two tramways measuring 0.02 km per square kilometre, compared with the Index average of 0.07. The government 20 years ago announced the intention to build a 44 km metro system along the coast, but these plans have not moved forward.

Water

Waste

Sanitation

Air quality

Environmental governance

Overall result

Performance

Energy and CO₂

Land use

Transport

Water

Sanitation

Air quality

Environmental governance

Overall result
The city has several main thoroughfares, the coastal road, which runs parallel to the sea and is the main traffic artery in the city, experiences severe traffic congestion during rush hours.

Green initiatives: The national government is considering rolling out its taxi scraping and recycling scheme in Alexandria, which has had considerable success in Cairo. Under the Cairo scheme, taxis more than 20 years old are being recycled and 270,000, or 45,000 to 50,000 over the course of the project. In April 2009 the Ministry of Finance launched the taxi scraping scheme and issued regulations on the sale and private transport. The scheme will be expanded to mass transport vehicles over time. Alexandria is one of the cities on the list for potential expan- sion but no further plans have been announced.

Waste: Well above average

Alexandria has particularly strong policies on waste recycling and reuse when compared with the other 14 cities in the Index. It has on-site and central collection points for recyclables, and accepts a wide range of materials for recycling. The city also enforces environmental standards for waste disposal sites and is the only city in the Index to regulate waste pickers – residents who informally scavange for recyclables and reusable items. The amount of waste generated by the city’s inhabitants, at an estimated average of 209 kg per year, is around half the Index average of 408 kg. Since 2000 Alexandria has employed international contractors, with financial assistance from the US Agency for International Development (USAID), to collect and dispose of the city’s waste. In addition, the government has focused on enhancing private sector participation in the cleaning process and on increasing solid waste management. This privatized system limits the government’s role to monitoring while at the same time involving citizens by adding collection fees to residents’ electricity bills.

Green initiatives: In August 2011 the national government in partnership with Korean investors opened a new chemical waste management plant in Alexandria. The plant is the first of its kind in the region and will treat 20,000 tons of hazardous waste, which is found in fluorescent lamps. The government first proposed the plant in 2007 to combat the problem of mismanaged mercury, which is harmful to plant life and fish. In January 2008 the government first proposed the plant in 2007 to combat the problem of mismanaged mercury, which is harmful to plant life and fish. In January 2008 the government confirmed that the plant was under construction and that it would be ready for operation in 2009. The plant is the first of its kind in the region to deal primarily with mercury waste, preventing pollution and adopting clean technology. The programme also has made a number of recommendations to the city in the future, including the strengthening of partnerships between banks and international organisations, the promotion of community participation in environmental issues and the encouragement of businesses to adopt cleaner policies and practices. In addition, a vehicle exhausts inspection programme has been implemented in 12 governorates, including Alexandria, in cooperation with the Ministry of the Interior. The Ministry of Environmental Affairs has also implemented a programme to change the fuel used by public transport vehicles to natural gas.

Environmental governance: Average

The national government sets environmental policy for the city. It has an executive arm responsible for drafting and implementing environ- mental policy. Alexandria scores well for regu- larly publishing reports on its environmental performance and progress – it is one of only a few cities in the Index to do so. Moreover, Alexandria recently conducted a baseline envi- ronmental review in the water and air quality categories. However, like most cities in the Index, Alexandria does not offer its citizens a central contact point for information on envi- ronmental performance and projects. The city’s governance has benefitted from outside inter- vention by aid agencies mentioned above, including outlining strategies for development, waste and water system upgrades.

Green initiatives: In May 2011 the national government announced plans to discuss creat- ing an environmental information sharing sys- tem between Europe and Arab countries in the southern and eastern Mediterranean regions. The goal would be to develop common environ- mental indicators, environmental reporting norms and processes for data sharing between these countries.

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Average</th>
<th>Alexandria</th>
<th>Year*</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY and CO2</td>
<td>Proportion of households with access to electricity (%)</td>
<td>42.2</td>
<td>99.9%</td>
<td>2005</td>
<td>UN Habitat</td>
</tr>
<tr>
<td></td>
<td>Electricity consumption per capita (GWh/habitant)</td>
<td>6.4</td>
<td>5.7**</td>
<td>2006</td>
<td>Egyptian Electricity Holding Company</td>
</tr>
<tr>
<td></td>
<td>CO2 emissions from electricity consumption per person (kg/person)</td>
<td>342.7**</td>
<td>364.7**</td>
<td>2005</td>
<td>Egyptian Electricity Holding Company</td>
</tr>
<tr>
<td>LAND USE</td>
<td>Population density (people/km²)</td>
<td>431.8</td>
<td>1,895.8</td>
<td>2010</td>
<td>EU Environment Agency</td>
</tr>
<tr>
<td></td>
<td>Population living in informal settlements (%)</td>
<td>18.9**</td>
<td>31.2</td>
<td>2007</td>
<td>SWITCH stakeholder analysis report for Alexandria</td>
</tr>
<tr>
<td></td>
<td>Green spaces per person (m²/person)</td>
<td>0.4**</td>
<td>0.4**</td>
<td>2006</td>
<td>CAPMAS</td>
</tr>
<tr>
<td>TRANSPORT</td>
<td>Length of mass transport network (km/km²)</td>
<td>2.7</td>
<td>1.0</td>
<td>2008</td>
<td>CAPMAS</td>
</tr>
<tr>
<td></td>
<td>Superior public transport network (km/m²)</td>
<td>0.07</td>
<td>0.07</td>
<td>2008</td>
<td>Alexandria Passenger Transport Authority</td>
</tr>
<tr>
<td>WASTE</td>
<td>Waste generated per person (kg/person/year)</td>
<td>40.7</td>
<td>209.2**</td>
<td>2007</td>
<td>Environmental Affairs Agency</td>
</tr>
<tr>
<td>WATER</td>
<td>Water population with access to potable water (%)</td>
<td>79.3</td>
<td>38.8**</td>
<td>2005</td>
<td>UN Habitat</td>
</tr>
<tr>
<td></td>
<td>Water population with access to drinking water (%)</td>
<td>33.7</td>
<td>35.7</td>
<td>2007</td>
<td>SWITCH urban system water modelling report for Alexandria</td>
</tr>
<tr>
<td>SANITATION</td>
<td>Population with access to sanitation (%)</td>
<td>84.1</td>
<td>94.1%</td>
<td>2005</td>
<td>UN Habitat</td>
</tr>
</tbody>
</table>

Notes: * Year refers to the most recent available year. ** Estimation. Data on Alexandria is not available for these categories: (a) Population density, (b) Proportion of households with access to electricity, (c) Electricity consumption per capita, (d) CO2 emissions from electricity consumption per person, (e) Population living in informal settlements, (f) Green spaces per person, (g) Length of mass transport network, (h) Superior public transport network, (i) Waste generated per person, (j) Water population with access to potable water, (k) Water population with access to drinking water, (l) Population with access to sanitation. ** Data is available for Alexandria.”

This table presents Alexandria’s performance relative to the other cities in the Index. If a city did not have data for a given indicator, that city was not included in the calculation. However, for the Index, Alexandria’s performance was included for all indicators except for the accessibility to air quality data, which is not available for Alexandria. Therefore, Alexandria was included in the calculation for all indicators except for air quality. Data is available for Alexandria. 

The national government is considering rolling out its taxi scraping and recycling scheme in Alexandria, which has had considerable success in Cairo. Under the Cairo scheme, taxis more than 20 years old are being recycled and 270,000, or 45,000 to 50,000 over the course of the project. In April 2009 the Ministry of Finance launched the taxi scraping scheme and issued regulations on the sale and private transport. The scheme will be expanded to mass transport vehicles over time. Alexandria is one of the cities on the list for potential expan- sion but no further plans have been announced.

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Environmental governance: Average

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Green initiatives: In May 2011 the national government announced plans to discuss creat- ing an environmental information sharing sys- tem between Europe and Arab countries in the southern and eastern Mediterranean regions. The goal would be to develop common environ- mental indicators, environmental reporting norms and processes for data sharing between these countries.

Quantitative indicators
Cairo is the capital city of Egypt. Located alongside the River Nile, Greater Cairo is home to just under 20 million people and encompasses the governorates of Cairo, Giza and Qalyubia. For reasons of data availability and comparability, data included in the African Green City Index are based on a mix of statistics for Greater Cairo and the inner Cairo Governorate. An estimated 7.1 million inhabitants occupy the 370 square kilometre area within Cairo Governorate; it is consequently the most densely populated city in the Index, with an estimated 19,100 people per square kilometre, compared with the Index average of 4,600.

Cairo is average overall in the Index. The city ranks above average in the transport category, thanks largely to the length of its metro system, operational since 1987, although chronic traffic congestion is still a serious problem. Cairo also performs well for having a relatively high share of the population with access to electricity and potable water. The city ranks average in most other categories. The social upheaval in early 2011 that led to the resignation of President Mubarak ushered in multiple changes of government and a continually shifting political landscape. However, already this year the national government has announced several environmental initiatives that are detailed below.

Energy and CO2: Average
UN-Habitat estimates that almost all households in Cairo have access to electricity, but the city fares less well in curbing electricity consumption. On average, Cairo consumes 8.0 gigajoules of electricity per capita, compared with the Index average of 6.4 gigajoules. Despite high electricity consumption, CO2 emissions from electricity are less than half of the Index average of 984 kg. Nearly 76% of the city’s electricity production is based on natural gas. During the summer months, the use of energy rises and the government in March 2011 announced measures to meet the soaring demand with generators powered by natural gas. Plans are under way to increase the country’s use of renewable energy (see “green initiatives”), which today accounts for around 12% of national electricity production.

Green initiatives: Egypt is a beneficiary of the Clean Technology Fund (CTF), an international, multi-donor trust fund to provide financing for low-carbon technologies with the potential for reducing greenhouse gas emissions. Egypt announced a US$350 million CTF investment plan in April 2011 that involves a combination of renewable energy production, clean transport and solid waste management projects. Under its renewable energy scheme, Egypt hopes to meet 20% of its energy needs from renewable energy by 2020 and to build 7,200 megawatts of wind generation capacity alone. Of this, construction of facilities to generate 400 megawatts has already been financed and plans have been developed for facilities to generate another 600 megawatts. In addition, the government has announced it will construct three pilot waste-to-energy plants in partnership with a private company.

In 2009 it attracted more than two million visitors and has contributed to improving the city’s air quality. The Al-Ashar park development was carried out by the Aga Khan Trust for Culture, an agency of the Geneva-based Aga Khan Development Network, in partnership with the Governorate of Cairo.

Transport: Above average
Cairo benefits from a relatively long mass transit network as well as a new metro system. The Greater Cairo area has the second longest super-rapid public transport network in the Index (defined as metro, trams, light rail or bus rapid transit), at 0.2 km square kilometre, compared with the Index average of 0.07 km, and it is being expanded. The first stations on the city’s third metro line will be operational in 2012. By

In 2011, the government announced several improvements to the city’s transport infrastructure, including new roads, river-based transport and encouraging cycling.

Green initiatives: For centuries, the Al-Darrasa site, located outside the boundary of historic Old Cairo, was used as a place for dumping debris and rubble from the city. With the 2005 inauguration of the Al-Ashar Park, a 30-hectare development in Al-Qanara, this has changed. The park, which provides a 360-degree panoramic view of historic Cairo, has been a huge success.

In September 2011, the government announced plans to invest in several improvements to the city’s transport infrastructure, including new roads, river-based transport and encouraging cycling.

Green initiatives: A major programme is under way to improve traffic congestion and reduce polluting emissions from public transport vehi-

Background indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Cairo</th>
<th>Other cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population (million)</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Administrative area (km²)</td>
<td>370</td>
<td></td>
</tr>
<tr>
<td>Population density (persons/km²)</td>
<td>19,100</td>
<td></td>
</tr>
</tbody>
</table>

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In 2011, the government announced plans to invest in several improvements to the city’s transport infrastructure, including new roads, river-based transport and encouraging cycling.
Waste: Below average
Cairo generates an estimated 457 kg of waste per person per year, more than the Index average of 408 kg. Waste collection is a challenge as much of the waste is generated by the informal sector, particularly in the poorer parts of the city’s historic centre. The prevalence of informal settlements has made waste collection difficult. While several private waste collection companies operate in the city, zabbaleen, waste-collectors from the poorer neighbourhoods who try to make a living from informal payments, also contribute significantly to waste collection and are considered more efficient than private companies. Despite the challenges, Cairo has introduced a policy aimed at encouraging recycling and reuse of waste.

Green initiatives: The government has succeeded in transferring 15 million cubic metres of accumulated municipal waste from the residential areas of greater Cairo to controlled dumping sites, according to the Egyptian Environmental Affairs Agency. In another initiative, a German government agency, GIZ, is carrying out a project to help improve waste management in two poor urban areas in Greater Cairo: Khanika and Khiosos. The project includes an analysis of the current system for waste collection, segregation and recycling, and the development of a new solid waste management strategy that emphasises the role of the informal sector. The Bill and Melinda Gates Foundation has provided a grant of US$3.3 million towards the project.

Water: Average
Cairo consumes 2.7 litres of water per capita per day, more than the Index average of 1.87 litres. This is coupled with an above average high leakage rate of 35%. Although UN-Habitat estimates that almost 100% of residents have access to potable water, compared with the Index average of 91%, the quality of water in Cairo is sometimes poor. Wealthier residents have their own water filtration systems, while visitors to the city drink bottled water. Those who cannot afford such measures are susceptible to a variety of waterborne diseases. Cairo’s residents should benefit, however, from a national initiative to improve the water quality of the River Nile (see “green initiatives” below), Cairo’s main source of drinking water.

Green initiatives: The national government has adopted 12 programmes for the protection of the River Nile. Measures include: preventing the flow of industrial effluents into the Nile, preventing sanitary drainage, managing waste from Nile river vessels, treatment of agricultural waste, solid waste management, periodic monitoring of water cleanliness; and developing a water quality database. Five plants have been established to receive waste from river cruise vessels, including one at Cairo. The plants are equipped to safely dispose of the waste in the sanitary drainage networks.

Sanitation: Average
An estimated 98% of Cairo’s population has access to sanitation. Even so, the standard of sanitation services can vary enormously. In some parts of the city, such as Maadi and Zamalek, sanitation is provided to a high standard. In other parts, particularly in the historic centre, sanitation is provided to a lower standard, with one facility serving many people or facilities not connected to the sewage system. The government is hoping to fund new wastewater projects as part of an overarching public-private partnership investment which was announced recently.

Green initiatives: The Aga Khan Trust for Culture has undertaken a programme to rehabili-
tate water and sanitation facilities in the Darb al-Ahmar quarter of Cairo’s Old City. The sewerage system, which previously did not reach all the houses, has been extended, and lead pipes have been replaced. The programme was carried out in conjunction with measures to improve awareness of health and environment-

Air quality: Average
During the past decade the national government set up 13 air pollutant monitoring sta-
tions in Greater Cairo, and parts of the Nile delta and upper Egyptian region. Of these, six are in the governorates of Cairo and Giza. Although air quality is monitored in different parts of the city, a combination of severe traffic pollution and dust from the desert south of the city makes air quality in Cairo extremely poor. In the autumn smoke from farmers burning rice straw following the harvest also contributes to air pol-
lution. However, the fact that the bulk of the city is paved, particularly in central districts, means that dust generated from the city itself is not as severe as in many African cities. The city’s performance in this category is also bolstered by the presence of a strategy to improve local air quality. The government recently reported that it had achieved the best air quality in a decade in the city following investments in air quality improvements (see “green initiatives” below).

Green initiatives: The national government spent US$1.2 billion to improve air quality in Greater Cairo and the rest of the country between 2006 and 2010. There were several projects involved in the programme, including moving polluting industries out of populated areas, increasing waste collections in informal areas (and thereby reducing waste burning in informal settlements), tree planting and improving Greater Cairo’s network of air moni-

Environmental governance: Average
National agencies oversee environmental policy and monitoring in Cairo. The national environ-
ment ministry is responsible for the formulation and application of environmental policies. The ministry has an executive arm that is responsible for elaborating environmental policy, overseeing implementation of policy, and carrying out pilot projects designed to preserve natural resources and prevent pollution. The city’s performance in this category is helped by its regular monitoring of environmental performance, and some inclusion of citizens and non-governmental organisations in the decision-making process on environmental projects.

Green initiatives: In May 2011 the national government announced plans to discuss creat-
ing an environmental information sharing sys-
tem between Europe and Arab countries in the southern and eastern Mediterranean regions. The goal would be to develop common environ-
mental indicators, environmental reporting norms and processes for data sharing between these countries.

Quantitative indicators

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Cairo</th>
<th>Year*</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY and CO2</td>
<td>Proportion of households with access to electricity (%)</td>
<td>84.2</td>
<td>19.7</td>
<td>2005</td>
</tr>
<tr>
<td>Electricity consumption per capita (GWh/hab)</td>
<td>6.6</td>
<td>0.8</td>
<td>2006</td>
<td>Egypt Information Portal</td>
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<tr>
<td>CO2 emissions from electricity consumption per person (kg/person)</td>
<td>4.6</td>
<td>4.6</td>
<td>2007</td>
<td>Egypt Information Portal</td>
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<tr>
<td>LAND USE</td>
<td>Population density (persons/km2)</td>
<td>4,198</td>
<td>19,085</td>
<td>2010</td>
</tr>
<tr>
<td>Population living in informal settlements (%)</td>
<td>30.0</td>
<td>31.3</td>
<td>2005</td>
<td>ISDC-Egypt Information and Decision Support Centre</td>
</tr>
<tr>
<td>Green spaces per person (m²/person)</td>
<td>0.8</td>
<td>0.8</td>
<td>2007</td>
<td>CAPMAS</td>
</tr>
<tr>
<td>TRANSPORT</td>
<td>Length of mass transport network (km/km²)</td>
<td>2.7</td>
<td>3.7</td>
<td>2008</td>
</tr>
<tr>
<td>Public transport network (km/km²)</td>
<td>0.0</td>
<td>0.24 ±0.1</td>
<td>2008</td>
<td>CAPMAS</td>
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<tr>
<td>WASTE</td>
<td>Waste generated per person (kg/person/year)</td>
<td>10.7</td>
<td>456.9</td>
<td>2007</td>
</tr>
<tr>
<td>WATER</td>
<td>Water consumption per person to potable water (%)</td>
<td>95.2</td>
<td>95.4</td>
<td>2005</td>
</tr>
<tr>
<td>Water consumption per person (litres/person per day)</td>
<td>38.7</td>
<td>237.6</td>
<td>2009</td>
<td>OECD</td>
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<td>System leakages (%)</td>
<td>30.5</td>
<td>35.0</td>
<td>2007</td>
<td>Egyptian Housing Company for Water and Wastewater</td>
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<tr>
<td>SANITATION</td>
<td>Population with access to sanitation (%)</td>
<td>98.2</td>
<td>8.0</td>
<td>2006</td>
</tr>
</tbody>
</table>

Note: 1) Data for Cairo includes greater Cairo and outlying areas. 2) Data from different years were used only for the years of the main indicators (based on EIU estimates). 3) National results for generations vary and include some in listed values.
Cape Town is the second most populous city in South Africa behind Johannesburg. Its 3.7 million inhabitants occupy a metropolitan area of just below 2,500 square kilometres, which is the second largest area in the African Green City Index behind Lagos. Aside from Pretoria, Cape Town is the least densely populated city in the Index. Located at the northern end of the Cape Peninsula and with a mild climate, it is one of the most popular tourist destinations in Africa. The city is also a base for IT and manufacturing companies, and has undergone a recent construction boom largely due to the 2010 World Cup. The legislative capital of South Africa, Cape Town is also home to the country’s World Cup. The city has also undergone a recent construction boom largely due to the 2010 World Cup. The city is also a base for IT and manufacturing companies, and has undergone a recent construction boom largely due to the 2010 World Cup. The legislative capital of South Africa, Cape Town is also home to the country’s World Cup. The city has also undergone a recent construction boom largely due to the 2010 World Cup. The legislative capital of South Africa, Cape Town is also home to the country’s World Cup.

Cape Town ranks above average overall in the Index. The city has some of the most robust environmental policies among index cities in most categories, which bolsters its strong performance. In some categories – such as energy and CO2, and waste – Cape Town does not perform well on quantifiable metrics, yet scores very well on policy. Its best category performance is in land use, where it is the only city that places well above average. In this category, strong policies go hand in hand with abundant green spaces and a relatively low percentage of people living in informal settlements. Underpinning much of Cape Town’s policy efforts is the city’s Energy and Climate Change Action Plan, which has set multiple targets and recommended various initiatives to improve green performance.

Energy and CO2: Below average
Cape Town is marked down for having the highest CO2 emissions per capita from electricity consumption in the Index, producing an estimated 4,099 kg, around four times the Index average of 984 kg. The city relies heavily on electricity produced from coal, which accounts for 93% of total supply. Only 2% of electricity production is generated by renewable sources. Electricity consumption is also relatively high, at an estimated 13.9 gigajoules per capita, compared with the average of 6.4 gigajoules. This is in part due to high consumption in wealthier households and cheap residential electricity prices in recent years that have not encouraged conservation. An estimated 90% of households have access to electricity, compared with the Index average of 84%. Although Cape Town is marked down for its CO2 emissions and electricity consumption, the city has the most robust clean energy policies in the Index, including its Energy and Climate Change Action Plan (see “green initiatives” below). It is also making efforts to source more renewable energy, including wind power.

Green Initiatives: City officials have drafted a comprehensive Energy and Climate Change Action Plan, which identifies 11 key objectives. While the plan covers a broad range of sectors, including transport and education, the first objective calls for a 10% reduction in electricity use city-wide by 2012; in the second objective the city aims to source 10% of its energy from renewable sources by 2020; and the third mandates a 10% reduction in energy consumption from council operations by 2012. Already 130 projects are under way across the city as a result of the plan. Programmes to achieve its goals include installing 300,000 solar water heaters across the city by 2015 and retrofitting public buildings with energy efficient lights.

Land use: Well above average
With just 1,500 people per square kilometre, versus an overall average of 4,600, Cape Town has the second lowest population density in the Index. It has grown rapidly over the past decade and faces the challenge familiar to other African cities of finding the right balance between environmental sustainability and economic necessity. The city has approached this dilemma proactively, implementing measures to contain urban sprawl that are currently being updated (see “green initiatives”). Home to multiple nature reserves containing some of the world’s rarest plant species, Cape Town has the most green space in the Index. The city boasts an estimated 289 square metres of green space per person, about four times the Index average of 74 square metres. A local environmental resource management department oversees Cape Town’s green spaces and environmentally sensitive areas. The city also has a robust set of policies to protect these areas. Furthermore, it has the second lowest share of its population living in informal settlements, at an estimated 17% compared with the Index average of 39%.

Green Initiatives: As part of the Climate Change Action Plan, the city has updated its development guidelines, which address urban sprawl, among many other issues. The new plan, currently with the Western Cape provincial government for approval, also promotes sustainable building design, construction and renovation. The city is looking to adopt urban planning principles that encourage non-motorised transport and create more open spaces that can be used for recreation.

Transport: Above average
Cape Town has invested US$5.8 billion over the past six years in developing a new bus rapid transit (BRT) network (see “green initiatives”). As a result, it is among the top cities in the Index for the length of superior forms of transport, such as metro, tram or BRT lines. The city’s superior public transport system measures 0.11 km per square kilometre, compared with the Index average of 0.07 km. Transport, however, is still dominated by private vehicles, taxis and minibuses, and congestion remains a challenge. While there is an extensive network of suburban rail lines, these are not adequately maintained and rapidly growing areas in the west of the city are poorly served. New investment in this network.

Performance Table: Cape Town's performance compared to other cities

<table>
<thead>
<tr>
<th>Category</th>
<th>Cape Town</th>
<th>Other cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and CO2</td>
<td>Below average</td>
<td>above average</td>
</tr>
<tr>
<td>Land use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental governance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall result</td>
<td></td>
<td>above average</td>
</tr>
</tbody>
</table>

The city of Cape Town’s relative performance in the green city index.

Cape Town’s Green City Index Performance Overview

- **Energy and CO2**: Below average
- **Land use**: Well above average
- **Transport**: Above average
- **Sanitation** and **Water**: Well above average
- **Air quality** and **Environmental governance**: Below average
- **Overall result**: Above average

With a strategic focus on sustainability and economic necessity, Cape Town has made significant strides in improving its green performance. The city’s Energy and Climate Change Action Plan, coupled with initiatives to improve land use and transport, position Cape Town as a leader in environmental governance and economic sustainability.
has been announced, although it will be driven by the national performance in this category is bolstered by policies aimed at encouraging commuters to use public forms of transport and by the existence of dedicated mass transport lanes.

Green initiatives: In 2009, ahead of the World Cup, the city launched the first phase of its new BRT network, known as MyCiti. The first phase included an inner city loop, a commuter route serving the West Coast, and links to the airport. By 2012 a network of nine permanent BRT bus routes is expected to be launched in the central city. By 2013 it is expected that an express service between the townships of Mitchells Plain and Goodwood on the Cape Flats will link to the central business district.

Waste: Above average

Waste generation in Cape Town on a per capita basis is the second highest in the Index, at 573 kg, compared with the index average of 408 kg. Despite this, the city’s good performance in this category is due to strong policies relative to the other 14 cities in the Index. Cape Town monitors and enforces standards for industries to properly dispose of hazardous waste, for example. In addition, a number of schemes are in place to reduce waste generation (see “green initiatives”). Recycling facilities are widely available, with on-site and collection points, including several community drop-off facilities for large items, construction rubble and recyclables. Nevertheless, population growth is putting pressure on waste management and the city is rapidly running out of landfill space at its three main sites.

Green initiatives: The city has a number of ongoing initiatives and plans to reduce waste generation. It is running a pilot scheme in some suburbs to have residents separate waste streams for recyclables before collection. There is also an Integrated Waste Exchange website, which allows businesses and the public to exchange potentially useful waste materials. Furthermore, under Cape Town’s Extended Producer Responsibility policy, city procurement guidelines ensure that companies that operate take-back programmes for items they sell, such as used printer cartridges and glass bottles. In addition, the city has published a detailed Smart Living Handbook encouraging residents to reduce, reuse and recycle waste.

Water: Above average

Cape Town performs very well for its policies related to water quality and sustainability. A code is in place to monitor and sustain surface water quality, and industrial water pollution standards are enforced. The 2011 Water Services Development Plan sets a target to provide water to all residents by financial year 2015/2016. However, with an estimated 91% of residents having access to potable water (which is on par with the Index average), Cape Town will need to make considerable progress in this area in the coming years. While the city consumes 225 litres of water per capita each day, compared with the index average of 187 litres, it aims to reduce water consumption to 180 litres per capita per day by 2014. To this effect, the city is targeting water leakages. Although it already has the lowest leakage rate in the Index, losing 10% of volume, compared with the index average of 30%, Cape Town is nonetheless trying to improve the efficiency of its water system (see “green initiatives” below).

Green initiatives: The city has an ongoing programme to help residents of poorer households reduce high water bills by fixing water leaks, as well as promotional flyers printed in English, Afrikaans and Xhosa, three of the country’s 11 official languages. In addition, more than 45,000 households have the power to conduct spot checks. The council has also produced a booklet explaining what residents can do to reduce air pollution.

Environmental governance: Above average

The city has conducted an environmental baseline review for areas such as water and sanitation, waste, energy, and climate change within the last five years. Regular reports are also published on green performance and progress. Environmental policy is overseen by the city government’s Environmental Resource Management (ERM) department is directly responsible and works in close collaboration with other city departments such as Electricity, Water and Sanitation, Transport, Solid Waste Management, and City Health. There are committees to address energy issues and climate change, and they often collaborate across departments under named, such as “energy security” and “carbon mitigation”.

Green initiatives: Cape Town runs environmental awareness trainings, including sessions for 23,000 city staff members on how to implement sustainability advice contained in the Smart Living Handbook. Officials have proposed building a Smart Living Centre that would include exhibits and educational activities for the public related to sustainability. The proposal is still at the planning permission stage, but organisers have proposed several facilities within the centre, including an organic farmers’ market and a recycling centre.

Quantitative indicators

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Average</th>
<th>Cape Town</th>
<th>Year*</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY and CO2</td>
<td>Proportion of households with access to electricity (%)</td>
<td>84.2</td>
<td>89.7*</td>
<td>2009</td>
<td>General Household Survey 2009</td>
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<td></td>
<td>Electricity consumption per capita (kWh/ab)</td>
<td>6.4</td>
<td>13.9*</td>
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<td></td>
<td>CO2 emissions from electricity consumption per person (kg/person/year)</td>
<td>483.7</td>
<td>4,060*</td>
<td>2009</td>
<td>State of Environment Report 2009</td>
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<td>LAND USE</td>
<td>Population density (persons/km²)</td>
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<td>1,306*</td>
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<td>ERL calculation</td>
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<td></td>
<td>Population living in informal settlements (%)</td>
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<td>17.0*</td>
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<td></td>
<td>Green spaces per person (m²/person)</td>
<td>73.6</td>
<td>285.5*</td>
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<td>City of Cape Town GIS data</td>
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<td>Length of mass transport network (km/km²)</td>
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<td>1.9*</td>
<td>2010</td>
<td>Golden Arrow Bus Company</td>
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<td></td>
<td>Superior public transport network (km/km²)</td>
<td>0.07</td>
<td>0.11*</td>
<td>2010</td>
<td>City of Cape Town GIS</td>
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<td>WASTE</td>
<td>Waste generated per person (kg/person/year)</td>
<td>67.7</td>
<td>572.9*</td>
<td>2010</td>
<td>City of Cape Town Solid Waste Minimization and Disposal Statistics Database</td>
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<td>WATER</td>
<td>Population with access to potable water (%)</td>
<td>97.2</td>
<td>91.4*</td>
<td>2009</td>
<td>General Household Survey 2009</td>
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<td></td>
<td>Water consumption per person (litres/person per day)</td>
<td>137.2</td>
<td>205.2*</td>
<td>2009</td>
<td>City of Cape Town, Environmental Resource Management Department</td>
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<tr>
<td></td>
<td>Water system leakages (%)</td>
<td>10.5</td>
<td>10.0*</td>
<td>2009</td>
<td>City of Cape Town, Environmental Resource Management Department</td>
</tr>
<tr>
<td>SANITATION</td>
<td>Population with access to sanitation (%)</td>
<td>96.1</td>
<td>94.1*</td>
<td>2009</td>
<td>General Household Survey 2009</td>
</tr>
</tbody>
</table>

*In 2009/2010, Cape Town used standardized household sizes. When data have differed prior years have used only the year of the main calculation is bold. e = estimate. b = baseline. *Number of households (1,521) and quality controlled by average roughness of scale (1.5, 1.5).}
Background indicators

<table>
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<tr>
<th>Total population (inhabitants)</th>
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<tbody>
<tr>
<td>Administrative area (km²)</td>
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<tr>
<td>Population density (persons/km²)</td>
<td>3,300</td>
</tr>
</tbody>
</table>

African Green City Index

Casablanca is Morocco’s chief port and largest city, with 3.4 million people across the metropolitan area. Situated on the Atlantic Ocean, the city is a conglomeration of several urban centres and has a large industrial presence. It is the fourth largest port in Africa, handling more than 500,000 containers a year. In all, the city is responsible for 60% of Morocco’s trade and is home to 46% of the country’s workforce. Casablanca relies heavily on a private concessionaire to deliver a range of essential services, such as electricity, water and sanitation. Privatization has led to a range of investments in public infrastructure in recent years. On the whole this arrangement has worked well, which is reflected in the city’s performance in the African Green City Index. Indeed, the concessionaire, rather than the city itself, is responsible for many of the green initiatives detailed in this city portrait. One downside to this policy is that without direct control, city authorities do not always have a quick remedy when things go wrong. Casablanca ranks above average overall in the Index, and places above average for five individual categories: energy and CO₂, land use, water, sanitation and air quality. It does not fall below average in any category. Particular strengths when compared with the other 14 cities in the Index include relatively high levels of access to electricity, potable water and sanitation, and a relatively low number of residents living in informal settlements. Policies in these areas are also comparatively strong. Challenges include making waste collection and disposal more consistent across the city, and the need for improvement in overall environmental monitoring. There is some hope that the uprisings around the Middle East and North Africa, which also centre on providing better services and living conditions for the population, may help to accelerate improvements.

Energy and CO₂: Above average

An estimated 99% of households in Casablanca have access to electricity, one of the highest percentages in the Index and above the Index average of 84%. Electricity, water and sanitation services are provided by Lydec, a private-sector consortium. Although Lydec has improved the city’s power network since it began operations there in 1997 (see “green initiatives”), there have been complaints about high prices. Electricity consumption remains relatively low, measuring 5.0 gigajoules per capita and below the Index average of 6.4 gigajoules. CO₂ emissions from electricity consumption are also lower than the average, at an estimated 405 kg per capita versus an Index average of 584 kg. Casablanca has one of the highest volumes of CO₂ emissions per capita from electricity consumption in the Index. That’s because more than half of the city’s electricity production is generated from coal, while only 8% comes from renewable sources.

Performance

<table>
<thead>
<tr>
<th>Category</th>
<th>Casablanca</th>
<th>Other cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and CO₂</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td></td>
<td></td>
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<tr>
<td>Waste</td>
<td></td>
<td></td>
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<tr>
<td>Water</td>
<td></td>
<td></td>
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<tr>
<td>Sanitation</td>
<td></td>
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<tr>
<td>Air quality</td>
<td></td>
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<tr>
<td>Environmental governance</td>
<td></td>
<td></td>
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<tr>
<td>Overall result</td>
<td></td>
<td></td>
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</tbody>
</table>

Green initiatives: The government has a development strategy that aims by 2030 to rehabilitate the city centre, bring more balance in living standards between the eastern and western regions of greater Casablanca, and improve conditions in informal settlements, including building new parks. In the past two years, officials have been running pilot programmes around the metropolitan area to test the viability of “urban agriculture”, which incorporates green space into urban centres and provides another food source for the city. The project receives funding from the German government’s ministry of education and research. A new football stadium is also under construction. The development of the 80,000-seat stadium, a high-profile project for the city, includes plans for the creation of green space, a new element of urban planning in Casablanca.

Transport: Average

The city’s public transport network measures 1.4 km per square kilometre, less than the Index average of 2.7 km. Transport connections are concentrated on the city centre with few links to peripheral areas, meaning that commuters on public transport from the suburbs are often lengthy and complicated. On a policy level, the city has made little effort on initiatives to tackle traffic congestion and there are no exclusive bus lanes in the greater area.
lanes that might encourage greater take-up of public transport. However, the city’s first tramway is under construction (see “green initiatives” below).

Green initiatives: Casablanca’s first 30 km tramway will have just under 50 stops and connect Sidi Moumen in the east, to Hay Hassan and the Quartier des Facultés in the west via the city’s historic centre. The government says the line will carry 250,000 passengers a day; operations are slated to begin in December 2012. Another 150 km line, along with a suburban rail link, is eventually planned to connect Mohammedia in the north of greater Casablanca with Nouaceur in the south. Additionally in 2011 the Moroccan government began works on a high-speed TGV train linking Casablanca to Rabat and Tangiers.

Water: Above average

While it is estimated that all Casablanca residents have access to potable water, the city’s consumption level, at 89 litres per person per day, is about half the Index average of 187 litres. The efficiency of the city’s water system, which is run by Lydec, is about average by the standards of the Index. The system loses an estimated 28% of volume to leaks, compared with the Index average of 30%, but work is under way to improve that performance (see “green initiatives”). Policy areas are also relatively strong. Casablanca is one of only a few cities in the Index with a code aimed at reducing strain on its water resources and consuming water more efficiently. Water quality standards have also been set, which is relatively rare among the other cities in the Index.

Green initiatives: Lydec has upgraded the city’s water network and improved supply of drinking water to a number of sectors. The Merchich pipe, which supplies water to Mohammed V, the city’s main airport, has also been renovated. In addition, work is under way to minimise system leakages by installing Flow meters to better monitor water volumes.

Sanitation: Above average

An estimated 99% of the city’s population has access to sanitation, exceeding the Index average of 84%. Sanitation policies are generally robust as well. Casablanca has a sanitation code in place and it has also set minimum standards for wastewater treatment, backed up by regular inspection. Lydec has been responsible for many of the improvements in sewage management in recent years. Even so, challenges remain. Some of the country’s biggest industrial facilities, located at Mohammedia in greater Casablanca, often pump waste and wastewater directly into the sea, a problem that Lydec is trying to address (see “green initiatives” below). An inability to drain rainwater effectively during periods of heavy rainfall is also an ongoing problem for the city.

Green initiatives: Lydec has implemented a programme to improve the wastewater network, eliminate the discharge of waste into the sea at Mohammedia and transfer wastewater from Bouksoura Oued Saleh for treatment. The programme involves the rehabilitation and extension of the sewerage system and wastewater collection facilities, the rehabilitation of wastewater treatment stations, and the construction of a flood relief channel for the Oued El Maleh River.

Air quality: Above average

Casablanca has comparatively strong clean air policies. There is a code to improve ambient air quality, and monitoring in different city locations regularly takes place. The city also measures a wide range of air pollutants. However, Casablanca is in need of strong policies as its air quality suffers from traffic congestion and pollution from large industrial facilities nearby in greater Casablanca, including the Samir refinery.

Green initiatives: After years of delays and negotiations, in 2009 the national government completed the conversion of the Samir refinery at Mohammedia to low sulphur diesel, bringing the refinery’s petroleum products into line with international standards. The conversion helped reduce the sulphur content in the country’s petroleum from about 10,000 parts per million (ppm) to just 50 ppm. In addition, until two years ago there was no inspection system for vehicles in Casablanca, and therefore no way to prevent owners from running highly polluting automobiles. In the past two years, however, there has been a major effort to address the problem. A Swiss private firm has been contracted to ensure that proper inspections are carried out and it has introduced a computerised record system that bans highly-polluting vehicles from the roads.

Environmental governance: Average

Casablanca performs relatively well for environmental management and it has a department dedicated to environmental issues. However, relatively little information has recently been published on environmental performance and progress, and Casablanca could also do more to integrate environmental concerns into public debate.

Green initiatives: As part of its management of Casablanca’s water, wastewater and power utilities, Lydec has introduced state-of-the-art computer technology to help improve oversight of the city’s key services. The systems are monitored electronically, and data is transmitted to a control room known as the Multifluid Central Coordination Bureau. In an effort to improve reliability, Lydec has installed more than 300 remote control points on the network to give early warning of the necessity of maintenance and repair work on the system, helping prevent leaks and outages. The systems are monitored 24 hours a day. Lydec has also sought to improve community engagement. It has organised local communication days, set up a new division focused on skills development, and held campaigns and exhibitions for the public in general and schoolchildren in particular.

Quantitative indicators

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Average</th>
<th>Casablanca</th>
<th>Year*</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY and CO2</td>
<td>Proportion of households with access to electricity (%)</td>
<td>84.2</td>
<td>92.9</td>
<td>2004</td>
<td>UN Habitat</td>
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<td></td>
<td>Electricity consumption per capita (GWh/hab)</td>
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<td></td>
<td>CO2 emissions from electricity consumption per person (kg/yperson)</td>
<td>13.9</td>
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<td>2006 IPCC Guidelines for National Greenhouse Gas Inventories</td>
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<td>LAND USE</td>
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<td>3,287</td>
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<td>EU Calculation</td>
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<td></td>
<td>Green spaces per person (m²/person)</td>
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<td>2005</td>
<td>ONCF (National Office for Railways in Morocco)</td>
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<td></td>
<td>Superior public transport network (km/km²)</td>
<td>0.07</td>
<td>0.03</td>
<td>2010</td>
<td>ONCF (National Office for Railways in Morocco)</td>
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<tr>
<td></td>
<td>Waste generated per person (kg/person/day)</td>
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<td>2006 IPCC Guidelines for National Greenhouse Gas Inventories</td>
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<tr>
<td>WATER</td>
<td>Population with access to potable water (%)</td>
<td>100</td>
<td>100</td>
<td>2004</td>
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<td>Water system leakages (%)</td>
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<td>World Bank</td>
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<td>SANITATION</td>
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<td>98.9</td>
<td>98.9</td>
<td>2004</td>
<td>UN Habitat</td>
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</tbody>
</table>
Dar es Salaam, more commonly known as Dar, is the largest city in Tanzania. It has a population of 3 million, a number expected to double by 2020. Located on a natural harbour on the Indian Ocean, Dar is the country’s trading hub. Like many other Tanzanian cities, it has experienced a construction and population boom in recent years, putting a strain on the city’s resources and infrastructures. Dar es Salaam is among the top ten fastest growing cities in the world, and this too will bring huge challenges, especially as more than two-thirds of its population already lives in informal settlements.

Dar es Salaam is a hub. Like many other Tanzanian cities, it has experienced a construction and population boom in recent years, putting a strain on the city’s resources and infrastructures. Dar es Salaam is among the top ten fastest growing cities in the world, and this too will bring huge challenges, especially as more than two-thirds of its population already lives in informal settlements.

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Dar es Salaam ranks well below average overall in the African Green City Index. Its best category results are in energy and CO2, where it ranks well below average. DAWASCO, Dar’s water and sewerage provider, is struggling to cope with demand. In addition, there are few policies in place to tackle green issues, and the city’s transport network is one of the least developed in the Index. Investment on the scale needed to overhaul Dar es Salaam seems unlikely in the short term. Instead, further green initiatives will most likely have to come from innovative approaches, community participation and more involvement from international agencies, such as the UN, which have been active in the city in recent years.

Energy and CO2: Average
One of Dar es Salaam’s stronger categories is energy and CO2, where it is marked up for its relatively low electricity consumption and emissions. The city consumes 2.5 gigajoules of electricity per capita, versus the Index average of 6.4 gigajoules. CO2 emissions from electricity consumption are an estimated 6.1 kg per capita, a tiny fraction of the Index average of 984 kg. The city’s emissions performance is helped by sourcing 60% of its electricity from hydropower. Also, a lack of electricity supply helps explain the low consumption and low CO2 emissions. Only an estimated 60% of households in Dar es Salaam have access to electricity, compared with the Index average of 84%. This leads to a heavy dependency on gas and diesel generators – leased at high expense from foreign companies – to meet the city’s power requirements. Dar seems set to reduce its reliance on hydropower, because the water supply to power the hydro plants has substantially supplies by building a natural gas pipeline from a newly discovered source in south Tanzania. The city is marked down for its lack of clean energy policies. For example, it does not have a strategy to reduce the environmental impact of its energy consumption.

Land use: Below average
An estimated 68% of Dar es Salaam’s population lives in informal settlements, compared with the Index average of 38%. Despite a fairly low population density of roughly 2,200 people per square kilometre, the city’s amount of green spaces is under the Index average, at 64 square metres per person. The Index average is 74 square metres. Relatively weak land use policies also contribute to Dar’s performance. It does not have policies to protect green space or environmentally sensitive areas, for example, nor does it have policies in place to manage urban sprawl. The city gains marks, however, for providing informal settlements with municipal services, which it has carried out in partnership with UN Habitat. The city’s master plan dates back to the 1970s, although it is currently being reviewed.

Green initiatives: Tanzania’s new minister of Lands, Housing and Human Settlements, Anna Tibajuka, has returned from heading UN Habitat to declare that one of her first tasks will be to impose “urban order” on Dar es Salaam. In particular, she wants to strengthen the city’s policies to improve the quality of the building stock and reduce illegal building. Under her watch, Ms Tibajuka says, developers will have to take account of sanitation, waste and traffic produced by their proposed constructions. The ministry will also seek to limit and manage illegal takeovers of vacant land in the city. In another initiative relating to buildings, the international Aga Khan Foundation, a non-governmental organisation, is trying to introduce traditional Swahili building methods. This includes using shade and breezes to cool buildings, and using local mud and thatch instead of imported steel and glass. Although these will be difficult to realise on a large scale, some of the principles of Swahili architecture can help show the way for superior and greener new developments. Other initiatives include the integration of urban farming.

Transport: Below average
Dar es Salaam’s public transport network is underdeveloped and the city lacks any form of superior transport such as light rail, trams or metro. Although 7,000 to 10,000 privately run buses and minibuses are in operation, dedicated bus routes have yet to be created. There are plans to roll out a bus rapid transit network (see “green initiatives”), but it is not expected to be up and running until 2013. Meanwhile, Dar es Salaam’s roads continue to get more and more congested – average commuting time has doubled during the last decade. Policies, too, are relatively underdeveloped. Dar es Salaam is one of only a few Index cities that have not taken any
steps to reduce emissions from mass urban transport. Nor has the city undertaken any initia-
tives to reduce traffic congestion, although it does have sequenced traffic lights. However, Dar is marked up for being one of three cities in the index that promote greener forms of trans-
port. It has, for example, a partnership with a local non-governmental organisation to take into account the needs of cyclists when con-
structing new roads.

Green initiatives: In 2005 the World Bank funded the development of plans for a bus rapid transit system in order to boost the public transportation network and limit the further growth of car traffic. The plan envisions that DART (Dar Rapid Transit) will run along dedicat-
ed lanes, with links to private minibuses. Although the project has been delayed, there are signs that the start of construction is near-
ing.

Sanitation: Well below average

An estimated 56% of the city’s population has access to sanitation, with an estimated 7% of Dar’s households linked directly to sewers. In addition, it is estimated that only 10% of the waste generated in Dar es Salaam is in line with the Index averages: the city consumes an estimated 187 litres of water per day per capita, which is equal to the Index average. An estimat-
ed 90% of the city’s inhabitants have access to potable water, compared with the average of 91%. Water system leakages, at an estimated 30% of total volume, also mirror the Index aver-
ey. Yet challenges remain. Poorer districts in the city receive water only on a weekly basis, and Dar’s performance is relatively weak in policy-
cy areas. The city does not yet have a strategy aimed at encouraging efficient water consump-
tion, nor does it enforce water pollution stan-
dards on local industry. In a recent assessment, UN Habitat outlined water and sanitation needs for Dar es Salaam. Those included developing an overall conservation and water-demand man-
agement strategy that addresses in particular the needs of the urban poor, educating policy makers and senior administrators about demand management in order to reduce the number of illegal connections and vandalism; transferring resource management from the city’s water and sewer agency to communities; and introducing water conservation education for children. The UN has made investments in the city to address some of these action points (see “green initiatives” below).

Green initiatives: UN Habitat has run several initiatives in the city in the last ten years, includ-
ing a programme aimed at identifying, protect-
sewage is treated before being discharged. The city has relatively weak sanitation policies, which need to be strengthened to improve sani-
tation services. Like the majority of Index cities, Dar could bolster regulations to monitor sanita-
tion facilities and treat wastewater. But unlike the majority of Index cities, Dar does not pro-
mote public awareness about healthy sanitation practices.

Air quality: Below average

Dar es Salaam has no code to improve air quality and there is no comprehensive and continuous monitoring of air pollutants. The city lacks cam-
paigns to raise public awareness about the dan-
gers of air pollution, although that might change if it is awarded outside financial assis-
tance (see “green initiatives”). Meanwhile, Dar’s roads are becoming more congested, which raises carbon monoxide and nitrogen oxide lev-
els. Another air pollution problem is the use of wood and charcoal for cooking, as well as the burning of solid waste. There has been air quality monitoring in the past, with the assistance of the US Environmental Protection Agency and the UN, but these efforts were temporary and only took place in limited locations around the city. Dar does not currently monitor air quality on its own without outside assistance.

Green initiatives: Dar es Salaam hopes to receive part of a US$777 million loan from the World Bank to the national government of Tan-
zania to improve the environment, including provisions to deal with air quality. Specifics are unclear at this point, although one suggested scheme could help develop clean energy stores and community cooking initiatives in poorer communities.

Water: Average

On quantifiable water metrics Dar es Salaam is in line with Index averages: the city consumes an estimated 187 litres of water per day per capita, which is equal to the Index average. An estimat-
ed 90% of the city’s inhabitants have access to potable water, compared with the average of 91%. Water system leakages, at an estimated 30% of total volume, also mirror the Index aver-
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tion, nor does it enforce water pollution stan-

Green spaces per person (m2/person)

Population living in informal settlements (%)

Electricity consumption per capita (GJ/inhabitant)

Gas Inventories

Category | Indicator | Average | Dar es Salaam | Year* | Source
--- | --- | --- | --- | --- | ---
ENERGY and C02 | Proportion of households with access to electricity (%) | 84.2 | 59.8 | 2004 | UN Habitat
| Electricity consumption per capita (GWh/inhabitant) | 1.6 | 2.5 | 2009 | National Bureau of Statistics
| CO2 emissions from electricity consumption per person (kg/person) | 183.5 | 60.8 | 2009 | 2004 IPCC Guidelines for National Greenhouse Gas Inventories
LAND USE | Population density (persons/km2) | 4,176.1 | 2,182.4 | 2009 | EIU calculation
| Population living in informal settlements (%) | 34.8 | 68.0 | 2008 | UN Habitat
| Green spaces per person (m2/person) | 79.6 | 64.5 | 2004 | Royal Institute of Technology, Division of Urban Studies, Stockholm
TRANSPORT | Length of mass transport network (km/km2) | 2.7 | 0.0 | 2011 | National Bureau of Statistics
| Super rapid public transport network (km/km2) | 0.0 | 0.0 | 2011 | National Bureau of Statistics
WASTE | Waste generated per person (kg/person/year) | 207.8 | 462.4 | 2009 | Dar es Salaam City Council
| Waste with access to potable water (%) | 91.2 | 90.9 | 2009 | Energy and Water Utility Regulatory Authority
| Waste consumption per person (litres per person per day) | 187.2 | 187.2 | 2008 | UN Habitat
| Water system leakages (%) | 30.7 | 20.7 | 2007 | UN Habitat
SANITATION | Water with access to sanitation (%) | 55.6 | 55.6 | 2004 | UN Habitat

Environmental governance: Below average

Unlike the majority of Index cities, Dar has no authority dedicated to green issues. Responsibil-
ity for environmental programmes is generally divided between various departments and in many cases when policies are in place they are ignored or not enforced. Neither have there been any recent published reports on environ-
mental performance and progress. In a city where more than two thirds of the population lives in informal settlements, the lack of green reporting is unlikely to be a top priority in most people’s minds. Nevertheless, the absence of baseline environmental reviews and the lack of any concerted green management efforts are cause for concern. Without a plan or strategy to improve the city’s environmental affairs, the majority of city inhabitants are unlikely to see a rise in their environmental living standards.
Durban, located on the Indian Ocean, is the third most populous South African city, with an estimated 3.5 million residents. It is home to East Africa’s largest port and has a substantial amount of industry and manufacturing. The heart of Durban is densely populated, but the city, which spreads out across 2,300 square kilometres, is one of the least dense in the Index. Like other South African cities, Durban used the 2010 World Cup as a catalyst for a range of environmental initiatives, which it can showcase when it hosts the COP 17 United Nations Climate Change Conference, taking place in November and December 2011. Durban ranks above average overall in the Index. With 1,400 bus routes, the city has the longest public transport network in the Index; it also boasts abundant green spaces and generally performs well in delivering utilities, public services and policies. As a result, Durban ranks above average in the Index in most categories—land use, transport, waste, water, sanitation, air quality and environmental governance. The city ranks below average for energy and CO2, owing in part to high CO2 emissions resulting from a major dependence on coal to produce electricity.

Energy and CO2: Below average
An estimated 88% of Durban households have access to electricity, above the Index average of 84%. Supply shortages, once common, particularly in colder months when heating and electrical appliance use increases, have been much less frequent in recent years. As a result of widespread access, electricity consumption is also higher than average, at 11.3 gigajoules per capita, versus the Index average of 6.4 gigajoules. Electricity in Durban is generated mainly through coal, with renewables, mostly hydro, comprising just under 2% of the electricity production mix. The city has also begun generating energy on a limited basis from local waste by-products. Durban’s heavy reliance on coal drives up CO2 emissions from electricity—the city emits an estimated 3,503 kg per person from electricity consumption, well above the Index average of 984 kg, and second only to Cape Town in the Index. However, promising policies in this area will hopefully catalyse reductions in consumption and improvements in efficiency.

Green initiatives: One effort aimed at addressing climate change locally is driven by the 2009-initiated Durban Climate Change Partnership, which includes members of the private sector, academia, government, civil society and non-governmental organisations. Durban was a host city for the 2010 World Cup and in the run up to that event launched the Greening Durban 2010 campaign. It aimed to neutralise the 370,000 tonnes of CO2 emissions forecasted to be produced during the construction and hosting period. Initiatives included making the Moses Mabhida Stadium as energy efficient as possible, a reforestation project at the Buffelsdraai landfill site, and promoting other water and electricity saving schemes, although there is no information on whether the initiatives reached their targets. Similar climate change initiatives are underway in the city, particularly in colder months when heating and electricity use increase.

Land use: Above average
Durban contains a densely populated urban core surrounded by more spread-out suburbs, fairly densely populated townships and informal settlements in the outskirts. As a result of this sprawl and the city’s large administrative area, it is one of the least dense cities in the Index, with an estimated 1,500 people per square kilometre, versus an overall average of 4,600. An estimated 22% of the population lives in informal settlements, well below the Index average of 38%. Durban is rich with green space, at 187 square metres per person. This is more than double the Index average of 74 square metres, and the third highest amount in the Index, behind Cape Town and Johannesburg. Nevertheless, many of these areas are under threat from urban sprawl and agriculture. The city’s recently introduced Spatial Development Framework plan aims to combat this potential sprawl, while an Integrated Development Plan has identified the importance of meeting infrastructure and housing needs in informal settlements.

Background indicators
Total population (inhabitants) 3.5
Administrative area (km²) 2,300
Population density (persons/ha) 1,500

Performance

<table>
<thead>
<tr>
<th>Category</th>
<th>Durban</th>
<th>Other cities</th>
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<tbody>
<tr>
<td>Energy and CO2</td>
<td>below average</td>
<td>average</td>
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<tr>
<td>Land use</td>
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<td>Environmental governance</td>
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Overall result

The order of the dots within the performance bands has no bearing on the cities' results.
Transport: Above average
With an extensive bus system of 1,400 routes and some 200 operators, Durban has the largest public transport system in the Index. In total it measures 9.2 km per square kilometre, more than three times the Index average of 2.7 km. Superior forms of public transport, such as metro, BRT or tram lines, make up an estimated 0.16 km per square kilometre, more than twice the Index average of 0.07 km, and consist mostly of suburban trains. Nevertheless, Durban’s public transit network is often hampered by unreliability and those who can afford them commonly use private vehicles. City officials’ ability to overcome these obstacles will be a key factor in the future success of mass transport development efforts.

Green initiatives: The city council used the hosting of the 2010 World Cup as an opportunity to invest in public transport, securing US$236 million of national government money for this purpose. Initiatives included the launching of a new passenger bus called the People Mover, which created new routes in areas not served by existing transport providers, running along the beachfront and connecting Durban to neighbouring communities. The council also created a new online travel information system integrating details of buses, taxis and minibuses on touch screens at various sites around the city, including the Moses Mabhida Stadium. There are longer-term plans to have a fully integrated public transport system, so that bus and taxi routes match up with train stations.

Waste: Above average
Durban generates 519 kg of waste per capita annually, more than the Index average of 408 kg. Landfills are increasingly unable to match demands. Those areas often suffer from a poorly maintained and often vandalised sewerage network, unsuitable to blockages during periods of high demand. Nevertheless, Durban’s efforts to promote public awareness around proper sanitation and its implementation of minimum wastewater treatment standards set it apart from many of the other cities in the Index.

Green initiatives: In 2000 the city’s water service launched a sewage education programme in a bid to reduce damage to the city’s sewerage network. Educational resources and toolkits were designed for use in schools and at informal education settings, such as clinics. There were road shows and street theatre performances aimed at lower-income communities where literacy levels are lower. The campaign appears to have had a positive impact, with blockages down significantly, and the scheme has been hailed as a best-practice example. Durban’s water department was invited to create a toolkit to be used in urban Kenya and then possibly elsewhere on the continent.

Air quality: Above average
Durban’s clean air policies are among the strongest in the Index, and officials have been monitoring air quality at various sites around the city since 2004. Systems measure sulphur dioxide, nitrogen dioxide, particulate matter and carbon monoxide. Air pollution is particularly severe in the south of the city, near the coast, where the mix of heavy industry and densely settled residential areas has prompted concerns about air quality.

Green initiatives: Through its Imagine Durban project (see “green initiatives” in the environmental governance category) the city has set a target to ensure that within ten years air is “not harmful to human health.” In a bid to achieve this target, a number of key goals have been outlined. The first is to reduce commercial pollution by establishing and implementing by-laws that create penalties for pollution and promoting low-emission industries. There are calls for vehicles to meet low-emissions standards, and suggestions that workers share vehicles and companies promote carpooling or provide more communal transport.

Environmental governance: Above average
Durban has some of the strongest policies on environmental management and monitoring in the Index. In 1994 Durban was the first South African city to adopt the LNS’s Local Agenda 21, which committed the city to implement sustainability measures, including creating a small environmental management department. Since then, the department has expanded to 20 full-time employees. The city government consistently monitors its environmental performance and regularly publishes information on progress.

Green initiatives: The Imagine Durban initiative is a city-council-led project on integrated, long-term planning. It is being implemented in conjunction with partners: Sustainable Cities, a Canadian non-governmental organisation, and the PLUS Network, a network of 35 cities sharing experiences in sustainability planning. The concept behind Imagine Durban is to focus on what citizens would like the city to be in the future and then set medium- and long-term targets to meet these goals. In another initiative, in September 2011 Durban hosted its second three-day “Sustainable Living Exhibition”, which aimed to showcase innovative ideas for more environment-friendly lifestyles. More than 130 stands exhibited a range of goods, including devices to save water and energy, solar-powered equipment, ozone-friendly appliances, and tools for organic gardening and recycling. The event was seen as a warm up for the COP 17 summit.
Johannesburg is the economic centre of South Africa and headquaters for the country’s manufacturing and mining industries. A magnet for immigration, it is South Africa’s most populous city, with around 3.9 million people. Johannesburg is located in the Gauteng province, which has a total population of over 10 million. Water, waste and sanitation standards are generally better than in many of the other cities in the African Green City Index, and often consistent with those in more developed parts of the world. However, like many developing cities in Africa and globally, and due in part to the legacy of Apartheid, there are wide income disparities and dramatically different living conditions between rich and poor. The city has introduced several policies and plans, particularly in the areas of transport, land use and air quality, with the specific aim of improving environmental performance. There was also significant progress in transport and land use in preparation for the 2010 World Cup.

Johannesburg ranks above average overall in the Index, along with five other cities. It is particularly strong in energy and CO₂, land use, transport, air quality and environmental governance, ranking above average in each category. The city’s environmental performance is bolstered by having the second highest amount of green space among the 15 index cities and an extensive bus network, as well as generally robust environmental policies, especially for clean energy and congestion reduction. The city’s performance is very consistent – it never falls below average in any individual category, achieving average rankings in water, waste and sanitation.

Energy and CO₂: Above average

Providing energy to Johannesburg’s 3.9 million residents, half of whom live in cramped and poorly served townships, is no easy feat. In the colder months when demand is high, power outages are regular occurrences. Still, an estimated 90% of households in the city have access to electricity, which is better than the Index average and 38% of the city’s residents live in informal settlements which are not susceptible to power failures, which cause congestion and higher fuel consumption from queuing drivers. Plans are also under way to convert landfill gas from several sites into electricity to power city homes. Work has begun on the first plant of its kind at one of the city’s landfills, and there are plans to extend the scheme to four further landfill areas, with a view to generating enough electricity for 12,500 households over a 20-year period.

Land use: Above average

Johannesburg is a sprawling city comprised of scattered pockets of residential, industrial and office developments. As a result, population density is lower than the Index average, at 2,400 people per square kilometre, versus the Index average of 6,600. More recent development has continued to favour sprawl, but the city is introducing policies to revive the city centre (see “green initiatives” below). An estimated 19% of Johannesburg’s residents live in informal settlements, which is well below the Index average of 38%. The city boasts more than 10 million trees in parks and along avenues, and has the second highest amount of green space in the Index, at 231 square metres per person, compared with the average of 74 square metres. Although Johannesburg aims to protect sensitive areas such as wetlands, the overwhelming demand for new housing will put pressure on this goal.

Green initiatives: The city is trying to reduce urban sprawl by rehabilitating under-populated city centre neighbourhoods, and building new mixed-density and mixed-income housing developments with access to municipal services and public transport links. To this end, the Johannesburg Development Agency, which receives city and private funds, was set up in 2001 with the specific remit to regenerate decayed inner city areas. It has been credited with transforming several city districts, upgrading pavements, lighting, parking and security. The parks department, meanwhile, works to maintain and refurbish green spaces and promote environmental projects, such as tree planting, bird watching, litter collection and river cleaning. A number of parks have been developed from wasteland alongside some townships with a view to create a greener environment for residents.

Transport: Above average

Although the city has an estimated 6.8 km per square kilometre of bus routes, far more than...
Johannesburg's car users switched to Rea Vaya buses, which run on low-sulphur diesel, instead of using their private vehicles, the city would be able to cut emissions by 1.6 million tonnes by 2020. The city is rapidly running out of landfill space and the city is drafting new regulations to make separation of waste into recyclables a legal requirement. The city is promoting proper sanitation at water sources. The city has considered long-term plans to source Johannesburg's water from as far away as the Vaal River 50 km away. In order to meet growing demand, the city has said it is keen to invest in urban rainwater harvesting systems and capitalise on increased rainfall due to climate change. The city has started with a nine-week consultation period, during which nine separate themes were tackled through community events, roundtables and roadshows, as well as high-level meetings and expert conferences. The 25 km route has 33 stations, stops and a number of other feeder routes join from the east and west. The long-term plan is for the Rea Vaya to cover more than 100 km and become a transport option for 80% of the city’s residents. Officials say it is the single biggest initiative to tackle greenhouse gases in the city. They also claim that if only 15% of Johannesburg’s car users switched to Rea Vaya buses, which run on low-sulphur diesel, instead of using their private vehicles, the city would cut its CO2 emissions by 1.6 million tonnes by 2020.

**Water/Average**

The city generates 401 kg per person of waste each year, about 80% of the Index average of 408 kg. Almost 95% of this goes to landfill, with recycling and composting accounting for less than 5% of waste treatment. The city has introduced recycling through central collection points rather than curbside collection. Overall, dealing with waste, including the estimated 244,000 tonnes that are illegally dumped each year, remains a challenge in Johannesburg as the city is rapidly running out of landfill space and the population is growing.

**Sanitation/Average**

Johannesburg’s water supply is delivered from the Vaal River 50 km away. In order to meet growing demand, the city has said it is keen to invest in urban rainwater harvesting systems and capitalise from increased rainfall due to climate change. The city has started with a nine-week consultation period, during which nine separate themes were tackled through community events, roundtables and roadshows, as well as high-level meetings and expert conferences.

**Green initiatives:**
- **In a bid to increase recycling,** the city is drafting new regulations to make separation of waste into recyclables a legal requirement for residents and businesses. Non-compliance could possibly be punishable by fines or criminal prosecution. Pick n’ up, the city’s waste management company, has been piloting collection of some recyclable materials from more than 30,000 households, and is encouraging people to use separate bins for paper, metal, plastic, textiles and electronic equipment, although this is voluntary.
- **Rea Vaya:** The first is the high-speed train line, the second is the Rea Vaya bus route (25 km). 2) There are no subway or tram lines. 3) Data refer to “unaccounted for water”. The city has said it is keen to invest in urban rainwater harvesting systems and capitalise from increased rainfall due to climate change. The city has started with a nine-week consultation period, during which nine separate themes were tackled through community events, roundtables and roadshows, as well as high-level meetings and expert conferences.

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Lagos, located on the southwest coast of Nigeria, is the most populous city in the African Green City Index, with an estimated urban agglomeration of 10.6 million people. It is made up of Lagos Island, the original city, and the Mainland, which is comprised of rapidly growing settlements. Lagos has a large concentration of multinational companies and is home to almost half of Nigeria’s skilled workers. It is one of Africa’s five biggest consumer markets and boasts a higher standard of living than anywhere else in Nigeria. Nevertheless, rapid urbanisation and population growth have introduced significant challenges for its water, waste management and sanitation infrastructure, and have put pressure on the energy supply and traffic management. However, officials are keen to transform this mega-city into a first-class business centre, and in the last decade have established a dedicated environmental authority and invested heavily in a mass transit plan.

Lagos ranks average overall in the Index, with its best performance in the energy and CO₂ category, where it ranks well above average. This is driven by better-than-average levels of electricity access, a very low rate of per capita electricity consumption and low levels of CO₂ emissions from electricity use. Lagos also places above average in the waste category due to a comparatively low rate of waste generation, although challenges still remain in waste management. The city’s transport, water, sanitation, air quality and environmental governance results are average. Land use, where Lagos ranks below average, remains a particularly challenging area for the city because of the demands of a rapidly growing population, which is expected to increase by 33% by 2020, according to the UN.

Energy and CO₂: Well above average

Lagos State as a whole consumes roughly 45% of the country’s energy and is responsible for a significant portion of its carbon footprint. In the city, incinerated solid waste, bush burning, domestic cooking, vehicles and electricity generators are the main sources of CO₂ emissions. Still, Lagos performs comparatively well on most indicators in the category. For example, UN Habitat estimates that just under 100% of households have access to electricity, more than the Index average of 84%. In addition, Lagos has one of the lowest per capita electricity consumption levels in the Index, at 0.8 gigajoules, compared with the average of 6.4 gigajoules. Per capita CO₂ emissions from electricity consumption, at an estimated 36 kg, also are well below the Index average of 984 kg. Just over a quarter, 27%, of the city’s electricity is generated from hydropower. Nevertheless, Lagos faces electricity shortfalls and blackouts common, forcing households and industries to rely on generators as an alternative power supply.

Green initiatives: For the past three years the state government has organised and hosted an annual three-day International Summit on Climate Change, which demonstrates its commitment to improving sustainability and mitigating its environmental impact. Officials have also been looking at ways to capitalise on global carbon credit trading schemes, such as the Kyoto Protocol’s Clean Development Mechanism, resources to champion the city’s electricity challenges and ensure the development of the state’s natural mineral resources.

Land use: Below average

The World Bank estimates that two-thirds of Lagos’s residents live in informal settlements, compared with the Index average of 38%. Only an estimated 20% to 40% of development in Lagos is carried out with government approval. Demand for land in Lagos has skyrocketed in line with the city’s rapid population growth, and as a result there are relatively few green spaces. They measure an estimated 34 square metres per person, compared with the Index average of 74 square metres. Policies to contain urban sprawl are weaker than in many other cities in the Index, and there are no clear policies protecting existing environmentally sensitive areas from development, although the state government has initiatives in place to plant trees and improve green spaces (see “green initiatives” below).

Green initiatives: In 2008 the Lagos State government, in collaboration with the Clinton Climate Initiative, embarked on a beautification programme for its major open spaces and highways. A year earlier it had started an aggressive tree planting campaign, with the commitment to plant a million trees within four years, which should have a positive impact on air quality. Within two years over 500,000 trees had been planted. On top of this the state government called on the private sector to partner with it in the greening of public spaces. A parks and gardens agency is being established to drive this programme forward.
Transport: Average With over six million cars on the road every day, traffic jams are a daily occurrence. The public transport system, consisting mainly of thousands of privately owned buses, is not directly controlled by city officials. Rail networks are limited, although the city introduced bus rapid transit in 2008 to tackle the huge mass transit challenges (see “green initiatives” below). As a result, the city’s public transport network is considerably shorter than the Index average, measured at 0.1 km per square kilometre, compared with the Index average of 2.7 km/km², though due to data availability private operators were not included. However, the state has a comprehensive urban mass transport policy in place and has awarded contracts for two new rail lines. The Lagos State Waterways Authority is considering using the city’s waterways for transport and has built jetties intended for ferry transport.

Green initiatives: In March 2008 the Lagos State government introduced bus rapid transit in conjunction with the private sector. This was followed by the Lagos Metropolitan Project, which is the overarching waste policy of the state government. One of the most notable initiatives of the past decade was the waste-to-energy programme to convert various types of waste into usable materials. The programme was introduced in 1999 but has gathered momentum in recent years. As part of this programme, Lagos has established one of the biggest compost plants in Africa and converts 800 tonnes of municipal solid waste into fertiliser each day. In addition, the city has established four small-scale plastic-recycling plants, which convert 30 metric tons of nylon or plastic waste materials into usable products like shopping bags. In April 2011 the state waste management authority announced that it had installed 20 recycling banks across the state, with 1,000 more to come within two years.

Water: Average Lagos has one of the lowest water consumption figures in the Index, at 90 litres per person per day, compared with the Index average of 187 litres. An estimated 86% of the population has access to potable water, versus the Index average of 91%. The city’s main water sources are local rivers and it does not suffer from water scarcity relative to the other 14 cities in the Index. Still, the delivery system to provide water to end users is insufficient, with treatment plants suffering from electricity shortages and pipe infrastructure that doesn’t meet the needs of the population. Ten additional mini-waterworks were unveiled in February 2011 and five more are under construction, but no target date for completion has been set. The city has forecasted that these plants, along with improved electricity supply to the water plants, will dramatically improve Lagos’ water delivery system. Desalination plants are not currently in use, though the city has considered this as a long-term strategy.

Sanitation: Average An estimated 83% of the population has access to sanitation, compared with the Index average of 84%. While there are no major wastewater treatment facilities in the city, Lagos State operates five smaller wastewater treatment plants serving about 500,000 people, a fraction of the total population. The state government set out a five-year sanitation plan in 2010, which includes a goal to improve water treatment infrastructure. In addition, the government conducts inspections of septic tanks and has ordered the removal of prohibited pit latrines (a dry toilet system that collects waste in large containers), the exact nature of enforcement is unknown, but noncompliance is subject to prosecution.

Air quality: Average Lagos has high concentrations of pollutants such as carbon monoxide, sulphur dioxide and nitrogen oxides, which explains why respiratory ailments due to air pollution are not uncommon. Some monitoring of air quality is conducted in non-industrial areas around the city, but this system is far from complete. All pollutants are regularly monitored in industrial areas. Nevertheless, with a rapidly expanding population, a limited public transport network and an economy centred largely on refining petrochemicals, Lagos faces major challenges in improving air quality. The newly established National Environmental Standards and Regulation Enforcement Agency, and the vision of a cleaner and healthier environment they intend to deliver, are positive steps forward.

Green initiatives: The Nigerian government has a long-standing ban on the import of cars more than five years old. While the government has not put any other specific measures in place, such as monitoring emissions from cars and generators, preventing very old cars from entering the country is expected to have a positive effect on air quality over time.

Environmental governance: Average The Lagos State Environmental Protection Agency, created in 1996, oversees and implements environmental policy for the city. In addition, citizens, non-governmental organisations and other stakeholders have been involved, to some extent, regarding decisions on projects with major environmental impact. One such organisation, Environmental Rights Action, regularly collaborates with the state government on major environmental issues and sometimes serves as an unofficial watchdog. Most laws that deal with the environment are not passed without a public hearing in the State House of Assembly. In 2008 the state government conducted a baseline review on water, sanitation and transport, though it is unclear how the results of that study were used.

Green initiatives: In 2006 the World Bank started an initiative, the Lagos Metropolitan Development and Governance Project, which aims to invest in critical infrastructure to increase access to basic urban services. It includes programmes to improve the professional capacity of the Lagos State Urban Renewal Authority to assess, develop, plan and coordinate a city-wide infrastructure programme, and to support public finance and budget reforms. The project is expected to end in September 2013. In another initiative, the National Environmental Standards and Regulations Enforcement Agency launched a competition on environmental protection in July 2011 for senior secondary schools, in an effort to improve sanitation awareness. The competition is aimed at encouraging school children to adopt healthful environmental practices.

Quantitative indicators

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Average</th>
<th>Lagos</th>
<th>Year*</th>
<th>Source</th>
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<tbody>
<tr>
<td>ENERGY and CO2</td>
<td>Proportion of households with access to electricity (%)</td>
<td>44.2</td>
<td>99.8</td>
<td>2003</td>
<td>UN Habitat</td>
</tr>
<tr>
<td></td>
<td>Electricity consumption per capita (GWh/hab)</td>
<td>6.4</td>
<td>8.8</td>
<td>2010</td>
<td>Lagos Bureau of Statistics</td>
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<td>CO2 emissions from electricity consumption per person (kg/person)</td>
<td>18.3</td>
<td>35.9</td>
<td>2009</td>
<td>Lagos Bureau of Statistics</td>
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<tr>
<td>LAND USE</td>
<td>Population density (persons/km²)</td>
<td>1,140</td>
<td>2,957</td>
<td>2010</td>
<td>EIU calculation</td>
</tr>
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<td></td>
<td>Population living in informal settlements (%)</td>
<td>18.0</td>
<td>64.0</td>
<td>2005</td>
<td>World Bank</td>
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<td>Green spaces per person (m²/person)</td>
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<td>TRANSPORT</td>
<td>Length of mass transport network (km/km²)</td>
<td>2.7</td>
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<td></td>
<td>Super-prior public transport network (km/km²)</td>
<td>0.07</td>
<td>0.01</td>
<td>2010</td>
<td>Lagos Metropolitan Area Transport Authority</td>
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<td>WASTE</td>
<td>Waste generated per person (kg/person/year)</td>
<td>107.8</td>
<td>276.0</td>
<td>2009</td>
<td>Lagos Waste Management Authority</td>
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<td>WATER</td>
<td>Population with access to potable water (%)</td>
<td>92.3</td>
<td>86.2</td>
<td>2003</td>
<td>UN Habitat</td>
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<td>Water consumption per person (litres/person per day)</td>
<td>187.2</td>
<td>90.1</td>
<td>2009</td>
<td>GM Water Corporation</td>
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<tr>
<td></td>
<td>Water system leakages (%)</td>
<td>30.5</td>
<td>30.0</td>
<td>2009</td>
<td>GM Water Corporation</td>
</tr>
<tr>
<td>SANITATION</td>
<td>Population with access to sanitation (%)</td>
<td>82.9</td>
<td>93.0</td>
<td>2003</td>
<td>UN Habitat</td>
</tr>
</tbody>
</table>

* All data applies to Lagos unless stated otherwise below. e = EIU Estimate. 1) Lagos State. 2) National electricity generation mix used to estimate city level CO₂ data. 3) There are no subway, tram or light-rail lines. 4) Unclear whether data refers to “unaccounted for water” or “system leakage”.

The data is presented in the Index format. Differences from the official statistics may arise due to the different methodologies used to calculate the statistics.
Luanda, Angola

Luanda is the capital city of Angola, a country in south-central Africa. Located on Angola’s west coast, facing the Atlantic Ocean, Luanda is yet the country’s major seaport. Angola, formerly a colony of Portugal, has undergone enormous socio-economic upheavals that have impacted the capital city. The Portuguese built Luanda to accommodate around 500,000 people but during the Angolan Civil War (1975-2002), which followed independence from Portugal, people flocked to the city in the belief it was safer than other parts of the country. Luanda’s population has now swelled to 5.8 million, living in informal settlements known as musseques. Electricity supplies and potable water are scarce, and the majority of the city’s population lives in informal settlements known as musseques. Luanda is also the capital of Luanda Province, a collection of municipalities surrounding the city. Luanda Province and the national government share the jurisdiction of Luanda. There is no separate city government. Luanda’s few green initiatives are mostly led by the national government and are short on detail. The absence of a city government, championing environmental improvements for its citizens, seems to work against Luanda. However, the city’s overall performance could improve with the recent adoption of a master plan aimed at improving the environment of a master plan aimed at improving the environment. Luanda’s few green initiatives are mostly led by the national government and are short on detail. However, the city’s overall performance could improve with the recent adoption of a master plan aimed at improving the environment. Luanda’s few green initiatives are mostly led by the national government and are short on detail. However, the city’s overall performance could improve with the recent adoption of a master plan aimed at improving the environment. Luanda’s few green initiatives are mostly led by the national government and are short on detail. However, the city’s overall performance could improve with the recent adoption of a master plan aimed at improving the environment.

Energy and CO₂ Average
One in every four households in Luanda has no access to electricity. In the city centre and newly built suburbs, nearly all homes and businesses rely on diesel-powered generators. For reasons of data availability electricity produced and consumed from these generators were not included in the Index, nor were annual CO₂ emissions from diesel generators. Electricity consumption per capita, at just under 1 gigawatt, is well below the Index average of 6.4 gigawatts, though if diesel generators were taken into account consumption would likely be much higher. Annual CO₂ emissions from electricity consumption per person are 3 kg, compared with the Index average of nearly 984 kg. Green energy also plays a part in keeping CO₂ emissions down. The share of renewable energy in Luanda’s electricity production, not including electricity generated from diesel generators, is 96%, all of which is hydropower. Only Maputo in the Index has a higher share of renewable energy in electricity production. Other than its limitation in energy, Luanda scores poorly in policy areas. Some work is under way, however, to rehabilitate the green spaces that remain.

Transport: Well below average
Luanda’s transport infrastructure is sparse and dilapidated. At an estimated 0.2 km per square kilometre, Luanda’s road network is among the poorest in the Index. Public transport is unreliable and offers limited services. There are unlikel…

Land use: Well below average
An estimated 60% of Luanda’s population lives in musseques, the informal settlements that have spread from the city centre in all directions for 20 km. In recent years there have been a number of controversial informal settlement clearances with residents transferred to new accommodations (although sometimes they are just given tents) some 30 km from the city centre in an area known as Zango. The land reclaimed from these clearances is usually sold for expensive office and luxury housing development. A number of large-scale national gove...
kilometre, the length of Luanda’s mass trans-
port network is much shorter than the Index,
2.7 km per square kilometre. Luan-
da is also one of only a handful of cities in the
Index that has yet to embark on building a supe-
rior public transport network (defined as sub-
ways, trams, light rail or bus rapid transit):
Luanda’s roads are invariably clogged by dense
traffic. Office workers living in the new sub-
urbs of Talatona, just 15 km south of Luanda, face a
thrice-hour commute into the city centre. The heat and humidity, coupled with
dusty streets where pavements are rare and
crime is common, mean walking is not an
option for anyone working in an office or similar
environment. Cycling is also impossible due to
the level of congestion, poor driving, bad road
surfaces and high temperatures. There are no
policies to reduce traffic congestion, although
roads and pedestrian areas are reportedly in
the planning stage. There are some transport
and housing plans at a national level (see
“green initiatives” below), which, if carried out,
should reduce congestion in Luanda’s city cen-
tre.

Green initiatives: The national government
has nearly finished a new ring road linking the
town of Cacuaco to the north of Luanda, to
Viana and the new government housing devel-
opments in the east, and to the suburbs of Benfi-
ca and Talatona in the south. The national gov-
ernment has longer-term plans for a metro system
in Luanda but there is no current strategy to move
forward. In 2009 the national Ministry of Trans-
port published its 2009-2012 plan for transport
development in Angola, which discusses “estab-
lishing strategies and plans”, and developing
better systems and services as well as an “Inte-
grated transport network”. There are few con-
crete plans in the document, however. There
have also been several public pledges about cre-
ating bus lanes, introducing maritime taxis and
generally reducing city centre congestion.

Green initiatives: The national government
began discussing plans for a recycling law in
2008 and since then officials have held several
workshops on the topic, but no concrete plans or
policies have emerged. In June 2011 Bevac, a
South African canned-beverage manufacturer,
launched a programme called Reclatas to recycle
used aluminium drinks cans produced by its
company has not released any more details. The
first initiative of its kind in the city, but the com-
pny has not released any more details. The
 Provincial Government of Luanda (GPL) runs bill-
board, television and radio campaigns, often
involving pop stars, to try to discourage street
littering.

Water: Well below average
Potable water is scarcer in Luanda than in any
other city in the Index. Barely more than half of
the city’s population has access to drinking
water against an Index average of 91%. Through
luck of supply, water consumption in Luanda is by
some distance the lowest in the Index. An
estimated 20 litres of water are consumed per
person in Luanda every day, yet the Index aver-
age is more than nine times that amount. The
government water company, Empresa de Aguas
de Luanda (EAPL), says it only supplies water to
around 131,000 households in a city in which has
a population of 5.8 million. With such limited
supply, measures to reduce over consumption are
not a concern for the city.

Green initiatives: The national Ministry of
Health, UNICEF, and other international and
national non-governmental organisations run campaigns to encourage people to use toilet Sanitation: Average
Luanda’s sprawling metropolis brings inevitable
sanitation challenges. UN Habitat estimates 92%
of the city’s population has access to some type
of sanitation system, but they are rarely the flush
systems used in developed cities. Drains and sep-
tic tanks are widely used in formal areas. Even in
offices and homes, it is common for lavatories to
be manually flushed with bucket water. Informal
settlements generally lack sanitation infras-
structure. Although the city promotes public awareness
about sanitation (see “green initiatives” below),
there is no regular monitoring of on-site sanita-
tion facilities, either in homes or communal areas.

Green initiatives: There are some local gov-
ernment poster campaigns, and television and
radio advertisements to discourage people
from urinating and defecating in the open
air, with some linked to wider health camp-
aigns run by agencies like the city’s health
department. Flushing of latrines in informal settlements
has been left largely to non-governmental organi-
sations, such as Development Workshop, and
individuals.

Environmental governance: Well below average
Luanda is the only city in the Index that falls into
the well below average category for environ-
mental governance. There is some citizen
involvement in decision-making for projects
that might have a major environmental impact,
but other than that Luanda fails to pick up any
points in this category. Developing a strong
environmental agenda is, understandably per-
haps, not a top priority for Luanda, particularly
at a time when the need to increase access to
water and energy is more important than cur-
tailing consumption. What is a concern is that
Luanda has no direct control over its own envi-
ronmental affairs, which might hand any future
green efforts. The Provincial Govern-
ment of Luanda (GPL) has a Directorate of Pub-
lic Works, Urbanism and Environment, but this
department has neither a budget nor a clear
purpose. Most GPL policy remains highly cen-
tralised, while the remit of the national Ministry
of Environment does not appear to make any
city or region-specific plans. No departments
within the GPL hold any city-specific environ-
mental data, although plans are said to be in
place to rectify that.

Green initiatives: In July 2010 the Ministry of
Environment began working on a national envi-
ronment database as part of a project being
financed by the African Development Bank, but
work on this is still ongoing.
Maputo, the capital of Mozambique and its largest city, is home to 1.2 million residents, making it the second smallest city in population terms in the African Green City Index. Although an estimated 70% of Maputo’s residents live in informal settlements that often lack safe drinking water and sanitation, in recent years the local government has made substantial efforts to upgrade infrastructure and services across the city. Urban planning is a somewhat new concept for Maputo, with officials having prioritised rural reconstruction and development in the years after the civil war ended in 1994. Nevertheless, many promising initiatives are under way, including a ten-year World Bank-funded project called the Maputo Municipal Development Program (PROMAPUTO), which aims to improve the city’s institutional capacity, service delivery and infrastructure by 2027. Also, in 2008 Maputo’s municipal council approved a master plan to guide the city’s urban planning.

Despite positive strides, Maputo ranks well below average overall in the Index. The city achieves its strongest placement in the waste category, where it is average due to a relatively low rate of waste generated per person. Although the city falls to below average in most other categories, it excels in the area of electricity and water consumption figures. While these low figures lessen Maputo’s environmental footprint, they also illustrate that a significant percentage of the population lacks access to basic services. The city has the most room for improvement in sanitation, where it ranks well below average due to the high percentage of inhabitants left without access to sanitation services.

Energy and CO₂: Below average
Almost 100% of Maputo’s energy is generated by renewable sources, primarily hydropower from the Cahora Bassa dam in northern Mozambique. On a per capita basis, Maputo performs favourably for CO₂ emissions from electricity consumption, at an estimated less than one kilogram per person, compared with the Index average of 984 kg. In addition, per capita electricity phone. The programme appears to have effectively expanded access to electricity.

Land use: Below average
According to the World Bank, an estimated 70% of Maputo’s residents live in informal settlements, a result of low incomes coupled with rapid urbanisation. This is well above the Index average of 38%. The city performs more favourably in the area of green spaces, boasting 74 square metres. Maputo has at least half a dozen parks and gardens in the city centre, as well as a few coastal ecological zones. However, Maputo would benefit from stronger policies aimed at containing urban sprawl. Indeed, the challenge of sprawl is increasing, with many workers in Maputo choosing to live in Matola, a formally separate city of about 700,000 people 17 km west of Maputo. In a 2010 report the World Bank concluded that Maputo and Matola now form a single metropolitan area despite the lack of formal metropolitan governmental structures. Some observers now refer to a “greater Maputo” area that includes Matola.

Green initiatives:
- In 2006 EDM introduced a new plan to connect informal settlements to the grid through a pre-paid system of electricity provision, in which users buy a specific amount of energy credit up front, similar to a pre-paid mobile phone plan. The programme appears to have effectively expanded access to electricity.
- Residents and businesses in the city centre have access to fairly dependable power through the national power utility, Electricidade de Moçambique (EDM), but the situation is much less reliable in informal settlements. These areas, which dominate the city’s landscape, are largely unconnected to the grid. Thus overall, Maputo also has the lowest rate of electricity access in the Index, at an estimated 29% of households compared with the Index average of 84%.
- Green initiatives: In 2006 EDM introduced a new plan to connect informal settlements to the grid through a pre-paid system of electricity provision, in which users buy a specific amount of energy credit up front, similar to a pre-paid mobile phone. The programme appears to have effectively expanded access to electricity.

Transport: Below average
Like many cities in the developing world, Maputo’s rapid urbanisation has not been matched with public investment in an efficient mass transit system, and the city lacks a transport master plan. Private vehicles and shared minivan taxis called chapas are the primary forms of transport in the city. Since 2009

Performance

<table>
<thead>
<tr>
<th>Category</th>
<th>Maputo</th>
<th>Other cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and CO₂</td>
<td>Below average</td>
<td>Above average</td>
</tr>
<tr>
<td>Land use</td>
<td>Below average</td>
<td>Above average</td>
</tr>
<tr>
<td>Transport</td>
<td>Below average</td>
<td>Above average</td>
</tr>
<tr>
<td>Waste</td>
<td>Below average</td>
<td>Above average</td>
</tr>
<tr>
<td>Water</td>
<td>Below average</td>
<td>Above average</td>
</tr>
<tr>
<td>Air quality</td>
<td>Below average</td>
<td>Above average</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Below average</td>
<td>Above average</td>
</tr>
<tr>
<td>Environmental governance</td>
<td>Below average</td>
<td>Above average</td>
</tr>
</tbody>
</table>

Overall result

The order of the dots within the performance bands has no bearing on the cities’ results.
Green initiatives: In 2011 the government
ordered 150 compressed natural gas (CNG)
buses, which emit fewer air pollutants. The first
batch of 32 CNG buses arrived in June and the
rest were scheduled to arrive later in 2011.

Waste: Average

The city produces an estimated 294 kg of waste
ever person per year, well below the Index aver-
age of 408 kg. Households and businesses pay a
waste collection fee, which is collected through
the electricity company. This fee is proportioned
based on energy consumed, on the logic that
consumers using less energy also produce less
waste. However, only about 19% of Maputo's
generated waste is collected and the city cur-
cently lacks environmental standards for waste
disposal. Most collected waste is deposited in
Hulene, a large open-air dump that extends over
several km of Maputo Bay. Though overlapping national and
local institutional roles have somewhat hin-
terfered with progress, the city has initiated
several methods, including the provision of
untreated groundwater from shallow wells, the
sanitation services. Though strategies and plans
have proliferated at the national level, a city san-
titation strategy is a necessary first step to creat-
ing synergy among public officials, communi-
ties and non-governmental organisations.

Air quality: Below average

The main sources of air pollution are informal
shared taxis, chaps, that ply the streets during
their poor emissions standards, as well as near-
by aluminium and cement factories. The city has
not yet created an air quality monitoring system,
or does it regularly monitor or promote air
quality. Independent air pollution studies in
Maputo indicate "exceedingly high" concentra-
tions of particulate matter. Developing enforce-
able regulatory standards is among the chal-
enges city officials will face in the years ahead.

Green initiatives: In March 2010 the city
adopted a new initiative to inspect automobiles
older than four years. One category for inspec-
tions is carbon emissions, with high-emissions
vehicles banned from the roads. It is unclear
how much progress has been made so far.

Environmental governance: Below average

The city has experienced a degree of institu-
tional reform from the First phase of the World Bank-
supported PROMAPUTO programme. This in-
cludes the establishment of the Maputo munici-
cipal council, which now oversees environ-
mental decision-making. Though the council has the ability to issue environmental licenses,
monitor water and sanitation quality, and man-
age waste, it is staffed with only full-time
employees and is limited in its ability to imple-
ment environmental policies. In the future,
the enlargement of this agency, both in terms of size
and authority, will be a key indicator of Maputo's
effectiveness in environmental governance.

Quantitative indicators

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Average</th>
<th>Maputo</th>
<th>Year</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Proportion of households with access to electricity (%)</td>
<td>84.2</td>
<td>28.8°</td>
<td>2005</td>
<td>UN Habitat</td>
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<tr>
<td></td>
<td>Electricity consumption per capita (GWh/habitant)</td>
<td>6.4</td>
<td>0.8°</td>
<td>2006</td>
<td>Electricidade de Mocambique - Annual Statistical Report 2007</td>
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<td></td>
<td>CO2 emissions from electricity consumption per person (kg/person)</td>
<td>0.04°</td>
<td>0.04°</td>
<td>2006</td>
<td>Electricidade de Mocambique - Annual Statistical Report 2007</td>
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<tr>
<td>LAND USE</td>
<td>Population density (persons/km²)</td>
<td>1,313.1</td>
<td>1,417.4°</td>
<td>2006</td>
<td>EIU calculation</td>
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<td>Population living in informal settlements (%)</td>
<td>30.0°</td>
<td>70.0°</td>
<td>2010</td>
<td>World Bank</td>
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<td></td>
<td>Green spaces per person (m²/person)</td>
<td>7.9°</td>
<td>114.5°</td>
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<td>TRANSPORT</td>
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<td>–</td>
</tr>
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<td></td>
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</tr>
<tr>
<td>WASTE</td>
<td>Waste generated per person (kg/person/year)</td>
<td>207.8°</td>
<td>293.9°</td>
<td>2010</td>
<td>Maputo Waste Management Department</td>
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<tr>
<td>WATER</td>
<td>Water consumption per person (litres per person per day)</td>
<td>187.2°</td>
<td>99.5°</td>
<td>2010</td>
<td>Mozambique Country Water Resources, Assistance Strategy</td>
</tr>
<tr>
<td></td>
<td>Water system leakage (%)</td>
<td>30.5°</td>
<td>50.0°</td>
<td>2009</td>
<td>Fundo de Investimentos e Patrimônio de Abastecimento de Água</td>
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<tr>
<td>SANITATION</td>
<td>Population with access to sanitation (%)</td>
<td>48.0°</td>
<td>50.0°</td>
<td>2006</td>
<td>UN Habitat</td>
</tr>
</tbody>
</table>

Notes: *: data for the latest available year; †: data for the latest available year after the year of the main indicator is noted; °: estimated; ‡: national electricity generation mix used to estimate city level CO₂ emissions. After 2006, Mozambique's electricity generation mix used to estimate city level CO₂ emissions.
Initially a railway outpost for the Mombasa- Kampala Railway, Nairobi is now home to 3.1 million people. It is one of Africa’s most important cities and a major hub for finance, media, technology and air travel. Its altitude of 1,900 metres above sea level results in a moderate climate, which means there is little need for air conditioning or heating. The city receives much of its energy from renewable hydro power, but insufficient generation and transmission infrastructure leads to the frequent use of diesel-fuelled generators. Like other large cities, their transmission infrastructure often forces utilities to rely on diesel-powered generators. An estimated 75% of households have access to electricity, below the Index average of 84%, and blackouts are common. The reliance on renewables drives down Nairobi’s per capita CO2 emissions to an estimated 182 kg, much less than the index average of 984 kg. Per capita electricity consumption is almost on par with the Index average, at an estimated 6.5 gigajoules per person versus the Index average of 6.4 gigajoules. Nairobi is also marked down for lack of many of the energy policies evaluated in the Index.

Energy and CO2: Below average
Although Nairobi generates 62% of its electricity from renewables, mostly hydro and some geothermal power, poor generation and transmission infrastructure often forces utilities to rely on diesel-powered generators. An estimated 75% of households have access to electricity, below the Index average of 84%, and blackouts are common. The reliance on renewables drives down Nairobi’s per capita CO2 emissions to an estimated 182 kg, much less than the index average of 984 kg. Per capita electricity consumption is almost on par with the Index average, at an estimated 6.5 gigajoules per person versus the Index average of 6.4 gigajoules. Nairobi is also marked down for lack of many of the energy policies evaluated in the Index.

Green initiatives:
Kenya’s first wind power plant, completed in 2010 with six turbines producing up to 5 megawatts of power, is located in the Ngong Hills 22 km outside Nairobi. Financing has been announced for a second phase of the project, which could bring the total capacity to 11 megawatts, enough to power 2,000 households. The national government is also exploring more wind power projects in other parts of the country. Although hydro-power is still a very small part of the energy mix in Kenya, national officials are looking at ways to diversely away from it because of unreliable rainfall.

Transport: Below average
More than 90% of city commuters depend on privately run, frequently over-crowded minibuses called matatus. City efforts to replace matatus with public buses have had disappointing results, and the density of the public transport network in the city is below the Index average, at an estimated 1.9 km per square kilometre, compared with the average of 2.7 km per square kilometre. The superior network serving the city, consisting of suburban railways built in the 1980s, measures 0.09 km per
square kilometre, just over the index average of 0.07 km per square kilometre, although only an estimated 19,000 commuters use the system daily. Although officials have discussed a rapid rail system, no concrete plans have been implemented. Nairobi is supposed to implement an advanced traffic-management system through the application of traffic light sequencing and to install some limited-vehicle lanes that are positive steps.

Green initiatives: Nairobi is seeing major investment in its road network. A road ring planned since the 1970s will finally be built by 2012. Even more significant is an eight-lane high-speed road that the city government hopes to have in place by 2010. A ring road around the city aims to reduce pollution and lessen traffic congestion.

Sanitation: Average
An estimated 83% of the population has access to sanitation, about equal to the Index average of 84%. The city’s wastewater treatment plants are unable to accommodate the total wastewater generated each day in Nairobi. In informal settlements access to toilets is limited, resulting in the pollution of local streams. To combat these issues, the Kenyan government adopted the National Environmental Sanitation and Hygiene Promotion Policy in 2007 to expand access to and the quality of sanitation services around the country. How much has been implemented is still unclear.

Air quality: Below average
The main causes of air pollution in Nairobi are idling cars in traffic jams and faecal dust from informal settlements during dry months. It is hoped that new limits on importing old cars that do not meet emission standards will improve conditions, though in the long term regulation of vehicles running on leaded petrol, such as lorries and buses, would likely yield more dramatic results. The city lacks an air-quality code and air monitoring in Nairobi is conducted only on a limited, ad hoc basis, which negatively affects its placement in this category.

Environmental governance: Below average
Nairobi has a dedicated environmental authority that oversees and implements environmental policy, as well as some ability to implement its own environmental legislation. In addition, the city involves external stakeholders, such as citizen groups and non-governmental organisations, to some extent in decision-making for projects with major environmental impact. For the fiscal year ending June 30th, 2010 Nairobi’s annual environmental budget was about US$5.9 million, or roughly 5% of the total annual city authority budget of US$107 million. Challenges remain, of course. New development in Nairobi is supposed to be overseen by the National Environmental Management Agency (NEMA). Some have been critical of the agency’s effectiveness, but the agency says it is moving forward with plans to better enforce environmental laws. The city’s placement in this category is hindered because it does not appear to regularly monitor its environmental performance and publish information on its progress.

Green initiatives: Numerous new technology initiatives are tracking Nairobi’s environmental conditions. A new government online data portal announced in July by President Mwai Kibaki will allow Kenyans to identify spending on water and energy, and to keep track of the state of the hydropower dams that provide the city most of its energy. A Climate Change Innovation Centre funded by the World Bank and the Danish government aims to make Nairobi a centre of green technology, creating 4,600 jobs within five years. As the third capital of the United Nations, after New York and Geneva, Nairobi is the world headquarters of the organization’s environmental and urban planning programmes. The UN campus in Githurai was overhauled in 2011 with energy-efficient offices. The new building for 1,200 employees includes 6,000 square metres of solar panels. The UN says the energy savings should pay for the investment within seven years.

Quantitative indicators

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Average</th>
<th>Nairobi</th>
<th>Year*</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY and CO2</td>
<td>Proportion of households with access to electricity (%)</td>
<td>84.2</td>
<td>75.0</td>
<td>2010</td>
<td>University of Nairobi, Department of Urban and Regional Planning</td>
</tr>
<tr>
<td></td>
<td>Electricity consumption per capita (GWh/person)</td>
<td>6.4</td>
<td>6.5</td>
<td>2008</td>
<td>International Energy Association</td>
</tr>
<tr>
<td></td>
<td>Electricity consumption per person (kWh/person)</td>
<td>169.1</td>
<td>181.5</td>
<td>2008</td>
<td>International Energy Association</td>
</tr>
<tr>
<td>LAND USE</td>
<td>Population density (persons/km²)</td>
<td>4,189</td>
<td>4,059</td>
<td>2007</td>
<td>CBD calculation</td>
</tr>
<tr>
<td></td>
<td>Population living in informal settlements (%)</td>
<td>38.3</td>
<td>50.0</td>
<td>2010</td>
<td>University of Nairobi, Department of Urban and Regional Planning</td>
</tr>
<tr>
<td></td>
<td>Green spaces per person (m²/person)</td>
<td>0.18</td>
<td>0.37</td>
<td>2009</td>
<td>UN Environmental Programme</td>
</tr>
<tr>
<td>TRANSPORT</td>
<td>Length of mass transport network (km/km²)</td>
<td>4.9</td>
<td>1.9</td>
<td>2009</td>
<td>Kenya-Bus Service Management Ltd</td>
</tr>
<tr>
<td></td>
<td>133.04, 133.08, 133.12, 133.13, 133.20, 133.25</td>
<td></td>
<td></td>
<td></td>
<td># of public transport network (km²)</td>
</tr>
<tr>
<td></td>
<td>Public transport network (km/km²)</td>
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<td>0.09</td>
<td>2009</td>
<td>Kenya Railway Corporation</td>
</tr>
<tr>
<td>WASTE</td>
<td>Waste generated per person (kg/person/year)</td>
<td>207.5</td>
<td>377.5</td>
<td>2007</td>
<td>City of Nairobi Environmental Outlook 2007</td>
</tr>
<tr>
<td>WATER</td>
<td>Population with access to piped water (%)</td>
<td>98.5</td>
<td>92.5</td>
<td>2003</td>
<td>UN Habitat</td>
</tr>
<tr>
<td></td>
<td>Water consumption per person (litres/person/day)</td>
<td>187.2</td>
<td>111.5</td>
<td>2005</td>
<td>City of Nairobi Environmental Outlook 2007</td>
</tr>
<tr>
<td></td>
<td>Water system leakages (%)</td>
<td>30.5</td>
<td>50.0</td>
<td>2007</td>
<td>City of Nairobi Environmental Outlook 2007</td>
</tr>
<tr>
<td>SANITATION</td>
<td>Population with access to sanitation (%)</td>
<td>82.0</td>
<td>82.0</td>
<td>2003</td>
<td>UN Habitat</td>
</tr>
</tbody>
</table>

* Data prior to 2006 were not available in this report. "Nairobi" refers to the city limits. ** Data are for the most recent year available. # Data from the London Declaration on Urban Water. $ Data from the 1st United Nations Global Human Settlement Survey Report.

Pretoria is South Africa’s administrative capital, housing the government ministries, foreign embassies, and various academic and research centres. The city centre is highly developed, with a mix of historical and modern buildings. Compared with other cities in the African Green City Index, Pretoria has a relatively small population of 2.3 million residents. It is over-seen by an entity called the City of Tshwane, which includes many different municipalities in the Gauteng Province, and was expanded in 2011. Following the absorption of several additional municipalities, the City of Tshwane’s population rose to 2.5 million and its area grew from 2,200 square kilometres to just under 6,400 square kilometres (much of this additional area being deliberately created black townships without access to basic services on the peripheries of the city). On a per capita basis there are only an estimated 39 square metres of green space per person compared with the Index average of 74 square metres.

Pretoria is closely connected to Johannesburg, both geographically and economically. Situated approximately 50 km from Johannesburg, Pretoria’s urban area is growing ever closer to its neighbour, and housing developments are being constructed along the corridor that links the two. Pretoria and Johannesburg are also connected by a new commuter railway. The city places average overall in the Index, with some mixed results in the individual eight categories: it achieves above average results in the transport, air quality and environmental governance categories. Pretoria boasts a transport network more than double the Index average. It also has a relatively strong environmental department and a comparatively high level of public participation in projects with environmental impact. Pretoria is average for land use and water. Although the city has introduced water quality standards, some residents are still without access to potable water. Officials are also working to improve overall environmental conditions in informal settlements. Pretoria’s performances in the categories of energy and CO₂ and sanitation are below average, driven by high levels of CO₂ emissions from electricity consumption – electricity for the city is mainly produced from coal – and relatively low levels of access to sanitation. The city is well below average in the waste category, due mainly to generating the most waste per capita in the Index. There is nevertheless a variety of notable green initiatives underway in the city.

**Background indicators**

<table>
<thead>
<tr>
<th>Total population (million)</th>
<th>2.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative area (km²)</td>
<td>2,200</td>
</tr>
<tr>
<td>Population density (persons/km²)</td>
<td>1,100</td>
</tr>
</tbody>
</table>

**Green initiatives:**

- The city is prioritising so-called integrated land use, in which housing for affluent residents is in close proximity to less wealthy developments. This is an attempt to address the legacy of Apartheid planning that deliberately created black townships without access to basic services on the peripheries of cities. There are plans to formalise all informal settlements (providing electricity and water access to sanitation, and more access to municipal services, including sanitation and electricity. Regarding green space, the city’s development strategy calls for investments in new parks as well as proposing a number of spratul-prevention policies. Already, Pretoria has 13 nature reserves and ten bird sanctuaries, along with other recreational nature areas. However, on a per capita basis there are only an estimated 39 square metres of green space per person compared with the Index average of 74 square metres.

**Energy and CO₂: Below average**

An estimated 78% of households have access to electricity, less than the Index average of 84%. However, the city has set a target to increase this to 100% of households by April 2016. Despite low access levels, the city consumes 12.0 gigajoules of electricity per person – nearly twice the Index average of 6.4 gigajoules. As is the case for the other South African cities in the Index, over 90% of Pretoria’s electricity is generated using coal, while nuclear power generates about 5% and renewable energy in the form of hydropower less than 2%. As a result, the city emits an estimated 3,048 kg of CO₂ per person from electricity consumption, more than three times the Index average of 984 kg. Pretoria introduced an integrated environmental policy in January 2005, which aims to diversify the energy supply, encourage energy efficiency and promote cooperation between government, business, labour, communities and other stakeholders, among other goals. The document says the city should discourage the use of inefficient and high-polluting fuels, although there are no specific action points. The plan also calls for reducing energy consumption in all municipal operations and implementing “green procurement” policies based on energy efficiency, but again no specific plans are included in the document.

**Overall result**

<table>
<thead>
<tr>
<th>Energy and CO₂</th>
<th>Pretoria</th>
<th>Other cities</th>
<th>Overall performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well below average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Above average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well above average</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Land use: Average**

The centre of Pretoria is not densely populated and most of the people who work there commute from nearby Johannesburg. Indeed, Pretoria is the least densely populated city in the Index, with only 1,100 people per square kilometre compared with the Index average of 4,600 people. An estimated 27% of the population lives in informal settlements, below the Index average of 38%. Like in many cities in South Africa, Pretoria’s population is growing rapidly, which has resulted in the appearance of informal settlements. In recent years, though, Pretoria has taken steps to redevelop these areas and provide more access to municipal services, including sanitation and electricity. Regarding green space, the city’s development strategy calls for investments in new parks as well as proposing a number of spratul-prevention policies. Already, Pretoria has 13 nature reserves and ten bird sanctuaries, along with other recreational nature areas. However, on a per capita basis there are only an estimated 39 square metres of green space per person compared with the Index average of 74 square metres.

**Overall result**

<table>
<thead>
<tr>
<th>Land use</th>
<th>Pretoria</th>
<th>Other cities</th>
<th>Overall performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well below average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Above average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well above average</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The city is prioritising so-called integrated land use, in which housing for affluent residents is in close proximity to less wealthy developments. This is an attempt to address the legacy of Apartheid planning that deliberately created black townships without access to basic services on the peripheries of cities. There are plans to formalise all informal settlements (providing electricity and water access to sanitation, and more access to municipal services, including sanitation and electricity. Regarding green space, the city’s development strategy calls for investments in new parks as well as proposing a number of spratul-prevention policies. Already, Pretoria has 13 nature reserves and ten bird sanctuaries, along with other recreational nature areas. However, on a per capita basis there are only an estimated 39 square metres of green space per person compared with the Index average of 74 square metres.

**Performance**

- Energy and CO₂
- Land use
- Transport
- Waste
- Water
- Sanitation
- Environmental governance
- Overall result
supplies, tarring roads and replacing shakes with brick houses) by the end of 2016, and deliver more services to less developed townships.

Transport: Above average

Pretoria’s public transport network, consisting mainly of buses and commuter trains linking it to Johannesburg, measures 6.4 km per square kilometre, more than double the Index average of 2.7 km. However, despite the network's wide coverage, as in the rest of South Africa, private automobiles remain the primary form of transport for those who can afford them. The arteries around the city centre are regularly clogged by high volumes of commuter traffic travelling to the various government offices in Pretoria. According to a 2008 city household survey, most respondents expressed concern about their personal safety while using buses, due to a high number of traffic accidents on the roads between Pretoria and Johannesburg.

Green initiatives: The city has plans to completely revamp its public transport system and is currently developing an integrated rapid public transport network (RPTN). At the heart of this will be a bus rapid transit (BRT) system, which will run along dedicated lanes through the city to avoid congestion and have sealed stations to create safety. However, as of December 2010 the BRT had been put on hold due to concerns about the feasibility of the design. Through the BRT had been put on hold due to concerns about the feasibility of the design. Through the BRT system also includes buses linking Pretoria to the various government offices in Pretoria. According to a 2008 city household survey, most respondents expressed concern about their personal safety while using buses, due to a high number of traffic accidents on the roads between Pretoria and Johannesburg.

The city has plans to completely revamp its public transport system and is currently developing an integrated rapid public transport network (RPTN). In another initiative, the Gau -IRPTN the city also plans to assess ways to reduce the amount of traffic in central Pretoria. According to a 2008 city household survey, most respondents expressed concern about their personal safety while using buses, due to a high number of traffic accidents on the roads between Pretoria and Johannesburg.

Green initiatives: The city has an Air Quality Management Plan (AQMP) that aims to mini -mise the negative impact of air pollution on peo- ple’s health and wellbeing, and on the environ- ment. Reducing domestic fuel burning, such as the burning of charcoal in informal settlements, is also a key priority stated in the AQMP.

Environmental governance: Above average

The city has a dedicated agriculture and environ- mental management department under which the municipality test for sulphur dioxide, nitrogen dioxide, suspended particulate matter, suspend- ed fine particulate matter and carbon monoxide. Green initiatives: Since 2003 the city has been running its Sustainable Energy and Climate Change programme, which aims to encourage the integration of sustainable energy and environ- ment concerns into urban development in South Africa. All departments are required to make sustainable energy objectives part of their activities and functions, although few specific details are available about how this policy has been implemented.

Quantitative indicators

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Pretoria</th>
<th>Average</th>
<th>Year*</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY and CITY</td>
<td>Population of households with access to electricity (%)</td>
<td>94.2</td>
<td>78.0</td>
<td>2010</td>
<td>National Department of Cooperative Governance and Traditional Affairs</td>
</tr>
<tr>
<td></td>
<td>Electricity consumption per capita (GJ/hab)</td>
<td>6.4</td>
<td>12.0</td>
<td>2005</td>
<td>State of Energy Report 2006</td>
</tr>
<tr>
<td></td>
<td>CO2 emissions from electricity consumption per person (gpc)(gpc)</td>
<td>913.0</td>
<td>3,049.6</td>
<td>2006</td>
<td>State of Energy Report 2006</td>
</tr>
<tr>
<td>LAND USE</td>
<td>Population density (persons/km2)</td>
<td>4,510.1</td>
<td>1,066.3</td>
<td>2007</td>
<td>BUI calculation</td>
</tr>
<tr>
<td></td>
<td>Population living in informal settlements (%)</td>
<td>18.0</td>
<td>26.8</td>
<td>2007</td>
<td>Community Survey 2007</td>
</tr>
<tr>
<td></td>
<td>Green spaces per person (m2/person)</td>
<td>39.2</td>
<td>39.2</td>
<td>2005</td>
<td>2005 Report – Proposed Tshwane open space framework</td>
</tr>
<tr>
<td></td>
<td>Length of mass transport network (km/km2)</td>
<td>2.7</td>
<td>6.4</td>
<td>2010</td>
<td>Tshwane Bus Service</td>
</tr>
<tr>
<td></td>
<td>Superior public transport network (km/km2)</td>
<td>0.07</td>
<td>0.04</td>
<td>2010</td>
<td>Supremo Magazine, Pretoria</td>
</tr>
<tr>
<td>WASTE</td>
<td>Water generated per person (gpc/person/year)</td>
<td>1,070.1</td>
<td>1,070.1</td>
<td>2005</td>
<td>Tshwane environment education and awareness strategy – appendix to report 2009</td>
</tr>
<tr>
<td></td>
<td>Water population with access to potable water (%)</td>
<td>91.2</td>
<td>97.2</td>
<td>2007</td>
<td>Community Survey 2007</td>
</tr>
<tr>
<td></td>
<td>Water consumption per person (litres per person per day)</td>
<td>187.2</td>
<td>319.7</td>
<td>2008</td>
<td>Mysander</td>
</tr>
<tr>
<td></td>
<td>Water system leakages (%)</td>
<td>10.5</td>
<td>18.6</td>
<td>2009</td>
<td>Department of Water Affairs – 2009 Water Services Development Plan</td>
</tr>
<tr>
<td>SANITATION</td>
<td>Population with access to sanitation (%)</td>
<td>66.3</td>
<td>53.9</td>
<td>2007</td>
<td>Community Survey 2007</td>
</tr>
</tbody>
</table>

* Year refers to publication of report on which indicator is based. Averages taken from different sources used as the year of the data indicated below. ± = ±1 standard deviation of the mean.
Tunis is the capital of Tunisia. It is the smallest city in the African Green City Index in terms of population, with only 1 million residents, though the greater metropolitan area is home to roughly 2.4 million. With an administrative area estimated at just 200 square kilometres, Tunis is also the second smallest city by area in the Index, just marginally larger than Accra. Compared with other major cities in North Africa, the city is relatively well managed and prosperous, and benefits from a tourist industry that brings visitors to Tunisia’s beaches and historic sites. The overturning of the previous national government in January 2011 and the installation of an interim regime means that environmental governance, like much else in Tunisia, is currently in a state of flux. However, the new government will have an opportunity to build on several existing environmental strengths in its capital city.

Tunis ranks above average overall in the Index, and is above average in the individual categories of transport, waste, sanitation and air quality. The city has the longest superior mass transit network in the Index, with a well-developed system of light rail and suburban trains. Tunis ranks average for land use, water and environmental governance. Sprawl is an ongoing issue, but the city is emphasising pedestrian-friendly development and increasing green spaces. Likewise, Tunis currently faces water supply and wastewater discharge issues, but improving water infrastructure has been a top priority in recent years. The city falls below average for energy and CO₂ due to relatively high CO₂ emissions and electricity consumption. However, recent investments in solar power could bolster its performance in this category.

**Energy and CO₂: Below average**

Tunis has the highest electricity consumption per capita in the Index, at 18.1 gigajoules per capita, almost three times the Index average of 6.4 gigajoules. A major driver of this high consumption has been the government’s push in recent years to continuously expand access to the grid. An estimated 99% of households have access to electricity, exceeding the Index average of 84%. Air conditioning in the summer also drives up Tunis’s electricity demand. Tunis emits an estimated 1,044 kg of CO₂ per capita from initiatives, the national government wants to increase its renewables from 0.5% of production to 10% by 2020. In addition, the World Bank has financed a programme to examine how Tunis and the rest of the region can adapt infrastructure for the potential effects of climate change, such as increased coastal erosion or natural disasters such as extreme storms and flooding.

**Land use: Average**

Tunis performs well for its relatively high population density, at an estimated 4,700 people per square kilometre, versus the Index average of 4,600. However, this also leads to a relative lack of green space. The city only offers an estimated 15 square metres of green space per person, well below the Index average of 74 square metres. The exception is the 100-hectare Belvedere Park, known as the "lungs" of the city. Many of the city’s poorer residents live in crumbling buildings in the city centre, but one particularly active non-governmental organisation has been leading a revitalisation of these neighbourhoods (see "green initiatives" below).

**Green initiatives:** In 2005 the government adopted a programme to promote solar energy, PROSOL. The programme is a joint initiative of the government-run National Agency for Energy Conservation, the state power company Société Tunisienne de l’Electricité et de Gas (STEG), the UN Environment Programme and the Italian environment ministry. The scheme includes loans and subsidies to offset the cost of solar water heaters. More than 50,000 families benefited in the first two years of the programme, saving an estimated 240,000 tonnes of CO₂ emissions. Ultimately, through a series of related initiatives, the national government wants to increase its renewables from 0.5% of production to 10% by 2020. In addition, the World Bank has reversed the creeping disrepair of the old city by upgrading electricity connections and street lights, restoring monuments, clearing waste from the streets and creating pedestrian areas. Under one of AMI’s initiatives, Project Dukales, three new neighbourhoods were built to accommodate some 1,300 households who had been forced to move because their former homes were dilapidated. The residents were provided with 25-year rent-purchase plans with low monthly repayments. The demolished buildings were then replaced with newer accommodations. In another US$19.5 million project, carried out between 1994 and 2007, the ASM led the restructuring of public spaces on two avenues, making them chiefly pedestrian. The organisation also listed and restored landmarks, including the Tunis municipal theatre and the central market.

**Transport: Above average**

Tunis residents have the choice of bus, light rail and suburban rail services. The city’s light rail

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**Background indicators**

| Total population (million) | 1.5 |
| Administrative area (km²) | 200 |
| Population density (persons/km²) | 4,700 |

**Performance**

<table>
<thead>
<tr>
<th>Category</th>
<th>Tunis</th>
<th>Other cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and CO₂</td>
<td>below average</td>
<td>average below average</td>
</tr>
<tr>
<td>Land use</td>
<td>average</td>
<td>well above average</td>
</tr>
<tr>
<td>Transport</td>
<td>average</td>
<td>average above average</td>
</tr>
<tr>
<td>Waste</td>
<td>average</td>
<td>below average</td>
</tr>
<tr>
<td>Water</td>
<td>average</td>
<td>well above average</td>
</tr>
<tr>
<td>Sanitation</td>
<td>below average</td>
<td>average</td>
</tr>
<tr>
<td>Air quality</td>
<td>average</td>
<td>below average</td>
</tr>
<tr>
<td>Environmental governance</td>
<td>average</td>
<td>below average</td>
</tr>
</tbody>
</table>

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**Overall result**

The state of the data within the performance bars is based on data from the client multiple categories.
Green initiatives: The city is investing US$2 billion in public transport network improvements. In November 2008 Tunis completed a 6.8 km extension to the light rail network in the south of the city and in December 2009 a 5.3 km western extension. Two further extensions are under way. An additional suburban network is planned by 2016. The city also plans to introduce 14 new bus corridors totalling 90 km.

Waste: Above average
On a per capita basis, Tunis generates an estimated 173 kg of waste annually, compared with the Index average of 408.4 kg. This is one of the lowest rates in the Index and the main driver of the city’s performance in this category. The government adopted a ten-year strategic framework for waste management in 1995 known as PRONAGES. It was designed to promote reuse and recycling, as well as reduce waste generation and improve cost management. The PRONAGES waste management framework was followed by a second programme covering the 2007-16 period and unauthorised dumps and increasing treatment rates of industrial and special waste to 70%.

Water: Average
Water resources in Tunis are limited because of the arid climate. Despite this, residents consume an average of 299 litres of water per person per day, which is well above the Index average of 187 litres. It is estimated that nearly 100% of the population has access to potable water, above the Index average of 91% and the second highest rate in the Index. Tunis’s water system leakages, at 28%, are slightly lower than the Index average of 32%. Several international agencies, including the World Bank, the French Development Bank and the African Development Bank, have invested and loaned large sums in recent years to upgrade infrastructure and management practices (see “green initiatives”). In large part these investments have paid off in terms of greater water access for residents and a more efficient water system. The city has relatively strong policies, including regular monitoring of surface water quality, a water quality strategy by a high rate of access and strong policies relating to the other cities in the Index. An estimated 95% of the population has access to sanitation, well above the Index average of 84%. Regarding policies, the city is covered by a sanitation code, has wastewater treatment standards, and monitors on-site treatment facilities in homes and communal areas. As in the water category, many international agencies have extended loans and financial assistance to upgrade wastewater treatment and sewage networks in Greater Tunis and the rest of the country in recent years (see “green initiatives” below).

Green initiatives: In 2006 the European Investment Bank invested US$121 million to upgrade sewerage networks in Greater Tunis and several other towns in the country, and to construct new wastewater treatment plants. Also, the French Ministry of Development is financing a programme to expand and rehabilitate 19 water treatment stations and 130 pumping stations throughout Tunisia. Additionally, the government is prioritising the local eco-system. With assistance from the World Bank and other international organisations, it has introduced a plan to increase the use of treated wastewater for agriculture rather than discharging it into the gulf of Tunis.

Air quality: Above average
Tunis city officials conduct regular air quality monitoring in locations around the city and inform citizens about air pollution. The air quality in Tunis is better overall than in other major urban centres in North Africa. Compared with cities in Egypt and Morocco, Tunis’s roadways have less congestion, though pollution from traffic and industry is still a significant problem. On a national level, energy generation contributes 31% of the country’s air pollution and transport contributes 30%.

Green initiatives: The government has implemented a national plan to survey air quality. The plan foresees the installation of a network of fixed stations and the use of mobile laboratories to monitor and control the sources of pollution.

By 2002 five fixed stations had been established, including three in Greater Tunis at Bab Alouia, Manouba and Ghazela. A total of 15 stations have now been deployed, none of which are located in Greater Tunis in Bab Sal- doum, El Moujou, Arana, El Nahli, Ben Arous and Rades. The government plans to extend the network to a total of 25 stations by the end of 2011.

Environmental governance: Average
The city’s recycling policy is managed by the national ministry of environment, with different state-owned agencies carrying out specific policies in different areas. The overarching aim of the regime is to achieve environmental goals that are consistent with the country’s development strategy. The Ministry of Environment is responsible for environmental planning and strategy development to 30%, closing 70% of unauthorised dumps and increasing treatment rates of industrial and special waste to 70%. The Ministry of Environment is also responsible for carrying out the national recycling plan. The Ministry of Energy is responsible for energy policy and energy efficiency. The Ministry of Water is responsible for water resource management. The Ministry of Health is responsible for the management of solid waste, including recycling.

Green initiatives: As part of the Programme National de Gestion des Déserts (PRONIGHD), see “green initiatives” below.

Green initiatives: PRONIGHD focuses on optimising the financing, collection, transport and recycling of household waste, and on promoting private sector involvement and cooperation between communities. The nationwide programme contains a series of key targets, including reducing waste generation by 20% by changing consumption patterns, increasing composting levels by 15% and household waste recycling by 20% and ensuring 100% of municipalities have access to waste transfer stations and landfill facilities. Additionally, the framework calls for raising private sector participation in waste collection and infrastructure development to 30%, closing 70% of and a policy aimed at conservation. These policies have also received input from Tunisia’s international partners.

Green initiatives: In 2005 the World Bank approved a loan of US$38 million to the state-owned water company to upgrade water infrastructure in Greater Tunis and other urban centres. The project, which is set to finish in 2012, has two components. The first entails upgrading water infrastructure to improve delivery capacity, and the second focuses on upgrading management systems, including information systems, planning, cost control and customer service procedures.

Sanitation: Above average
The city’s performance in this category is driven by a high rate of access and strong policies relating to the other cities in the Index. An estimated 95% of the population has access to sanitation, well above the Index average of 84%. Regarding policies, the city is covered by a sanitation code, has wastewater treatment standards, and monitors on-site treatment facilities in homes and communal areas. As in the water category, many international agencies have extended loans and financial assistance to upgrade wastewater treatment and sewage networks in Greater Tunis and the rest of the country in recent years (see “green initiatives” below).

Green initiatives: In 2006 the European Investment Bank invested US$121 million to upgrade sewerage networks in Greater Tunis and several other towns in the country, and to construct new wastewater treatment plants. Also, the French Ministry of Development is financing a programme to expand and rehabilitate 19 water treatment stations and 130 pumping stations throughout Tunisua. Additionally, the government is prioritising the local eco-system. With assistance from the World Bank and other international organisations, it has introduced a plan to increase the use of treated wastewater for agriculture rather than discharging it into the gulf of Tunis.

Air quality: Above average
Tunis city officials conduct regular air quality monitoring in locations around the city and inform citizens about air pollution. The air quality in Tunis is better overall than in other major urban centres in North Africa. Compared with cities in Egypt and Morocco, Tunis’s roadways have less congestion, though pollution from traffic and industry is still a significant problem. On a national level, energy generation contributes 31% of the country’s air pollution and transport contributes 30%.

Green initiatives: The government has implemented a national plan to survey air quality. The plan foresees the installation of a network of fixed stations and the use of mobile laboratories to monitor and control the sources of pollution.

By 2002 five fixed stations had been established, including three in Greater Tunis at Bab Alouia, Manouba and Ghazela. A total of 15 stations have now been deployed, none of which are located in Greater Tunis in Bab Saloudoun, El Moujou, Arana, El Nahli, Ben Arous and Rades. The government plans to extend the network to a total of 25 stations by the end of 2011.

Environmental governance: Average
The city’s recycling policy is managed by the national ministry of environment, with different state-owned agencies carrying out specific policies in different areas. The overarching aim of the regime is to achieve environmental goals that are consistent with the country’s development strategy. The Ministry of Environment is responsible for environmental planning and strategy development to 30%, closing 70% of unauthorised dumps and increasing treatment rates of industrial and special waste to 70%. The Ministry of Environment is also responsible for carrying out the national recycling plan. The Ministry of Energy is responsible for energy policy and energy efficiency. The Ministry of Water is responsible for water resource management. The Ministry of Health is responsible for the management of solid waste, including recycling.

Quantitative indicators

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
<th>Average</th>
<th>Tunis</th>
<th>Year</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY and CO2</td>
<td>Proportion of households with access to electricity (%)</td>
<td>96.9</td>
<td>99.5</td>
<td>2010</td>
<td>EIU calculation</td>
</tr>
<tr>
<td>CO2 emissions from electricity consumption per person (kg/person)</td>
<td>133.3</td>
<td>1,044.1</td>
<td>2003</td>
<td>IPCC Guidelines for National Greenhouse Gas Inventories</td>
<td></td>
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<tr>
<td>LAND USE</td>
<td>Population density (persons/km²)</td>
<td>4,376.4</td>
<td>4,696.1</td>
<td>2009</td>
<td>EIU calculation</td>
</tr>
<tr>
<td></td>
<td>Population living in informal settlements (%)</td>
<td>18.4</td>
<td>25.8</td>
<td>2001</td>
<td>Société du Métro léger de Tunis</td>
</tr>
<tr>
<td></td>
<td>Green spaces per person (m²/person)</td>
<td>73.6</td>
<td>14.5</td>
<td>2004</td>
<td>National Statistical Institute</td>
</tr>
<tr>
<td>TRANSPORT</td>
<td>Length of mass transport network (km/1kkm²)</td>
<td>2.7</td>
<td>2.3</td>
<td>2004</td>
<td>Société du Métro léger de Tunis</td>
</tr>
<tr>
<td></td>
<td>Proportion of households with access to electricity (%)</td>
<td>96.9</td>
<td>99.5</td>
<td>2010</td>
<td>EIU calculation</td>
</tr>
<tr>
<td></td>
<td>Proportion of households with access to potable water (%)</td>
<td>91.2</td>
<td>99.7</td>
<td>2005</td>
<td>Société Nationale de la Propagation et de Distribution des Eaux</td>
</tr>
<tr>
<td></td>
<td>Water consumption per person (litres/person per day)</td>
<td>187.2</td>
<td>299.3</td>
<td>2004</td>
<td>Ministry of Environment</td>
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<tr>
<td></td>
<td>Water system leakages (%)</td>
<td>30.0</td>
<td>28.4</td>
<td>2004</td>
<td>Ministry of Environment</td>
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<tr>
<td>SANITATION</td>
<td>Proportion of households with access to sanitation (%)</td>
<td>95.0</td>
<td>95.0</td>
<td>2005</td>
<td>National Office of Reassurance</td>
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</tbody>
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