



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



Content

African Green City Index

- 4 Expert advisory panel
- 6 Introduction
- 8 Results
- 10 Overall key findings
- 16 Key findings from the categories
 - 16 Energy and GO
 - 16 Land use
 - 17 Transport
 - 18 Waste
 - 18 Water
 - 19 Sanitation
 - 19 Air quality
 - 19 Environmental governance
- 20 “Far from a nice-to-have option”: Green policies are central to economic and social progress in African cities
An interview with Nicholas You, urban sustainability expert
- 22 Best green initiatives
 - 22 **Energy and CQ**
Reducing the carbon footprint in Cape Town
 - 23 **Land use**
Combining social, economic and environmental revitalisation in Johannesburg
 - 24 **Transport**
Investing billions in the public transit network in Cairo
 - 25 **Waste**
Lagos turns waste into wealth
 - 26 **Water and sanitation**
International agencies invest in African cities
 - 27 **Environmental governance**
Imagining a more sustainable Durban
- 28 Methodology



- 32 City portraits
 - 32 Accra, Ghana
 - 36 Addis Ababa, Ethiopia
 - 40 Alexandria, Egypt
 - 44 Cairo, Egypt
 - 48 Cape Town, South Africa
 - 52 Casablanca, Morocco
 - 56 Dar es Salaam, Tanzania
 - 60 Durban, South Africa
 - 64 Johannesburg, South Africa
 - 68 Lagos, Nigeria
 - 72 Luanda, Angola
 - 76 Maputo, Mozambique
 - 80 Nairobi, Kenya
 - 84 Pretoria, South Africa
 - 88 Tunis, Tunisia

Expert advisory panel

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.



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 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 for Urban Planning. 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.



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).



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 lead specialist on energy, environment and climate change in the bank's west Africa region, based in Dakar. While at the bank, 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.



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).



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 Steering 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 joined 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, 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 world wide 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.



Introduction

African Green City Index

Africa's urban transition - approaching a tipping point

Africa is urbanising faster than any 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 percentage increases in urban migration, it remained mostly rural. That balance is starting to shift and the continent is approaching a tipping point. The number of urban residents in Africa has 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 2035 the total number of those living in informal settlements in the continent's growing cities is expected to double again to 870 million, at which point all Africans will live in urban areas.

Growth will be particularly strong south of the Sahara. Lagos and Kinshasa, currently the 18th and 29th most populous cities in the world, will by 2025 have vaulted to 12th place, respectively, easily surpassing Africa's current largest city, Cairo. In percentage terms, the next 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 32% over the next ten years. The only exceptions are South African cities and Congo-Brazzaville (the Republic of Congo). Such expansion would be difficult to manage with the best urban governance, yet too many African cities suffer from unplanned sprawl. The region has the highest proportion of 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 Africa's cities, "Not a single African government can afford to ignore the ongoing rapid urban transition, 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 findings 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 land use, transport, waste, water, sanitation, air quality and environmental governance. **Third**, the report presents the highlights of a variety of green initiatives underway 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, challenges and ongoing environmental initiatives. These profiles rightly constitute the bulk of the report because the aim of the study is to share valuable experience.

Cities must become priority areas for public policies." With African governments focussing on so many urgent challenges - from health and unemployment and inequality - one may question whether they have the time and 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 from being a 'nice-to-have option'," says Nicholas You, chairman of the Steering Committee of UN Habitat's World Urban Campaign, in an interview for this report. "These policies will ultimately determine Africa's capacity to create sustainable development for society as a whole."

* UN Habitat, The state of African cities 2010: Governance, inequality and urban land markets, November 2010.

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 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 population centres, such as Kinshasa in the Democratic Republic of the Congo, with a population of over 9 million people, and Khartoum in Sudan, with about 5 million, or Algiers, Algeria, at about 3 million, had to be excluded due to a significant lack of available information.

The methodology, described in detail in a separate section in this report, has been developed by the Economist Intelligence Unit (EIU) in cooperation with Siemens. It relies on the expertise of both organisations, a panel of outside experts, and the experience from producing Green City Indexes in Europe, Latin America, Asia, and the US and Canada. There are 25 individual indicators for each city and these indicators are often based on multiple data points. Each city is assessed in eight categories and placed within a performance band to indicate its relative results. The process is transparent, consistent, replicable, and reveals sources of best practice.

Obtaining consistent, reliable and accurate data on environmental performance across Africa is a substantial challenge. For example, key figures such as population numbers are disputed and accurate urban GDP figures do not exist for many leading cities. The EIU considered carefully whether to include each of the 12 quantitative indicators that appear in the African Green City Index. These data points came from transparent, reliable sources. The EIU chose indicators according to whether they could be compared across all 15 cities in the Index. For example, concentrations of air pollutants such as nitrogen oxide, sulphur dioxide or particulate matter may be available for some cities, but because they were not available for all 15 cities, they were excluded. The same was true for indicators included in previous regional Green City Indexes, such as the share of waste properly disposed of or the share of wastewater treated in the city. In the energy category, only electricity consumption figures from the electricity grid were available and could be incorporated. This only reflects part of the overall energy consumption. For example, diesel generators are common in many Index cities to generate electricity during blackouts or in the absence of access to the grid, but no comprehensive figures about this form of energy consumption exist. Thus, the Index does not include the amount of electricity or CO₂ emissions produced by diesel generators. Regarding informal settlements, it could not always be determined whether and to what extent informal settlements were covered in published data so far. In the end, the EIU made the judgment that it was necessary to include the best available data in the environmental index of African cities, even if coverage of informal settlements could not be exactly or uniformly defined. Full details are available in the methodology section.

Thirteen of the 25 indicators in the African Green City Index are qualitative assessments of each city's policies, regulations and ambitions - for example, its commitment to reducing the environmental impact of energy consumption, developing green spaces and conservation areas, reducing congestion or recycling waste. Data limitations in Africa mean that the African Green City Index relies more on qualitative assessments of policies than previous regional Indexes. Policies indicate commitment to reduce environmental impacts and for that reason, the rankings in the African Green City Index are weighted more toward an assessment of a city's potential future environmental performance than previous Indexes.

Finally, data limitations for African cities raise an important point for the future of sustainability efforts on the continent as a whole. Effective policy making depends on accurate information and improved information gathering must be a priority along with other sustainability efforts. Africa-based specialists agree: "There is a need to set up programmes to develop, access and use environmental data on African cities," says Alfred Omenya, professor of architecture at the University of Nairobi and an expert in urban planning and climate change. "Currently, this data is captured in a fragmented way by all sorts of agencies. More importantly, there is no system to ensure it can be used to deal with urban sustainability challenges."

Results

African Green City Index



Overall results

well below average	below average	average	above average	well above average
Dar es Salaam Maputo	Luanda Nairobi	Addis Ababa Alexandria Cairo Lagos Pretoria	Accra Cape Town Casablanca Durban Johannesburg Tunis	

Category results

Energy and CO₂

well below average	below average	average	above average	well above average
	Cape Town Durban Maputo Nairobi Pretoria Tunis	Alexandria Cairo Dar es Salaam Luanda	Accra Casablanca Johannesburg	Addis Ababa Lagos

Transport

well below average	below average	average	above average	well above average
Luanda	Accra Addis Ababa Dar es Salaam Maputo Nairobi	Alexandria Casablanca Lagos	Cairo Cape Town Durban Johannesburg Pretoria Tunis	

Water

well below average	below average	average	above average	well above average
Luanda	Alexandria Maputo	Accra Cairo Dar es Salaam Johannesburg Lagos Nairobi Pretoria Tunis	Addis Ababa Cape Town Casablanca Durban	

Air quality

well below average	below average	average	above average	well above average
	Addis Ababa Dar es Salaam Luanda Maputo Nairobi	Alexandria Cairo Lagos	Accra Cape Town Casablanca Durban Johannesburg Pretoria Tunis	

Land use

well below average	below average	average	above average	well above average
Luanda	Alexandria Dar es Salaam Lagos Maputo	Accra Cairo Nairobi Pretoria Tunis	Addis Ababa Casablanca Durban Johannesburg	Cape Town

Waste

well below average	below average	average	above average	well above average
Dar es Salaam Pretoria	Cairo	Accra Addis Ababa Casablanca Johannesburg Luanda Maputo Nairobi	Cape Town Durban Lagos Tunis	Alexandria

Sanitation

well below average	below average	average	above average	well above average
Dar es Salaam Maputo	Addis Ababa Pretoria	Alexandria Cairo Cape Town Johannesburg Lagos Luanda Nairobi	Accra Casablanca Durban Tunis	

Environmental governance

well below average	below average	average	above average	well above average
Luanda	Addis Ababa Dar es Salaam Maputo Nairobi	Alexandria Cairo Casablanca Lagos Tunis	Cape Town Durban Johannesburg Pretoria	Accra



Overall key findings

African Green City Index

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 con-

sumption, 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. 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 particu-

larly, 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 built structures in place. While in many of the African and sub-Saharan African cities policy run from afar at the national or provincial level, South African cities have city departments, often under the direction of a city council directly oversee and implement policies at the urban level.

Overall results
South African and North African cities lead the Index

well below average	below average	average	above average	well above average
Dar es Salaam Maputo	Luanda Nairobi	Addis Ababa Alexandria Cairo Lagos Pretoria	Accra Cape Town Casablanca Durban Johannesburg Tunis	
■ South African cities	■ North African cities	■ Sub-Saharan cities		

to resemble those more familiar in Western countries. “They have working services and infrastructure. They have the most basic problems – water supply, waste management, human health, that whole kind of things that go together,” she says. “Lower 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, for example, are very strong on access to electricity, potable water and sanitation, with rates approaching 100%. Cairo and Alexandria, although average overall, have strong access figures as well. Tunis in particular has been proactive in recent years in connecting

environmental policies have been a key part of the post-Apartheid reforms. “South African cities have been able to use the political capital of the post-Apartheid reconstruction to address environmental problems that were part of the legacy,” he says. These problems included designing black townships on the periphery of the city, far away from basic municipal services. “They have working services and infrastructure. They have the most basic problems – water supply, waste management, human health, that whole kind of things that go together,” she says. “Lower and power



households to the electricity grid. The city has also invested heavily in its light rail and suburban trains. In Casablanca, the authorities have taken over management of key services such as electricity provision, water, waste management and sanitation services to private contractors. In 1997, the move has not been without its costs, but the city can point to successes in access and service quality over that time. The uprisings around the Arab world have also led to a renewed sense of optimism that more democratic, responsive governments will continue to accelerate improvements.

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

Some North African cities are similar. In sub-Saharan Africa, she says, “city governments on the whole lack autonomy and, even when they have it, city politics are unstable and shaky.” More than half of the population has access to some form of sanitation, only an estimated 17% of households are connected to the sewer system and only an estimated 10% of sewers are used before being released. Likewise, in Maputo a significant percentage of the population lacks access to basic services for waste management or sanitation. These cities also have among the highest percentages of their populations living in informal settlements, at an estimated 70% for Maputo and an estimated 68% for Dar, compared with the average of 38%.

Africa specialists confirm that these environmental issues are often not prioritised by political elites is that, by definition, sustainability 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 longer-term ones.” In addition, the climate change agenda is sometimes viewed with suspi-

cion 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.

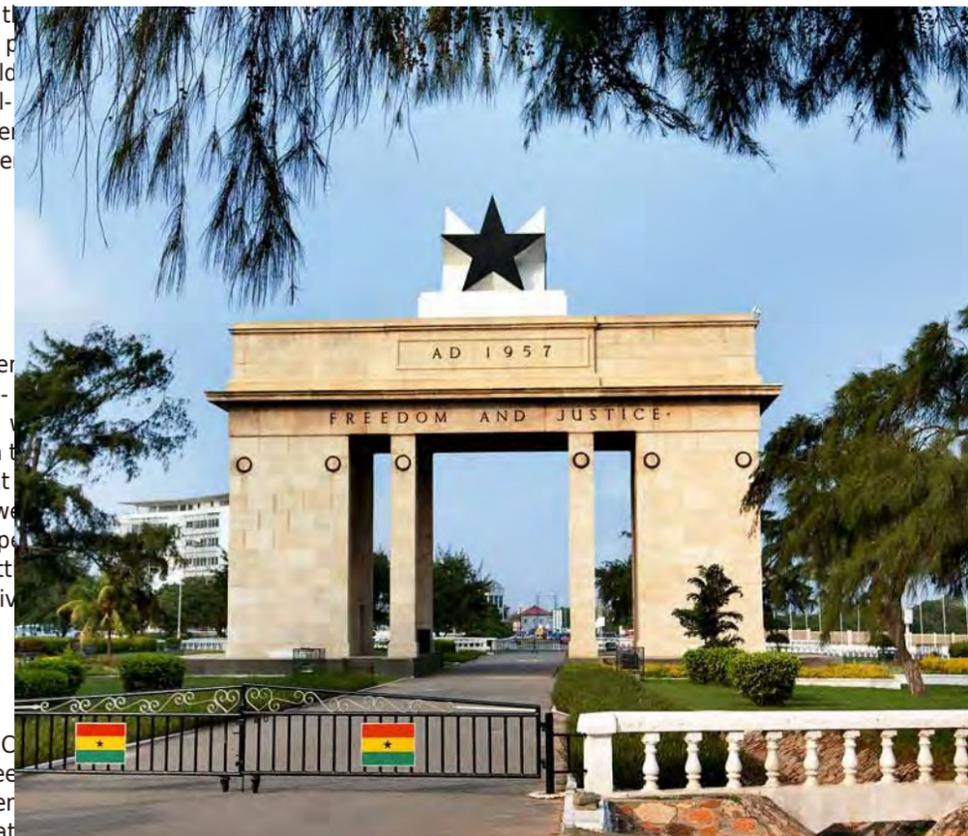
Good performance in the Index is strongly correlated with fewer people living in informal settlements. What explains the link?

Among the 15 Index cities, the average percentage of the population living in informal settlements 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 best, 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 consumption. “While institutional frameworks and governance need resources,” says Mr Omenya of the University of Nairobi, “the reverse, that the presence of resources will automatically lead to better management of environment, 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 greenness is questionable,” he says. “Wealth does make the provision of formal water and sanitation services affordable, but this is a small proportion of greenness. For the rest, in Africa,



Index results: Spotlight on Accra

Although six of the seven sub-Saharan cities (excluding South Africa) finish average, below or well below average overall, Accra comes in above average. What sets it apart from other sub-Saharan cities?

Accra’s standout category in the Index is environmental governance, where it ranks well above average relative to its Index peers. It has strong scores for environmental management, with structures in place for local assemblies to work with the national government in implementing policies. It also scores relatively well for environmental monitoring and policies on public participation. In addition, the city has policies in place addressing air quality and sanitation, and has a high ratio of renewable energy – 74% comes from hydropower.

Africa specialists said that although policies may be in place for the city, which is an indicator of their performance in the future, they are not necessarily a complete reflection of the current situation on the ground. A recent UN Habitat profile of the city found that it suffers from an “urban divide” between the rich and poor. Policies, it seems, have not always turned into practical action, especially in terms of delivering municipal services to poorer residents.

However, Accra has received considerable outside investment in transport, water and sanitation infrastructure from the World Bank and the European Commission in recent years. Residents in Accra’s informal settlements are also more likely to have “tenure” (a form of land ownership), which provides more access to municipal services and encourages residents to upgrade facilities themselves. Although Mr Omenya of the University of Nairobi would caution against calling Accra “above average” on anything but the relative scale of the Index, he says, “Accra does have unique attributes that may enable it to outperform most of the sub-Saharan African cities, especially because of security of tenure.”



indeed, while informal settlements have many environmental problems, he suggests, “they also have high density, low emissions, low water consumption, high levels of resource efficiency and relatively high levels of collective coherence compared to atomistic suburbs.”

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 infrastructure and the environment. Lagos State – the state is in effect the metropolitan government – in particular has a growing reputation for addressing things which were in a parlous state, in particular relating to sanitation, environmental aesthetics, and remediation generally. There has been dramatic change.” Indeed, for sub-Saharan cities, adds Susan Parnell, professor at the African Centre for Cities at the University of Cape Town, “the big error is to assume that they are not powerful. They have controlled over some of the most critical levers of change, sometimes unwittingly, things like land use management.”

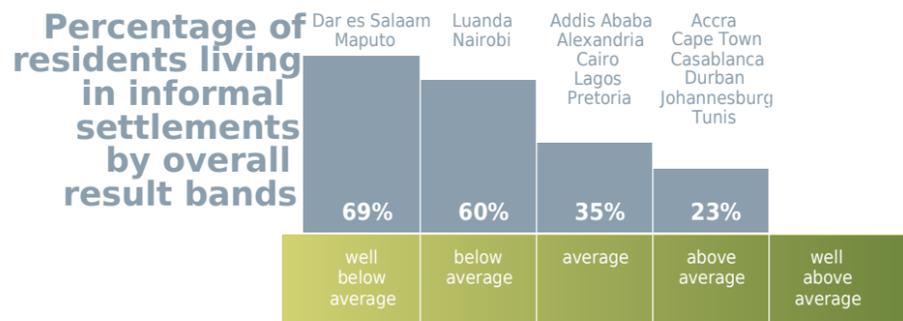
Unfortunately, according to Edgar Pieterse, director of the African Centre for Cities at the University of Cape Town, there is a trend towards national governments taking more authority over decisions about cities. “In many countries there has been a recentralisation of functions; and very seldom, except for South Africa, have 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 countries must be located.”

more affluence currently correlates with regions of the world, but where environmental challenges cannot wait. 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 Habitat and former mayor of Barcelona, suggests that institutional capacity is the first step: “The West African cities, they are mainly undisputed 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 settlements set on public land. These are targets for attention 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 difficult to distinguish between the two in some places, as cities begin to deliver municipal services 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 ensure that in areas with adequate daylight solar power can be used to remove domestic consumer electronics from the national grid. Good planning and development controls can ensure that rainwater harvesting takes place and people are not travelling long distances across the city, polluting the environment in their wake. Currently planning seems to overtly 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

“Far from a nice-to-have option”



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 EIU about the results of the Index, the difficulty of measuring the environmental impact of informal settlements and the necessity to administer cities as “living organisms”.

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?

at the city level in Africa are far from being “nice-to-have option”. These policies will ultimately determine Africa's capacity to sustain able development for society as a whole.

Although wealth is important for environmental performance, what kinds of initiatives or activities can lower income cities undertake to improve their environmental performance?

Africa is 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, flooding may or may not be directly caused by human activity, but the resulting famine, human displacement and impoverishment a direct consequence of poor planning and 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

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 immeasurable social and economic benefits for all, and at minimal cost.

Why 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 many cities in developing countries, this is carried out by scavengers working and living in deplorable conditions. The right mix of policies and 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. 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 better 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 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 say “100% coverage”, while the city as a whole may drop down to 70% access. Since the Green City Index is comparative within a region that is, comparing 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 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 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 statistician will say they have access to sanitation.

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 – integrating the full benefits of smart growth, smart infrastructure and smart services, for example – could allow these cities to leapfrog more mature societies. But smart technologies also require better governance, including better

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 that poverty is the worst form of pollution. A lot of the reason why

formal settlements are living proof that we are not planning our cities well.

Often statistical agencies and city authorities report high levels of access to basic services, such as potable water, waste collection and sanitation, when the situation on the ground may be very different because of the presence of informal settlements. What are the challenges in trying to get an accurate picture through data?

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 designated 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 informed 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. We must look at the city or the metro region as a whole. Competing jurisdictions are one of the biggest obstacles to sustainable urbanisation. Most metropolitan areas cut across many jurisdictions, with different elected bodies and local government structures. You could be busy trying to green your city, but half of the population that depends on your city may fall under different planning and regulatory regimes, and service providers that are engaged in establishing the next shopping mall, the next golf course, the next suburb. The city is a living organism that needs to be managed as a single entity, and just like any living organism, it needs to develop holistically.

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 in informal settlements, as opposed to removal and demolition. Slums are communities with their own social, cultural and economic networks. A lot of the reason why



Best green initiatives

African Green City Index

Energy and CQ: Reducing the carbon footprint in Cape Town

Cape Town's below average score in the energy and CQ category comes in part from the city's high rate of electricity consumption in the Index, but even more from the type of energy used 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 power generation, still relies mainly on coal, although with the support of the national government it has recently begun to look for cleaner sources of fuel.

What makes the city unique is its impressive efforts to address its carbon footprint. Cape Town, with the best clean energy policies in the Index, began early. In 2003 it was the first African city to create an Integrated Metropolitan

Environmental Policy, which set a vision and strategy to improve in several areas such as waste management, open spaces and energy conservation. Its goal is to reduce electricity consumption by 10% by 2012. Efforts to meet this target include an electricity saving campaign aimed at individuals, the creation of an Energy Efficiency Forum for business, and substantial retrofitting of the city's own buildings and traffic lights.

Cape Town has also made commitments to power generation, still relies mainly on coal, although with the support of the national government it has recently begun to look for cleaner sources of fuel. At the end of 2011 through the installation of solar panels in three northern regions of Ghana and a local wind farm.

Although efforts are in the early stages, officials have been looking at ways to capitalise on the global carbon-credit trading schemes such as the Kyoto Protocol's Clean Development Mechanism, under which developed countries can invest in developing nations in exchange for carbon emissions credits. As part of this the Lagos

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, solar water heaters have no cost apart from their initial installation and are popular among income households.

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

Ten years ago the heart of Johannesburg was many dangerous, dilapidated neighbourhoods and business generally stayed away. Since a dramatic turnaround has taken place in the small part due to the work of the Johannesburg

Development Agency (JDA). The city set up a friendly to pedestrians, revived an existing transit 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. As 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 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 \$300 million in private investment after regeneration efforts began.



Highlights from other cities:

Dar es Salaam: The Aga Khan Foundation, trying to address its transport problems through international non-governmental organisation investments and new policies.

Addis Ababa: The city master plan calls for reforestation of surrounding mountains, the planting of trees, and the establishment of new parks and green spaces. The most significant green space will be a pedestrian linear park that winds some 5 km through the city centre. Although these will be difficult to realise on a large scale, some of the principles of urban architecture can help show the way for superior urban centres and provides another food source for the city. The project receives funding from the German government's Ministry of Education and Research.

Nairobi: The Kenya Wildlife service in partnership with private companies is managing the Green Line Project, an initiative to plant forest along 30 km of the perimeter of Nairobi National Park in the south of the city. The hope is to create a visible boundary between the park and surrounding new developments, and to encourage lobbying by developers to cut slices of the park.

Cairo: The city has a bad reputation for traffic. 80% of intersections in central Cairo are saturated, and this may be 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. 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,

Transport: Investing billions in the public transit network in Cairo

The Aga Khan Foundation, trying to address its transport problems through international non-governmental organisation investments and new policies.

The city master plan calls for reforestation of surrounding mountains, the planting of trees, and the establishment of new parks and green spaces. The most significant green space will be a pedestrian linear park that winds some 5 km through the city centre. Although these will be difficult to realise on a large scale, some of the principles of urban architecture can help show the way for superior urban centres and provides another food source for the city. The project receives funding from the German government's Ministry of Education and Research.

The Kenya Wildlife service in partnership with private companies is managing the Green Line Project, an initiative to plant forest along 30 km of the perimeter of Nairobi National Park in the south of the city. The hope is to create a visible boundary between the park and surrounding new developments, and to encourage lobbying by developers to cut slices of the park.

The city has a bad reputation for traffic. 80% of intersections in central Cairo are saturated, and this may be 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. 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,

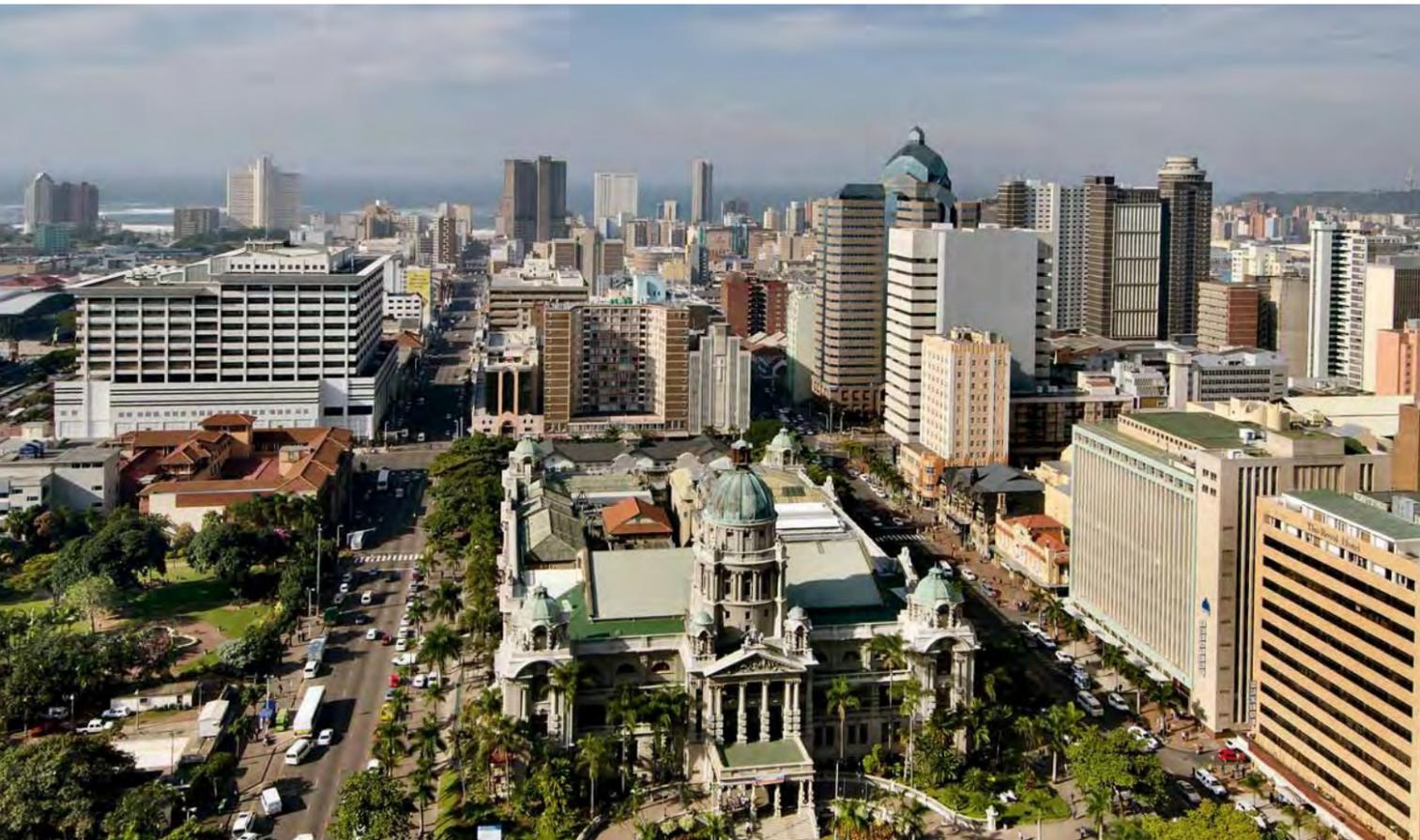
Finally, the Carbon Finance Vehicle Street rail network in the south of the city and Bill Clinton came to the city in April 2011, paving and Recycling programme aims to get new western extension was completed in December 2009. Two further extensions are also under way. An additional suburban network is planned for 2016. The city also has plans to introduce 20,000 vehicles replaced in 2009 alone. This is the first transport programme in the world to be implemented by the Lagos State government in partnership 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 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 Johannesburg and Pretoria: The high-speed operation. In its two years of operation 120 million passengers have used the system, reducing carbon emissions by an estimated 13%. 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 have in these containers, a new recycling facility will be built in cooperation with the Clinton Climate Initiative. When complete, it will be able to

Highlights from other cities:

Lagos: The Lagos State government has been actively introducing a new strategy through its branded department, the Lagos Waste Management Authority (LAWMA). Under LAWMA's waste-to-wealth programme, waste is treated and promoted as an affordable, reliable and safe option 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 Johannesburg and Pretoria: The high-speed operation. In its two years of operation 120 million passengers have used the system, reducing carbon emissions by an estimated 13%. 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 have in these containers, a new recycling facility will be built in cooperation with the Clinton Climate Initiative. When complete, it will be able to

Waste: Lagos turns waste into wealth

The Lagos State government has been actively introducing a new strategy through its branded department, the Lagos Waste Management Authority (LAWMA). Under LAWMA's waste-to-wealth programme, waste is treated and promoted as an affordable, reliable and safe option 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 Johannesburg and Pretoria: The high-speed operation. In its two years of operation 120 million passengers have used the system, reducing carbon emissions by an estimated 13%. 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 have in these containers, a new recycling facility will be built in cooperation with the Clinton Climate Initiative. When complete, it will be able to



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 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 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.

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 was expected to be released in late 2011. The results of the study will be used to develop a national climate change mitigation policy.

Dar es Salaam: UN Habitat has run several initiatives in the city in the past decade, including a programme to identify and protect the city's water sources. A key element is a campaign of water education for Dar es Salaam residents that provides a clearer understanding of the value of conserving water.

Maputo: The improvement of sanitation services is a priority of the World Bank-funded PROMAPUTO plan over the next five years. The city is in the process of developing a Citywide Sanitation Strategy through consultation with donors and non-governmental organisations. Though strategies and plans have proliferated at the national level, a city sanitation strategy is a necessary first step to creating synergy among public officials, communities and non-governmental organisations.

Nairobi: Numerous new technology initiatives are tracking Nairobi's environmental conditions. A government online data portal announced in July 2011 will allow Kenyans to identify spending on water and energy, and to keep track of the state of the hydropower dams that provide the most of its energy.

Maputo: In 2011 the Maputo municipal council's environmental department launched an awareness campaign to educate students about the importance of protecting the environment. According to the department's director, representatives have visited most of Maputo's schools, highlighting the importance of planting trees and keeping beaches clean. The department also initiated a tree-planting programme in schools.

Durban: In 2000 the city's water service launched a sewage education programme in the city to reduce damage to the city's sewerage network. The campaign, which includes toolkits, posters and street theatre performances, appears to have had a positive impact, with packages 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.

water requirements, including improved 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 replaced.

Durban: In a bid to increase recycling and reduce the discharge of waste into the sea, the city has set a 2030 vision for improved sanitation in Accra, calling for increased access to acceptable sanitation and emphasising the importance of improved coordination among the municipal and provincial assemblies in greater Accra.

Alexandria: A major research project known as SWITCH Urban Water, funded by the European Commission, has provided an assessment of Alexandria's water requirements and examined options for meeting expected demand up to 2030. The project aims to reduce extractions from the Nile by 20%. The research looked at a range of options to better meet Alexandria's

receiving assistance from outside agencies to invest in plans and policies for long-term water management advances. Here are highlights of some of these programmes: In 2006 the European Commission headed a strategic planning process for urban water management and involved multiple stakeholders. This process culminated in an integrated vision and planning document released in April 2011, which called for a target of 100% access to uninterrupted water supply in the city by 2030. The European Commission also helped create a 2030 vision for improved sanitation in Accra, calling for increased access to acceptable sanitation and emphasising the importance of improved coordination among the municipal and provincial assemblies in greater Accra.

Maputo: In 2007 the city piloted a waste management project in informal settlements that lack paved roads. The city contracted with micro-enterprises to collect household waste on foot, going door-to-door with plastic bags. By December 2010 the program was extended to include the majority of the informal neighbourhoods, according to city officials.

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 and combat the problem of mismanaged municipal waste. 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 site, which allows businesses and the public to exchange potentially useful waste materials. And the city has published a detailed Smart Living Handbook encouraging residents to reduce reuse and recycle waste in their homes. They can then sell their items at various recycling companies and the city.

Maputo: In 2007 the city piloted a waste management project in informal settlements that lack paved roads. The city contracted with micro-enterprises to collect household waste on foot, going door-to-door with plastic bags. By December 2010 the program was extended to include the majority of the informal neighbourhoods, according to city officials.

Alexandria: In August 2011 the national government in partnership with Korean investment received assistance from outside agencies to invest in plans and policies for long-term water management advances. Here are highlights of some of these programmes: In 2006 the European Commission headed a strategic planning process for urban water management and involved multiple stakeholders. This process culminated in an integrated vision and planning document released in April 2011, which called for a target of 100% access to uninterrupted water supply in the city by 2030. The European Commission also helped create a 2030 vision for improved sanitation in Accra, calling for increased access to acceptable sanitation and emphasising the importance of improved coordination among the municipal and provincial assemblies in greater Accra.

Maputo: The improvement of sanitation services is a priority of the World Bank-funded PROMAPUTO plan over the next five years. The city is in the process of developing a Citywide Sanitation Strategy through consultation with donors and non-governmental organisations. Though strategies and plans have proliferated at the national level, a city sanitation strategy is a necessary first step to creating synergy among public officials, communities and non-governmental organisations.

Maputo: In 2011 the Maputo municipal council's environmental department launched an awareness campaign to educate students about the importance of protecting the environment. According to the department's director, representatives have visited most of Maputo's schools, highlighting the importance of planting trees and keeping beaches clean. The department also initiated a tree-planting programme in schools.

Durban: In 2000 the city's water service launched a sewage education programme in the city to reduce damage to the city's sewerage network. The campaign, which includes toolkits, posters and street theatre performances, appears to have had a positive impact, with packages 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.

Nairobi: Numerous new technology initiatives are tracking Nairobi's environmental conditions. A government online data portal announced in July 2011 will allow Kenyans to identify spending on water and energy, and to keep track of the state of the hydropower dams that provide the most of its energy.

Cairo: The Aga Khan Trust for Culture has undertaken a programme to rehabilitate water

Water and sanitation: International agencies invest in African cities

Delivering clean water and sanitation services to urban households is one of the continent's biggest challenges. Many cities in the Index



aggregated according to an assigned weighting. The indicators receive the same weighting within the respective categories. The category scores were then rebased onto a scale of zero to 100. To build the overall Index scores, the EIU assigned even weightings to each category score; that is, no category was given greater importance than any other. The Index is essentially the sum of all category scores, rebased 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

Above average: Cities score between 0.5 and 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

Below average: Cities score between 0.5 and 1.5 times the standard deviation below the mean

Very below average: Cities score >1.5 times the standard deviation below the mean

In some cases where there were data gaps, the EIU applied theoretically robust techniques to calculate estimates. Regarding the indicator CO₂ emissions, for example, the EIU used international CO₂ coefficients provided by the 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 national 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 the Cairo – a significant outlier – from skewing the distribution of scores. Qualitative indicators were scored by clusters of analysts with expertise in the city in question, based on objective scoring criteria that considered the city's targets, strategies and concrete actions. The qualitative indicators were again scored on a scale of zero to ten, with ten points assigned to cities that meet the criteria on the checklist. In the case of the “clean air policy” indicator, for example, cities were assessed according to whether they have a code or policy to sustain or improve local ambient air quality, and the degree to which such codes are enforced.

Index construction
The Index is composed of aggregate scores for each underlying indicator. It is first aggregated by category – creating a score for each area for infrastructure and policy (for example, energy emissions) – and finally, overall, based on the total of the category scores. To create the Index, each underlying indicator was

→ 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; “mid 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; “mid 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

Category	Indicator	Type	Weighting	Description	Normalisation
Energy and CO ₂	Access to electricity	Quantitative	25%	Percentage of households with access to electricity.	Min-max.
	Electricity consumption per capita	Quantitative	25%	Total electricity consumption, in GJ per inhabitant (1 GJ = 277.8 kWh).	Zero-max.
	CO ₂ emissions from electricity consumption per capita	Quantitative	25%	CO ₂ emissions in kg per capita.	Zero-max.
	Clean energy policy	Qualitative	25%	Measure of a city's efforts to reduce carbon emissions associated with energy consumption.	Scored by EIU analysts on a scale of 0-10.
Land use	Population density	Quantitative	25%	Population density, in persons per km ² . Upper benchmark of 10,000 persons per km ² inserted to prevent outliers.	Zero-max; upper benchmark of 10,000 persons per km ² inserted to prevent outliers.
	Population living in informal settlements	Quantitative	25%	Percentage of the population living in informal settlements.	Zero-max.
	Green spaces per capita	Quantitative	25%	Sum of all public parks, recreation areas, greenways, waterways, and other protected areas accessible to the public, in metres squared per inhabitant.	Zero-max; upper benchmark of 100 metres squared per inhabitant inserted to prevent outliers.
	Land use policy	Qualitative	25%	Measure of a city's efforts to minimise the environmental and ecological impact of urban development.	Scored by EIU analysts on a scale of 0-10.
Transport	Public transport network	Quantitative	33%	Consists of two equally weighted sub-indicators: 1) Length of superior transport network, including bus rapid transit, trams, light rail and subway, in km ² of city area per km 2) Length of mass transport network, including dedicated public and private bus routes, in km ² of city area per km	1) For superior transport network: upper benchmark inserted to prevent outliers. 2) For mass transport network: Zero-max.
	Urban mass transport policy	Qualitative	33%	Measure of a city's efforts to create a viable mass transport system as an alternative to private vehicles.	Scored by EIU analysts on a scale of 0-10.
	Congestion reduction policy	Qualitative	33%	Measure of a city's efforts to reduce congestion.	Scored by EIU analysts on a scale of 0-10.
Waste	Waste generated per capita	Quantitative	33%	Total annual volume of waste generated by the city, including waste not officially collected and disposed, in kg per capita per year.	Zero-max.
	Waste collection and disposal policy	Qualitative	33%	Measure of a city's efforts to improve or sustain its waste collection and disposal system to minimise the environmental impact of waste.	Scored by EIU analysts on a scale of 0-10.
	Waste recycling and re-use policy	Qualitative	33%	Measure of a city's efforts to reduce, recycle and re-use waste.	Scored by EIU analysts on a scale of 0-10.
Water	Access to potable water	Quantitative	20%	Proportion of population with access to potable water.	Min-max.
	Water consumption per capita	Quantitative	20%	Total water consumption, in litres per person per day.	Min-max; cities that consume between 10 and 20 l/capita/day score full points, cities that consume less than 10 l/capita/day score zero points.
	Water system leakages	Quantitative	20%	Share of water lost in transmission between supplier and end-user, excluding illegally sourced water or on-site leakages, expressed in terms of total water supplied.	Zero-max.
	Water quality policy	Qualitative	20%	Measure of a city's policy towards improving the quality of surface water.	Scored by EIU analysts on a scale of 0-10.
	Water sustainability policy	Qualitative	20%	Measure of a city's efforts to manage water sources efficiently.	Scored by EIU analysts on a scale of 0-10.
Sanitation	Population with access to improved sanitation	Quantitative	50%	Share of the total population either with direct connections to sewerage, or access to on-site sources.	Min-max.
	Sanitation policy	Qualitative	50%	Measure of a city's efforts to reduce pollution associated with inadequate sanitation.	Scored by EIU analysts on a scale of 0-10.
Air quality	Clean air policy	Qualitative	100%	Measure of a city's efforts to reduce air pollution.	Scored by EIU analysts on a scale of 0-10.
Environmental governance	Environmental management	Qualitative	33%	Measure of the extensiveness of environmental management undertaken by the city.	Scored by EIU analysts on a scale of 0-10.
	Environmental monitoring	Qualitative	33%	Measure of the city's efforts to monitor its environmental performance.	Scored by EIU analysts on a scale of 0-10.
	Public participation	Qualitative	33%	Measure of the city's efforts to involve the public in environmental decision-making.	Scored by EIU analysts on a scale of 0-10.

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



Accra Ghana

African Green City Index

Background indicators

Total population (million)	2.3
Administrative area (km ²)	200
Population density (persons/km ²)	11,700

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 when neighbouring urban agglomerations are taken into account) 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 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 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 Index 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 emissions are another above average category for Accra, driven by a high rate of renewable electricity and low electricity consumption, but limited supplies and steep prices

have access to electricity, equal to the Index average, though residents in the city's 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. The dam is scheduled for completion in 2017 and is expected to produce 1,000 gigawatt hours per year. Following the discovery of natural gas fields, the national government is 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. The city's inhabitants rely heavily on private vehicles, primarily trotros (minivans). Some operate informally but few people use the Bui dam. The dam is scheduled for completion in 2017 and is expected to produce 1,000 gigawatt hours per year. Following the discovery of natural gas fields, the national government is diversifying away from hydropower; the majority of power generation increases in the coming years will come from gas-fired power plants.

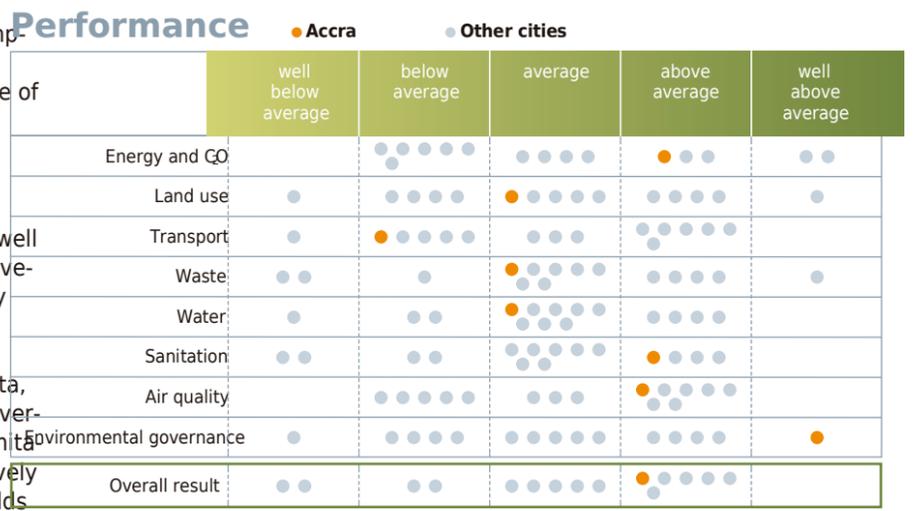
Green initiatives: In 2007 the national government adopted an urban transport policy, financed by the World Bank. One of its objectives is to promote more environmentally sustainable transport in Accra through the creation of a bus rapid transit (BRT) route in the city. The project began construction in February 2011 and is expected to be operational in 2012, serving about 12,000 passengers during peak hours.

Land use: Average
Accra has the second highest population density in the Index, at 11,700 people per square kilometre, versus the Index average of 4,600. Over the past two decades officials have struggled to keep up with the sprawling metropolitan area and the city's policies to contain sprawl and collect green spaces could be improved. Although Accra's informal settlements, slightly above the Index average of 38%. There was no availability for the amount of green spaces per person in Accra, but there are pleasant green areas on the

Waste: Average
Accra generates an estimated 440 kg of waste per year on a per capita basis, just above the Index average of 408 kg. The city scores well for the range of materials it adequately disposes of and recycles, which includes household hazardous waste, paper and plastic. Accra also collects and adequately disposes of medical, chemical and construction waste. Yet unlike the city's middle- and high-income communities, which typically pay for house-to-house waste collection, residents in informal settlements have to carry their rubbish to container sites. The sites

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 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



are few in number and often difficult to read. 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 affirmed 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 water provided by these various merchants. 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 affirmed 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.

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, of wastewater treatment plants. In addition, a

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 to be done in improving the city's sanitation facilities. Accra's sewer system only covers a part of the city, around the government ministries and central market. Moreover, the 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

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, of wastewater treatment plants. In addition, a

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, 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. Checkpoints are made at various locations throughout the city for levels of nitrogen dioxide, suspended 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 industries in the neighbouring city of Tema, about 10 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 to implement the plan. In addition, the government's bus rapid transit project is intended to reduce air pollution from the transport sector. In the late 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 industries in the neighbouring city of Tema, about 10 kilometres east of Accra.

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 assembly has the power to implement environment-related regulations, and has a relatively wide remit, encompassing all the main categories monitored by the Index, including

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 by sector 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.

land use, informal settlements and waste management. In addition, each of those main category areas 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 by sector 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.



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 vendors distribute water through separate mechanisms: sachets (treated water in half-litre plastic sachets), which are sold in shops and the streets; tanker services, which directly deliver water to households from tanker trucks; and domestic vendors, who purchase water from tankers and resell it to households in smaller 5-litre to 20-litre containers. The price and quality

multi-stakeholder strategic planning process for urban water management. This process is documented in an integrated vision and planning document released in April 2011, which called for a target of 100% access to uninterrupted water supply in the city by 2030. Also, in 2011, an agreement was signed with the Export-Import Bank of China for a US\$270 million loan to double the capacity of the Kpong water treatment plant (on the Volta River, downstream of the Akosombo Dam) – an improvement that will increase the supply of piped water in Accra by 50%. The project is scheduled for completion in 2014. The presence of sanitation policies evaluated in the Index and the relatively high level of access

Sanitation: Above average

percentage of the sludge from the city's septic tanks is dumped untreated into nearby creeks and the sea. Those living in informal settlements have to use public facilities, which are limited in number for the populations they serve. A green initiative: The European Commission funded strategic planning process for urban water management defined a 2030 vision for improved sanitation in Accra, calling for increased access to acceptable sanitation by 2030 and emphasising the importance of improved coordination among the municipal assemblies in greater Accra. The national government, led by the Ministry of Water Resources and Housing, is nearing completion of a

Quantitative indicators

Category	Indicator	Accra	Year*	Source	
ENERGY and CQ	Proportion of households with access to electricity (%)	84.3	2003	UN Habitat	
	Electricity consumption per capita (GJ/inhabitant)	2.6	2009	Ghana Energy Commission	
	2 emissions from electricity consumption per person (kg/person)	983.9	2009	Ghana Energy Commission	
LAND USE	Population density (persons/km ²)	4,511	2000	EIU calculation	
	Population living in informal settlements (%)	42.0	2010	UN Habitat	
	Green spaces per person	73.6	0.0	n/a	No data available
TRANSPORT	Length of mass transport network ² (km/km ²)	2.7	0.0	2010	Metromass Transit Ltd
	Superior public transport network ³ (km/km ²)	0.07	0.00	2010	Metromass Transit Ltd
WASTE	Waste generated per person (kg/person/year)	439	2010	Accra metropolitan assembly presentation	
WATER	Population with access to potable water (%)	80.0	2007	International water management institute report	
	Water consumption per person (litres per person per day)	121.0	2010	Aqua-Viten Rand Ltd	
	Water system leakages (%)	30.0	2007	International water management institute report	
SANITATION	Population with access to sanitation (%)	88.0	2007	International water management institute report	

All data applies to Accra unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) National electricity generation mix used to estimate city data. 2) National data used as proxy for city data. 3) Negative marking used. 4) There are no dedicated bus routes in Accra. 5) There are no subway, tram, light rail or BRT lines. 6) Accra Metropolitan Area



Addis Ababa

Ethiopia

African Green City Index

Background indicators

Total population (million)	2.7
Administrative area (km ²)	500
Population density (persons/km ²)	5,200

e = EIU Estimate

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. Addis Ababa ranks average overall in the Index. The city's best category performance is in Energy and CO₂ where it performs well above average. Water and land use are also strong categories in which Addis Ababa achieves above average ranks. On a per capita basis, it has one of the lowest water consumption rates and generates the least waste in the Index. Emissions from electricity consumption also fall below the Index average. The city ranks below average in transport, 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.

Mountains encircling the city are protected and aside a watershed, there is a lack of public green space. Addis Ababa ranks average overall in the Index. The city's best category performance is in Energy and CO₂ where it performs well above average. Water and land use are also strong categories in which Addis Ababa achieves above average ranks. On a per capita basis, it has one of the lowest water consumption rates and generates the least waste in the Index. Emissions from electricity consumption also fall below the Index average. The city ranks below average in transport, 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.

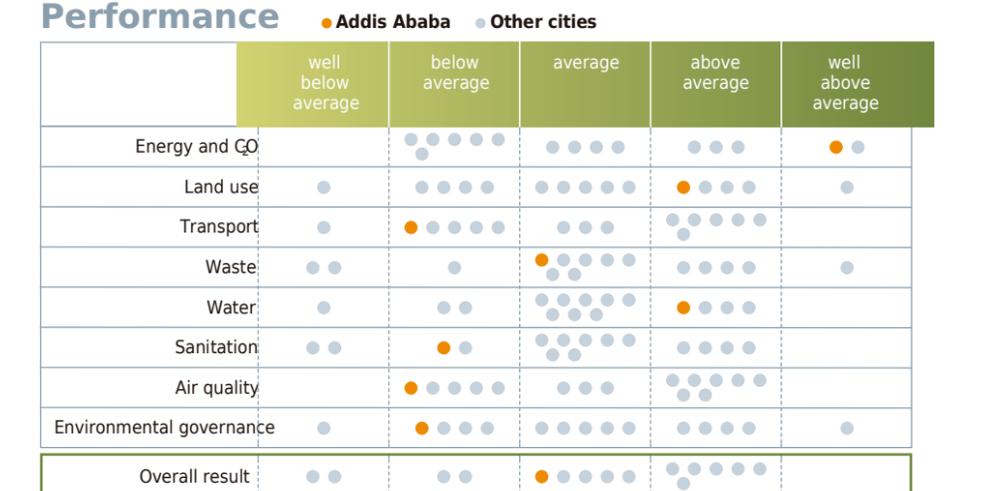
Energy and CO₂: Well above average Addis Ababa's performance in this category is the third highest in the Index. According to official figures, an estimated 18% of the city's population lives in informal settlements, which is the lowest in the Index. However, depending on definitions of informal settlements, other sources put the figure higher. Addis Ababa's 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, particularly hydropower. Prime Minister Meles Zenawi is particularly proud of the proposal for the Renaissance Dam on the Nile, which he claims will supply enough electricity for Addis.

Transport: Below average Addis Ababa's performance in this category. 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. Addis Ababa's urban sprawl containment, Addis Ababa could benefit from the increase in dam construction is ensuring cheaper electricity to Addis and an estimated 97% of households have access to electricity.

ity for 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 customers. Blanking apartment blocks in their place. Some outs 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 efforts are focused on large hydro projects, a small-scale pilot is under way to provide solar street lights in Addis Ababa. A private company has won a contract to operate the pilot, which was set to begin in January 2011 with the replacement of 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

Land use: Above average Addis Ababa has a relatively high population density of about 5,200 residents per square metre.





public transport system relies heavily on than in other African cities. For example, sores to cope with chemical and pharmaceutical Anbessa, the state-owned bus company, which 40% of commuters use the Anbessa buses. By 2016, with population growth, Anbessa estimates, however, Addis Ababa has no collection mented by 12,000 private minibuses. The length of the city's mass transport network is Addis Ababa does have a waste. 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 mass public transport, such as subways, light-rail or bus rapid transit lines. Addis Ababa has 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.



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 struggles to cope with its waste. There is only one main landfill site, at Kosh, in southwest Addis, which dates back to the 1960s. City-wide waste collection is absent in many neighbourhoods ("kebeles") responsible for collecting rubbish. This is done in partnership with private companies, but collection costs remain high. In policy areas, 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 a

Water: Above average
Addis Ababa has one of the lowest rates of per capita water consumption in the Index, measuring 57 litres per day, compared with the Index average of 187 litres. An estimated 99% of the city's population has access to some form of potable water, according to UN Habitat, above the Index average of 91%. However, the water delivery infrastructure in Addis is badly built and often does not adequately serve the poor. The actual water supply is plentiful, with abundant water table and reservoirs. In many cities where drinking water is so widely available, water consumption is typically much higher than in Addis Ababa. Water delivery could be improved with better management and if Addis Ababa is one of only three cities in the Index that does not encourage proper water 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 a

Sanitation: Below average
There are major sanitation challenges in Addis Ababa. Access to sanitation is limited to 72% of the population, according to estimates by UN Habitat, but access for many people means shared toilets and communal washing facilities. Often there are not enough of these, and air borne diseases are common as a result of defecation on open ground, and directly into streams and rivers. Even in richer neighbourhoods, overflowing sewers are not an uncommon sight. The city lacks adequate wastewater treatment facilities, with an estimated less than 20% treated, and there is no regular monitoring of sanitation facilities. However, the city is making some attempts to impose regulations gradually requiring new apartment buildings to manage their own sewage according to stricter standards.

Air quality: Below average
Air quality in Addis Ababa is widely regarded as the poorest among the poorest in Africa, largely because of air entrapped by the mountains, heavy traffic and high emissions from older vehicles. Studies have shown that more than 65% of the vehicles on the roads in Addis are over 15 years old - many of these are Russian Lada cars that form the majority of Addis's taxi fleet. The burning of rubbish in open areas is another contributor. The city 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, requiring new apartment buildings to manage their own sewage according to stricter standards, good prospects for improved environmental governance. The bigger challenge for the city will be translating laws into meaningful enforcement, especially laws regulating state-enterprises and ministries that are not used to oversight.



Quantitative indicators

Category	Indicator	Addis Ababa	Year*	Source
ENERGY and CO ₂	Proportion of households with access to electricity (%)	84.2	2005	UN Habitat
	Electricity consumption per capita (GJ/inhabitant)	1.8	2009	The Ethiopian Electric Power Corporation
	CO ₂ emissions from electricity consumption per person (kg/person)	983.9	2009	2006 IPCC Guidelines for National Greenhouse Gas Inventories
LAND USE	Population density (persons/km ²)	4,578	2007	EIU calculation
	Population living in informal settlements (%)	18.3	2007	Addis Ababa City Administration, Land Administration Office
	Green spaces per person (m ²)	73.6	2007	Addis Ababa Environmental Protection Authority
TRANSPORT	Length of mass transport network ¹ (km/km ²)	2.7	2009	Anbessa City Bus Service Enterprise
	Superior public transport network ² (km/km ²)	0.07	2009	Federal Transport Authority, Addis Ababa Branch Office
WASTE	Waste generated per person (kg/person/year)	160.0	2004	Ethiopian Development Research Institute
WATER	Population with access to potable water (%)	99.0	2005	UN Habitat
	Water consumption per person (litres per person per day)	56.7	2009	Addis Ababa Water and Sewerage Authority
	Water system leakages (%)	20.0	2009	Addis Ababa Water and Sewerage Authority
SANITATION	Population with access to sanitation (%)	71.8	2005	UN Habitat

All data applies to Addis Ababa unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) National electricity generation mix used to estimate CO₂ data, 2) Number of bus routes (88) multiplied by average length of bus route (13.5 km), 3) There are no subway, tram, light-rail or BRT lines



Alexandria

Egypt

African Green City Index

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 includes iron and steel, petroleum, cement and petrochemicals. Around 60% of Egypt's foreign trade is handled through Alexandria's port and the nearby El Dekheila port. The city is also an important historical, cultural and religious hub in Egypt, second only to Cairo. Alexandria is relatively well above average in the waste category, with some of the best waste management policies among the 15 cities evaluated in the Index. It has also been assisted in this area in recent years by foreign aid. Alexandria is average in the categories of energy and transport, sanitation, air quality and environmental governance, with relative high rates of access to electricity and potable water. The city falls to below average in the waste category because of a high rate of consumption and less developed policies in this area. Alexandria is average in the categories of energy and transport, sanitation, air quality and environmental governance, with relative high rates of access to electricity and potable water. The city falls to below average in the waste category because of a high rate of consumption and less developed policies in this area. Alexandria is average in the categories of energy and transport, sanitation, air quality and environmental governance, with relative high rates of access to electricity and potable water. The city falls to below average in the waste category because of a high rate of consumption and less developed policies in this area.

Background indicators

Total population (million)	4.4
Administrative area (km ²)	2,300
Population density (persons/km ²)	1,900

Energy and CO₂: Average

It is estimated that almost 100% of households in Alexandria have access to electricity. Still, CO₂ emissions and electricity consumption are relatively low. Based on national figures, it is esti-

nology Fund (CTF), a multi-donor trust fund run by the World Bank and UN Habitat. Local and international consultants compiled five reports detailing a development strategy for Alexandria through to 2017. One of the major results of the Alexandria Governate Pole Project, which is focused on sustainable economic growth, is the project's objectives include environmental regeneration, supporting private development and improving access to basic services for people living in informal settlements. This includes upgrades to six informal neighbourhoods in the city by improving infrastructure and basic services, setting up community facilities, and increasing access to credit and business support. A number of new projects have been developed as a result of the strategy, including a policy to ensure the protection of coastal areas and a pollution abatement project.

Land use: Below average

Alexandria is marked down in the Index for having a relatively low population density of 1,900 people per square kilometre compared with the Index average of 4,600 and also for having fewer green spaces than other cities in the Index. Alexandria offers less than 1 square metre per person versus an Index average of 74 square metres. Much of the green space that does exist in Alexandria is along the beachfront and is privately owned. 31% of Alexandria's developed public transport network, compared with the Index average of 38%. Regarding transport network falls short of the Index average of 2.7 km per square kilometre. Alexandria's superior transport network - defined in the Index as comprising subways, trams, light-rail or 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.

Transport: Average

Green initiatives: Between 2004 and 2006 the World Bank helped Alexandria create its first development strategy, using a grant from the

estimated that Alexandria generates nearly 70% of its electricity using natural gas, with 12% coming from renewable sources. The city emits an estimated 353 kg of CO₂ per capita from electricity consumption against an Index average of 984 kg. Electricity consumption, at an estimated 5.7 gigajoules per capita, is marginally below the Index average of 6.4 gigajoules. Energy strategy in Egypt is driven by the national government, which is investing in numerous projects (see "green initiatives" below). However, the city is only undertaking limited efforts to source energy from renewable sources.

Green initiatives: Green initiatives in energy happen at the national level in Egypt. The country as a whole is a beneficiary of the Clean Tech-

Performance



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

The city has several main thoroughfares, which limits the amount of greenhouse gases released into the atmosphere. The Alexandria Coastal Zone Management Project, the main traffic artery in the city, experienced severe traffic congestion during rush hours. 171,000 tonnes of CO₂ emissions from escaping into the atmosphere between February 2010 and April 2011.

Green initiatives: The national government is considering scrapping and recycling scheme in Alexandria, which has had considerable success in Cairo. Under the scheme, taxis more than 20 years old are being recycled with the aim of replacing around 45,000 to 50,000 over the course of the project. In April 2009 the Ministry of Finance launched the taxi scrapping scheme with the initial focus on private taxis. The scheme will be expanded to mass transport vehicles over time. Alexandria is one of the cities on the list for potential expansion but no further plans have been announced.

Water: Below Average

According to UN Habitat, an estimated 99% of Alexandria's population has access to piped water supply and has a relatively high level of consumption, at 351 litres per person per day, versus the Index average of 187 litres. The city loses 36% of its water through leaks. Compared with the Index average of 30%, Alexandria is also marked down for a lack of investment to encourage greater water efficiency. However, Alexandria's regulations on water pollution standards for local industry are not always enforced.

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 scavenge 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 integrated solid waste management. This privatised 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 investment opened a new chemical waste management plant in Alexandria. The plant is the first of its kind in the region to deal primarily with mercury waste, which is found in fluorescent lamps. Efficiency and the upgrading of wastewater treatment plants. Among those that were examined in more detail were minimising losses from the disposal, which is harmful to plant life and fish. According to the national government Egypt produces 40 million fluorescent bulbs annually and 8 million are discarded as general waste. Furthermore, landfills used by the city have methane gas capture projects, which were established in 2006 by a private contractor. Methane is captured and disposed of through

Global Environmental Facility grant for the Alexandria Coastal Zone Management Project. The project aims to improve institutional management of the Alexandria coastal zone and reduce pollution in the Mediterranean Sea and Lake Mariout.

Sanitation: Average

A relatively large percentage of Alexandria's population has access to sanitation, at an estimated 94%, compared with the Index average of 86%. However, despite investment by outside agencies (see "green initiatives" below), which has improved the situation, the city's wastewater treatment standards could be better. Alexandria is also marked down for a lack of investment in on-site sanitation facilities in homes and communal areas.

Green initiatives: Since 1987 the US Agency for International Development (USAID) has run a programme to support improvements in wastewater collection, pumping, treatment and disposal. The agency invested an initial US\$42.5 million in the construction of 211 km

Green initiatives: A major research project funded by the European Commission, known as SWITCH Urban Water, has provided an



treatment plants. The aim was to fully prevent the discharge of raw waste into the lake. The programme also worked to prevent the dumping of industrial waste in the lake by installing treatment plants.

Air quality: Average

Alexandria scores well for regularly monitoring air quality in different city locations and for ensuring a wide range of pollutants. The city has campaigns around air pollution, although the same can be said about the majority of cities. The air quality in Alexandria is poor, largely because of traffic congestion and industry but its proximity to the Mediterranean Sea disperses some air pollution.

Green initiatives: The Egypt Pollution Abatement programme to change the fuel used by public transport vehicles to natural gas. The programme, which is sponsored by the World Bank, encourages voluntary environmental management and sustainable financing, as well as introducing mechanisms for the enforcement of environmental legislation. Under the project, public and private businesses receive help to bring their emissions in compliance with the country's environment protection law. Specific projects carried out under the scheme have included minimising waste, preventing pollution and adopting clean technology. The programme also has made a number of recommendations to the authorities 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 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 environmental policy. Alexandria scores well for regularly 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 environmental 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 environmental performance and projects. The city's performance has benefitted from outside intervention by aid agencies mentioned above, including outlining strategies for development, waste and water system upgrades.

Quantitative indicators

Category	Indicator	Alexandria	Year*	Source
ENERGY and CO ₂	Proportion of households with access to electricity (%)	84.2	2005	UN Habitat
	Electricity consumption per capita (GJ/inhabitant)	5.7	2006	Egyptian Electricity Holding Company
	CO ₂ emissions from electricity consumption per person (kg/person)	983.9	2006	Egyptian Electricity Holding Company
LAND USE	Population density (persons/km ²)	4,578	2010	EIU calculation
	Population living in informal settlements (%)	31.2	2007	SWITCH stakeholder analysis report for Alexandria
	Green spaces per person (m ²)	73.6	2006	CAPMAS
TRANSPORT	Length of mass transport network ¹ (km/km ²)	2.7	2008	CAPMAS
	Superior public transport network ² (km/km ²)	0.07	2008	Alexandria Passenger Transport Authority
WASTE	Waste generated per person (kg/person/year)	209.2	2007	Egyptian Environmental Affairs Agency
WATER	Population with access to potable water (%)	98.8	2005	UN Habitat
	Water consumption per person (litres per person per day)	350.7	2009	SWITCH urban system water modelling report for Alexandria
	Water system leakages (%)	36.3	2007	SWITCH urban system water modelling report for Alexandria
SANITATION	Population with access to sanitation (%)	94.1	2005	UN Habitat

All data applies to Alexandria unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) National data used as proxy for city level data. 2) National electricity generation mix used to estimate city level CO₂. 3) Data refer to gardens and public parks only. 4) There are no subway or BRT lines. 5) Data refer to "unaccounted for water"



Cairo Egypt

African Green City Index

Cairo is the capital city of Egypt. Located alongside the River Nile, Greater Cairo 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 from the 2011 census and other sources. The social upheaval in early 2011 that led to the resignation of President Hosni Mubarak ushered in multiple changes of government and a continually shifting political landscape. However, already this year the Egyptian government has announced several environmental initiatives that are detailed below.

Background indicators

Total population (million)	7.1
Administrative area (km ²)	370
Population density (persons/km ²)	19,100

e = EIU Estimate

Energy and CQ: Average
 Cairo is average overall in the Index. The UN Habitat estimates that almost all households in Cairo have access to electricity, but the city thanks largely to the length of its metro system, has 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 Cairo's high population density bolsters its electricity consumption, CO₂ emissions from electricity are an estimated 477 kg per capita, with less than an estimated 1 square metre of green space per person the city falls below the Index average of 74 square metres. Around a third of Cairo's population is estimated to live in informal settlements, primarily located in the city's outskirts and historic centre. Green initiatives: For centuries, the Al-Darrasa area, located outside the boundary of historic Cairo, was used as a place for dumping debris and rubble from the city. With the inauguration of the Al-Azhar Park, a 30-hectare development in Al-Darrasa, this has changed. The park, which provides a 360-degree panoramic view of historic Cairo, has been a huge success.

2022 the city is planning to add another three metro lines; it is hoping to attract new funding from the well-run metro system apart, the city's public transport services are otherwise over-relied and often unreliable. Traffic on the roads can be chaotic and congested. With out-of-pocket funding assistance, however, plans are now in place to tackle traffic pollution and congestion (see "green initiatives" below). The government has also announced plans to invest in central 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 emissions from public transport vehicles.

multi-donor trust fund to provide financing for 2009 it attracted more than two million visitors and has contributed to improving the city's air quality. The Al-Azhar park development was announced a US\$350 million CTF investment project out by the Aga Khan Trust for Culture, and in April 2011 that involves a combination of renewable energy production, clean transport and solid waste management projects. Under the 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 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.

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

Performance



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

cles. The work is being carried out through two schemes - the Egypt Urban Transport Infrastructure Development Project and the Carbon Finance Vehicle Scrapping and Recycling Programme. Both initiatives are being developed with financial assistance from the World Bank and the multi-donor Clean Technology Fund. The urban transport project includes the provision of 1,100 new fuel-efficient buses to replace the old fleet, the construction of six bus rapid transit corridors and improvements to the traffic management system. In addition, the government wants to promote the use of the river for commercial transport as an alternative to using the countries' roads, and thereby reducing traffic congestion. Plans include funding a management system to help coordinate river transport and a committee has been established at the national level to improve safety for river traffic. The government has also launched a pilot scheme in an area of Greater Cairo to encourage residents to ride bicycles, including a public information campaign to encourage cycling, the installation of bicycle racks and the sale of bicycles at discounted prices.



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, and piles of waste are commonplace, 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 poorer neighbourhoods who try to make a living from informal payments, also contribute significantly to waste collection and are considerably more efficient than private companies. Despite the challenges, Cairo has introduced a number of initiatives to improve water cleanliness; and developing a water quality database. Five plants have been established to receive waste from river cruises, including one at Cairo. The plants are equipped to safely dispose of the waste in the sanitary drainage networks.

Green initiatives: The national government has 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 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 to limit vehicle emissions by converting government cars from petrol to compressed natural gas (CNG), introducing unleaded petrol, creating a national programme for vehicle testing and rehabilitating old taxis. The government has instituted fines for the burning of rice husks, which contributes to air pollution in the autumn after the harvest, and has also provided several hundred special compressors to farmers as an alternative to disposing of the husks.

Water: Average

Cairo consumes 237 litres of water per capita per day, more than the Index average of 187 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 water-borne 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.

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 Ma'adi and Khossos, 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.

improve awareness of health and environmental issues, to provide education and training to local residents, and to restore historic buildings in the quarter.

Air quality: Average

During the past decade the national government set up 13 air pollutant monitoring stations in Greater Cairo, and parts of the Nile delta and upper Egypt region. Of these, six are in Greater Cairo and the rest of the country. Although air quality is monitored in different parts of the city, a combination of severe traffic pollution (and thereby reducing waste burning in informal settlements), tree planting and dust from the desert south of the city are making air quality in Cairo extremely poor. In the autumn smoke from farmers burning rice straw following the harvest also contributes to air pollution. 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 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 as a result of investments in environmental governance: Average. National agencies oversee environmental policy and monitoring in Cairo. The national environment 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 monitoring of environmental performance, and some inclusion of citizens and non-governmental organisations in the decision-making process to limit vehicle emissions by converting government cars from petrol to compressed natural gas (CNG), introducing unleaded petrol, creating a national programme for vehicle testing and rehabilitating old taxis. The government has instituted fines for the burning of rice husks, which contributes to air pollution in the autumn after the harvest, and has also provided several hundred special compressors to farmers as an alternative to disposing of the husks.

Quantitative indicators

Category	Indicator	Cairo	Year*	Source
ENERGY and CQ	Proportion of households with access to electricity (%)	84.2	2005	UN Habitat
	Electricity consumption per capita (GJ/inhabitant)	8.0	2006	Egypt Information Portal
	CO ₂ emissions from electricity consumption per person (kg/person)	983.9	2007	Egypt Information Portal
LAND USE	Population density (persons/km ²)	4,571	2010	EIU calculation
	Population living in informal settlements (%)	31.3	2005	IDSC Egypt Information and Decision Support Centre
	Green spaces per person (m ²)	73.6	2007	CAPMAS
TRANSPORT	Length of mass transport network ² (km/km ²)	2.7	2008	CAPMAS
	Superior public transport network ³ (km/km ²)	0.07	2008	CAPMAS
WASTE	Waste generated per person (kg/person/year)	456.9	2007	Egyptian Environmental Affairs Agency
WATER	Population with access to potable water (%)	99.6	2005	UN Habitat
	Water consumption per person (litres per person per day)	237.0	2009	OECD
	Water system leakages (%)	35.0	2007	Egyptian Holding Company for Water and Wastewater
SANITATION	Population with access to sanitation (%)	98.2	2006	Egypt Information Portal

All data applies to Cairo unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) National electricity generation mix used to estimate city data. 2) Greater Cairo area. 3) There are no light rail or BRT lines





Cape Town

South Africa

African Green City Index

Cape Town is the second most populous city in South Africa behind Johannesburg. The city has some of the most robust environmental policies among Index cities in its categories, which bolsters its strong performance. In some categories - such as energy and CO₂ emissions and waste - Cape Town does not perform well on quantifiable metrics, yet scores well on policy. Its best category performance is in land use, where it is the only city that 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 many other companies, and has undergone a recent boom largely due to the 2010 World Cup. The legislative capital of South Africa, Cape Town is also home to the country's parliament.

Cape Town ranks above average overall.

Background indicators

Total population (million)	3.7
Administrative area (km ²)	2,500
Population density (persons/km ²)	1,500

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 renewables. 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 Energy and Climate Change Action Plan (green initiatives below). It is also making efforts to source more renewable energy, including wind power.

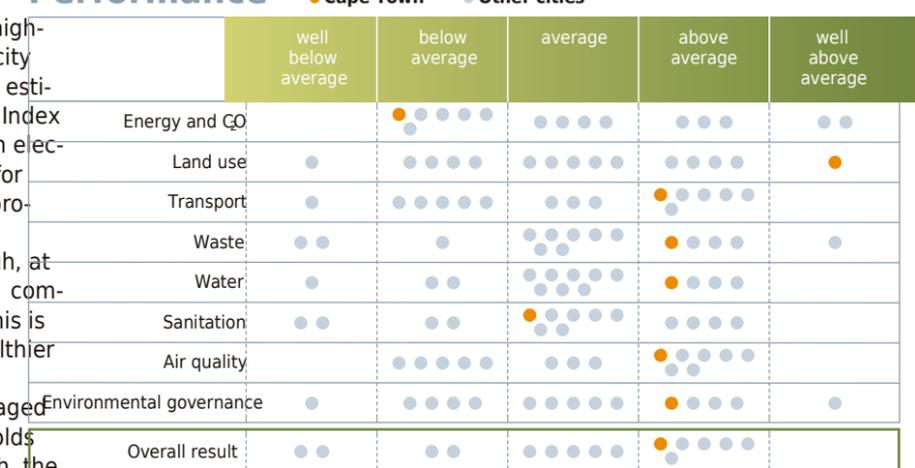
Green initiatives: City officials have drafted a comprehensive Energy and Climate Change Action Plan, which identifies 11 key objectives.

Transport: Above average
Cape Town has invested US\$5.8 billion over the last 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

Land use: Well above average

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 through "green initiatives". Home to multiple national parks, Cape Town has the most green

Performance



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

has been announced, although it will be driven by the national government. The city's standards are enforced. The 2011 Water Services Development Plan sets a target to provide access to all residents by financial year 2016. However, with an estimated 91% of residents having access to potable water (which is on par with the Index average), Cape Town is one of six cities in the Index that will need to make considerable progress in the coming years. While the city has a policy aimed at setting standards for treatment and monitoring of wastewater, compared with the Index average of 187 litres, it is expected 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 at 10% of volume, compared with the national average of 30%, Cape Town is nonetheless

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 service route serving the West Coast, and links to the bus routes is expected to be launched in the central city. By 2013 it is hoped that an express service between the townships of Mitchells Bay and Khayelitsha 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 central 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 from 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 favour companies that operate take-back programmes for items they sell, such as used printer cartridges and fridges 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 performance related to water quality and sustainability. A code is in place to monitor and sustain surface

Sanitation: Average

An estimated 94% of Cape Town's population has access to sanitation, according to global figures, which is above the Index average of 84%. However, some studies have suggested

that eight of Cape Town's 23 wastewater facilities were given the Department of Water and Forestry's "Green Drop" award for high standards of pre-wastewater management.

Air quality: Above average

Cape Town has the most robust clean air policies in the Index, with ongoing air monitoring at 13 sites around the city and public information campaigns. Air quality checks are made at various locations throughout the city and most of the air pollutant meters have been installed in houses, including sulphur dioxide, nitrogen dioxide, suspended particulate matter and carbon monoxide, are measured. Despite this, air pollution levels in Cape Town are high, especially in informal areas. Air pollution is caused by a number of factors, including vehicle emissions, smoke from wood or coal-burning fires, industrial processes and wind-blown dust. Another contributing fac-

tor is a meteorological condition known as low-level temperature inversion, whereby cooler air just above the ground becomes trapped under a layer of warm air and cannot rise until the wind blows. During winter, when the region is less windy, brown-coloured smog hovers over the city. Cape Town has announced a goal of becoming the African city with the cleanest air and is aware that implementation of current policies will help it achieve this vision.

Green initiatives: The city's 2005 Air Quality Management Plan established 11 objectives to control air pollution. The plan includes increased monitoring, improving air quality, specifically in informal areas, stepping up enforcement of existing air quality legislation and limiting vehi-



cle emissions. A diesel vehicle testing programme is under way whereby traffic officials 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. Its Environmental Resource Management (ERM) department is directly responsible and works in close collaboration with other core 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 remits 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 relating 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

Category	Indicator	Cape Town	Year*	Source
ENERGY and CQ	Proportion of households with access to electricity (%)	84.2	2009	General Household Survey 2009
	Electricity consumption per capita (GJ/inhabitant)	13.9	2009	City of Cape Town, Electricity Department
	2 emissions from electricity consumption per person (kg/person)	983.4	2006	State of Environment Report 2008
LAND USE	Population density (persons/km ²)	4,578	2009	EIU calculation
	Population living in informal settlements (%)	17.0	2009	City of Cape Town, Environmental Resource Management Department
	Green spaces per person	73.6	2010	City of Cape Town GIS data
TRANSPORT	Length of mass transport network (km/km ²)	2.7	2010	Golden Arrow Bus Company
	Superior public transport network (km/km ²)	0.07	2010	Cape MetroRail & MyCiti BRT
WASTE	Waste generated per person (kg/person/year)	572.9	2010	City of Cape Town Solid Waste Minimisation and Disposal Statistics Database
WATER	Population with access to potable water (%)	91.4	2009	General Household Survey 2009
	Water consumption per person (litres per person per day)	225.2	2009	City of Cape Town, Environmental Resource Management Department
	Water system leakages (%)	10.0	2009	City of Cape Town, Environmental Resource Management Department
SANITATION	Population with access to sanitation (%)	94.1	2009	General Household Survey 2009

All data applies to Cape Town unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) Number of bus routes (182) multiplied by average route (26.1 km). 2) There are no subway or tram lines. 3) Unaccounted for water = 24.5%



Casablanca

African Green City Index

Background indicators

Total population (million)	3.4
Administrative area (km ²)	1,000
Population density (persons/km ²)	3,300

1) Greater Casablanca

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 home to 40% 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. Private provision has led to a range of investments in infrastructure in recent years. On the whole, the arrangement has worked well, which is reflected in the city's performance in the African Green City Index. Indeed, the concessionaire, the

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 CQ: 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, measured as 5.0 gigajoules per capita versus an Index average of 6.4 gigajoules. Although in general the city lacks sufficient green space, the main exception is the Hassan II League Park in central Casablanca. Planted in 1918, the park features palm trees and café terraces for refreshments. There has been discussion of another new large park but this is yet to be realised. Casablanca has one of the highest volumes of 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.

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. Lydec, operating in Casablanca since 1997, has upgraded the city's power network and expanded access to areas that previously lacked electricity. According to the 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 in urban planning in Casablanca.

Land use: Above average

Historically Casablanca has been well planned and its growth over the past 50 years has followed a deliberate pattern. But the urban sprawl that makes up greater Casablanca, which is used to consist of 27 different municipalities, is less organised and there is a great disparity in standards of living in different parts of the city. Casablanca has the smallest proportion of population living in informal settlements in the Index, at an estimated 15%, considerably below the Index average of 38%. Land use policies are also strong, particularly regarding green space protection, with city authorities focused on integrating more green space into urban areas. The city has an estimated 55 square metres of

Transport: Average

The city's public transport network measures 4.4 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 commutes 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

Performance



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

lanes that might encourage greater take-up of public transport. However, the city's first tramway is under construction (see "green initiatives" below).

Water: Above average

While it is estimated that all Casablanca families 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 per person per day. 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 water resources and consuming water more efficiently. Water quality standards have been set, which is relatively rare among 14 cities in the Index.

Green initiatives: Casablanca's first 30-km tramway will have just under 50 stops and connect Sidi Moumen in the east, to Hay Hassani and 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 eventually planned to connect Mohammedia and the north of greater Casablanca with Nouaceur in the south. Additionally in 2011 the Moroccan government began works on a high-speed train linking Casablanca to Rabat and Tangier.

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 ability to drain rainwater effectively during 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 to Bouskoura Ouled 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.



relatively little information has recently been published on environmental performance and progress, and Casablanca could also do more to increase public participation in environmental affairs. As mentioned above, a number of areas of environmental policy – electricity, water and waste management – are managed by public-private partnerships (PPPs) in which the government grants a concession to a private company to operate the service in a certain region of the city for a set period of time. By and large, the use of PPPs has proved an effective way of improving public services, but it means that policy is not necessarily consistent across the city, and there has been some popular opposition to the strategy, particularly in the waste management sector. However,

Environmental governance: Average

Casablanca performs relatively well for environmental management and it has a department dedicated to environmental issues. However,

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 focussed on skills development, and held campaigns and exhibitions for the public in general and schoolchildren in particular.



The 350-km train line, scheduled to be operational in 2015, will cut travelling time from Casablanca to Tangiers from five to just over two hours.

Green initiatives:

Lydec has upgraded the city's water network and improved the 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 flows.

Waste: Average

Casablanca generates an estimated 474 kg of waste per capita versus the Index average of 408 kg. Recycling policies are relatively undeveloped compared with the other 14 cities in the Index. In general, waste collection has improved in the last five years, but the quality of service varies widely across the city, with responsibility split between three private contractors who pose of waste at one site. Casablanca fares well in the Index for special waste collection and disposal. Facilities are available for medical, chemical and construction waste. Casablanca marked down in the Index, however, for a lack of onsite collection points for recyclable materials and a limited range of items accepted.

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 oil refinery.

Sanitation: Above average

It is estimated 99% of the city's population has access to sanitation, exceeding the Index average of 84%. Sanitation policies are generally good. Casablanca has a sanitation code in place and it has also set minimum standards. 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

Quantitative indicators

Category	Indicator	Casablanca	Year*	Source
ENERGY and CQ	Proportion of households with access to electricity (%)	84.2	2004	UN Habitat
	Electricity consumption per capita (GJ/inhabitant)	5.0	2009	Centre d'Etudes et de Recherches Démographiques
	2 emissions from electricity consumption per person (kg/person)	983.9	2006	2006 IPCC Guidelines for National Greenhouse Gas Inventories
LAND USE	Population density (persons/km ²)	4,578	2009	EIU calculation
	Population living in informal settlements (%)	14.6	2008	Development Innovations Group Report – Best practices in slum improvement, the case of Casablanca
	Green spaces per person (m ²)	73.6	55.5	n/a
TRANSPORT	Length of mass transport network (km/km ²)	2.7	2005	ONCF (National Office for Railways in Morocco)
	Superior public transport network (km/km ²)	0.07	2010	ONCF (National Office for Railways in Morocco)
WASTE	Waste generated per person (kg/person/year)	474.4	2009	Estimate by GESI (private contractor running the city's landfill)
WATER	Population with access to potable water (%)	100.0	2004	UN Habitat
	Water consumption per person (litres per person per day)	89.0	2004	Office National de l' Eau Potable
	Water system leakages (%)	28.0	2005	World Bank
SANITATION	Population with access to sanitation (%)	98.9	2004	UN Habitat

All data applies to Casablanca unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) Greater Casablanca. 2) National electricity generation to estimate city level. 3) Metropolitan area. 4) Number of bus routes (56) multiplied by average length of bus route for other cities in the Index (26 km). 5) There are no subway, tram or BRT lines



Dar es Salaam

African Green City Index

Background indicators

Total population (million)	3.0
Administrative area (km ²)	1,400
Population density (persons/km ²)	2,200

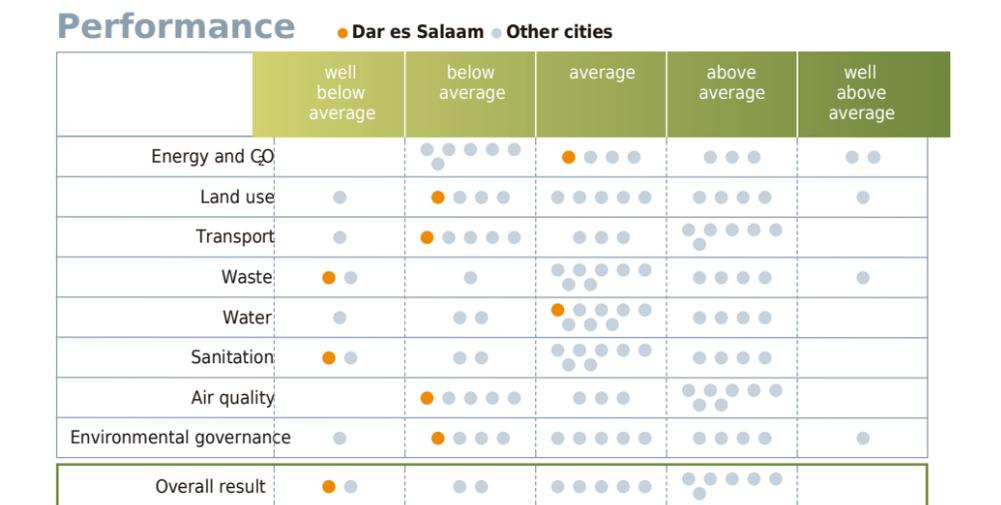
Dar es Salaam, more commonly known as Dar, is the largest city in Tanzania. It has a population of 3 million, a number expected to double by 2020. Located on a natural harbour on the Indian Ocean, Dar is the country's trading hub. Like many other Tanzanian cities, it is a boom in recent years, putting 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 the population already lives in informal settlements.

Dar es Salaam ranks well below average in all in the African Green City Index. Its best category results are in energy and water, where it ranks average. The city has enormous environmental challenges to

actively low electricity consumption and emissions per person. The city consumes 2.5 gigajoules of electricity per capita, versus the Index average of 6.4 gigajoules. Emissions from electricity consumption are an estimated 61 kg per capita, a tiny fraction of the Index average of 984 kg. The city's emissions performance is helped by its sourcing 60% of its electricity from hydropower. Also, a lack of electricity supply helps explain why it has carried out in partnership with UN Habitat. The city's master plan dates back to the 1970s, although this is currently being reviewed. This leads to a heavy dependency on gas and diesel generators - at high expense from foreign companies. Dar es Salaam's roads continue to get more and more congested - average commuting time has doubled during the last decade. Policies, too, are set to reduce its reliance on hydropower, but impose "urban order" on Dar es Salaam. In

been compromised by inefficient agricultural activities upstream in the Kilombero and Usungu valleys. Instead it is favouring natural gas, which currently accounts for 36% of electricity production. For example, the city is looking to add substantial supplies by building a natural gas pipeline from a newly discovered source in south Tanzania. The city is marked down for lack of clean energy policies. For example, it does not have a strategy to reduce the environmental impact of its energy consumption. A non-governmental organisation, is trying to introduce traditional Swahili building methods. This includes using shade and breezes to cool buildings, and using 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 farm-

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 open spaces is under the Index average, at 64 square metres per person.



steps to reduce emissions from mass urban transport. Nor has the city undertaken any initiatives 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 transport. It has, for example, a partnership with a local non-governmental organisation to take into account the needs of cyclists when constructing new roads.

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

Water: Average

On a quantifiable water metrics Dar es Salaam 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 estimated 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 average. Yet challenges remain. Poorer districts in the city receive water only on a weekly basis. Dar's performance is relatively weak in policy areas. The city does not yet have a strategy at encouraging efficient water consumption, nor does it enforce water pollution standards.

Sanitation: Well below average

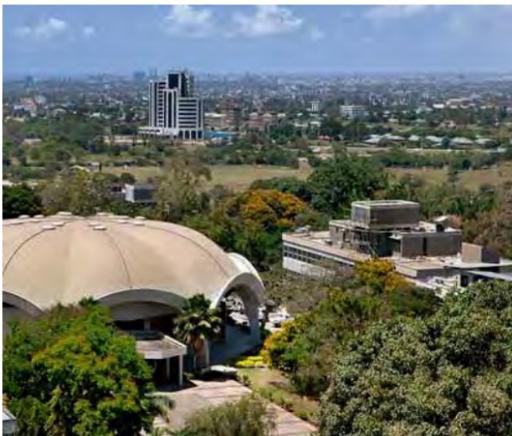
Only an estimated 56% of the city's population has access to sanitation, with an estimated 7% of Dar's households linked directly to sewers. In addition, it is estimated that only 10% of the

raises carbon monoxide and nitrogen oxide levels. 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 Tanzania to improve the environment, including provisions to deal with air quality. Specific schemes could help develop clean energy and community cooking initiatives in poorer communities.

Environmental governance: Below average

Like the majority of Index cities, Dar has no authority dedicated to green issues. Responsibility for environmental programmes is generally divided between various departments and many cases when policies are in place they are ignored or not enforced. Neither have there been any recent published reports on environmental 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 rise in their environmental living standards.



ing. City authorities say the first seven stations will be open by 2013. This initial phase is expected to cost US\$10 million, with most of the funding coming from the World Bank.

Waste: Well below average

Dar es Salaam generates an estimated 462 kg of waste per capita, slightly more than the Index average of 408 kg. Policies, however, are relatively weak and the city lacks an integrated strategy aimed at reducing or recycling waste. It lacks regulations for waste picking, monitoring of illegal waste dumping and standards for hazardous waste. As a result the city is struggling to cope with municipal waste. In the absence of a regular and reliable waste collection service, residents typically burn their rubbish. Toxic fumes from burning plastic are not uncommon. Faults on local industry. In a recent assessment, the city has relatively weak sanitation policies, which need to be strengthened to improve sanitation services. Like the majority of Index cities, Dar would bolster regulations to monitor sanitation facilities and treat wastewater. But unlike the majority of Index cities, Dar does not promote public awareness about healthy sanitation practices. Dar es Salaam has no code to improve air quality and there is no comprehensive and continuous monitoring of air pollutants. The city lacks campaigns to raise public awareness about the dangers of air pollution, although that might change if it is awarded outside financial assistance (see "green initiatives"). Meanwhile, Dar's roads are becoming more congested, which

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 campaigns to raise public awareness about the dangers of air pollution, although that might change if it is awarded outside financial assistance (see "green initiatives"). Meanwhile, Dar's roads are becoming more congested, which

Quantitative indicators

Category	Indicator	Dar es Salaam	Target Year*	Source
ENERGY and CQ	Proportion of households with access to electricity (%)	84.2	59.8 2004	UN Habitat
	Electricity consumption per capita (GJ/inhabitant)	6.2	5.2 2009	National Bureau of Statistics
	2 emissions from electricity consumption per person (kg/person)	983.9	60.8 2009	2006 IPCC Guidelines for National Greenhouse Gas Inventories
LAND USE	Population density (persons/km ²)	4,578.1	2,182.4 2009	EIU calculation
	Population living in informal settlements (%)	68.0	68.0 2009	UN Habitat
	Green spaces per person (m ²)	73.6	64.1 2004	Royal Institute of Technology, Division of Urban Studies, Stockholm
TRANSPORT	Length of mass transport network ²⁾ (km/km ²)	2.7	2.0 2011	
	Superior public transport network ³⁾ (km/km ²)	0.07	0.0 2011	
WASTE	Waste generated per person (kg/person/year)	462.4	462.4 2009	Dar es Salaam City Council
WATER	Population with access to potable water (%)	91.0	90.0 2009	Energy and Water Utility Regulatory Authority
	Water consumption per person (litres per person per day)	187.0	187.0 2009	UN Habitat
	Water system leakages (%)	30.0	30.0 2007	UN Habitat
SANITATION	Population with access to sanitation (%)	84.5	55.6 2004	UN Habitat

All data applies to Dar es Salaam unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) National electricity generation mix used to estimate level CQ data. 2) There are no dedicated bus routes in Dar es Salaam. 3) There are no subway, tram, light-rail or BRT lines. 4) Data refer to Tanzania urban population. As the largest urban centre, this is a good estimate for Dar es Salaam. 5) Unaccounted for water = 60%



Durban South Africa

African Green City Index

Background indicators

Total population (million)	3.5
Administrative area (km ²)	2,300
Population density (persons/km ²)	1,500

e = EIU Estimate, 1) eThekweni area

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.

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

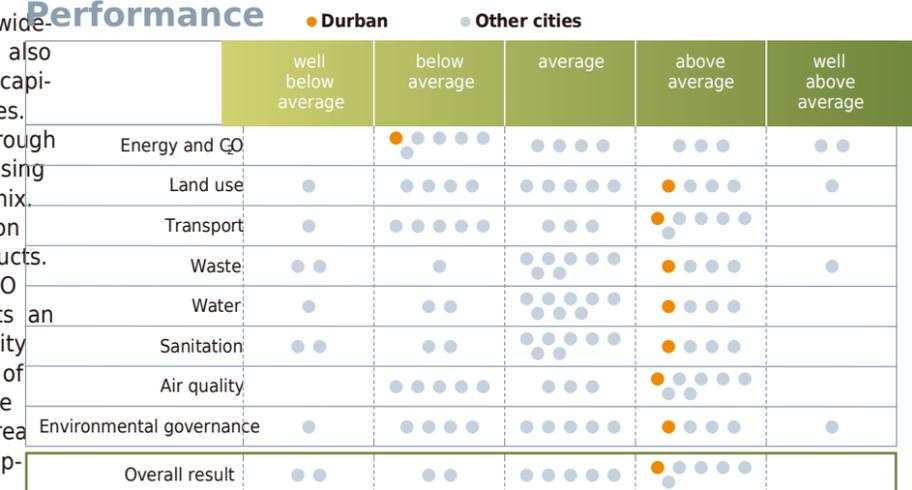
less frequent in recent years. As a result of widespread access, electricity consumption is also higher than average, at 11.3 gigajoules per capita, versus the Index average of 6.4 gigajoules. Electricity in Durban is generated mainly through coal, with renewables, mostly hydro, comprising just under 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 Durban Climate Change Partnership. An estimated 22% of the population lives in informal settlements, well below the Index average of 38%. Durban is rich with green spaces, 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 agricultural development. 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.

Land use: Above average

There are several initiatives to improve the city's ecosystem under the overall Durban Metropolitan Open Space System (D'MOSS) project. D'MOSS is a system of open spaces, some 74,000 hectares of land and water deemed to be of high biodiversity value. A key part of D'MOSS has been to identify and categorise endangered and sensitive areas to protect them from development, and raise awareness about the city's biodiversity. There is also a campaign to stop the invasion of alien plant species, and the soil erosion that they cause. Furthermore, as part of the preparations for hosting the 2010 World Cup, 62,500 trees were planted. With this Greening Durban project, the city largely targeted the city's biggest landfill site, Buffelsdraai. For low-income residents living fairly densely populated townships and informal settlements in the outskirts. As a result, rubbish and encouraged new wildlife to flourish in the area, it is one of the least dense cities in the Index.

Performance



Transport: Above average

With an extensive bus system of 1,400 routes and some 200 operators, Durban has the longest public transport system in the Index. It measures 9.2 km per square kilometre, more than three times the Index average of 0.16 km per square kilometre, more than twice the Index average of 0.07 km, and consists 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 say that their ability to overcome these obstacles will be a key factor in the future success of mass transit 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 the purpose. Initiatives included the launching of

city's growth. Though there is no separate municipal collection service for household hazardous waste, a domestic collection programme ensures the adequate disposal of cardboard, paper, tin and glass, and covers most of the formal housing areas. In recent years, the city has introduced public clean-up campaigns to address the problem of illegal dumping and even conducted raids to stop that. Durban's score is further bolstered by a robust policy aimed at enforcing environmental standards on landfill sites.

Green initiatives: In a bid to increase recycling and create local income, informal waste-pickers are allowed to rummage through the Bisasar Road landfill site for items they perceive to have value. They can then sell their items at various buy-back centres run by both private recycling companies and the city. It is estimated that before the Bisasar Road site each month by some 100 waste collectors, or around 200 families.

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 the purpose. Initiatives included the launching of

city's growth. Though there is no separate municipal collection service for household hazardous waste, a domestic collection programme ensures the adequate disposal of cardboard, paper, tin and glass, and covers most of the formal housing areas. In recent years, the city has introduced public clean-up campaigns to address the problem of illegal dumping and even conducted raids to stop that. Durban's score is further bolstered by a robust policy aimed at enforcing environmental standards on landfill sites.

Sanitation: Above average

It is estimated 90% of the population has access to sanitation, compared with the Index average of 84%, and the city's wastewater is treated before being discharged into nearby rivers and the ocean. However, like many cities in the Index, Durban faces challenges providing sanitation conditions to low-income informal settle-



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 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 expanding waste volumes resulting from

city's growth. Though there is no separate municipal collection service for household hazardous waste, a domestic collection programme ensures the adequate disposal of cardboard, paper, tin and glass, and covers most of the formal housing areas. In recent years, the city has introduced public clean-up campaigns to address the problem of illegal dumping and even conducted raids to stop that. Durban's score is further bolstered by a robust policy aimed at enforcing environmental standards on landfill sites.

Those areas often suffer from a poorly maintained and often vandalised sewerage network susceptible 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 services launched a sewage education programme to 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 water 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 settled residential sectors has prompted concerns about air quality.

In a bid to achieve the target, a number of key goals have been lined. The first is to reduce commercial pollution by establishing and implementing by-laws that make penalties for pollution and promoting low-emission industries. There are calls for companies to meet low-emissions standards, and companies promote carpooling or provide more communal transport.

Environmental governance: Above average

Durban has some of the strongest policies for environmental management and monitoring in the Index. In 1994 Durban was the first South African city to adopt the UN'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 fully monitors its environmental performance and regularly publishes information on progress. The first is to reduce commercial pollution by establishing and implementing by-laws that make penalties for pollution and promoting low-emission industries. There are calls for companies to meet low-emissions standards, and companies promote carpooling or provide more communal transport.

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 environmentally friendly lifestyles. More than 130 vendors exhibited a range of goods, including devices to save water and energy, solar-power equipment, ozone-friendly appliances, and tools for organic gardening and recycling. The event was seen as a warm up for the COP 17 summit.

Quantitative indicators

Category	Indicator	Durban	Year*	Source
ENERGY and CQ	Proportion of households with access to electricity (%)	84.8	2010	National Department of Cooperative Governance and Traditional Affairs
	Electricity consumption per capita (GJ/inhabitant)	11.3	2010	Durban Electricity Department
	CO ₂ emissions from electricity consumption per person (kg/person)	3,503.4	2010	World Bank
LAND USE	Population density (persons/km ²)	4,578	2007	EIU calculation
	Population living in informal settlements (%)	22.4	2007	Community survey 2007
	Green spaces per person (m ²)	73.1	2007	State of Energy, Key Indicators Report 2007/08
TRANSPORT	Length of mass transport network (km/km ²)	2.7	2011	eThekweni Transport Authority
	Superior public transport network (km/km ²)	0.07	2010	Metrorail
WASTE	Waste generated per person (kg/person/year)	519.0	2007	State of Energy, Key Indicators Report 2007/09
WATER	Population with access to potable water (%)	98.0	2007	Community Survey 2007
	Water consumption per person (litres per person per day)	252.9	2007	State of Energy, Key Indicators Report 2007/08
	Water system leakages (%)	36.4	2007	State of Energy, Key Indicators Report 2007/09
SANITATION	Population with access to sanitation (%)	90.1	1998	UN Habitat

All data applies to Durban unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) eThekweni area. 2) There are no subway, tram or BRT lines in Durban.



Johannesburg

South Africa

African Green City Index

Background indicators

Total population (million)	3.9
Administrative area (km ²)	1,600
Population density (persons/km ²)	2,400

Johannesburg is the economic centre of South Africa and headquarters for the country's manufacturing and mining industries. A major hub for migration, 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 and waste and sanitation standards are generally better than in many of the other cities in the African Green City Index, and often consistently better than 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

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 use, transport and their quality and environmental governance, and often consistently 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

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 of 84%. Although the majority of people are connected to the electricity grid, those in informal settlements rely on coal and wood fires. Grid electricity is also highly dependent on coal, which is responsible for more than 90% of the city's electricity production. As a result, CO₂

emissions are higher than average, at a density is lower than the Index average, at 2,400 people per square kilometre, versus the Index average of 984 kg. On the other hand, Johannesburg's per capita electricity consumption, at 5.6 gigajoules, is lower than the Index average of 6.4 gigajoules per person. And like other South African cities, Johannesburg has a robust strategy aimed at reducing the environmental impact of energy consumption (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 "green initiatives" below), which helps secure the 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. The Johannesburg Development Agency, which receives 700 million installing solar water heaters in 700 cost homes in Cosmo City, a housing development. There are plans to extend the scheme to other parts of the city where electricity supplies are poor. In another solar-related initiative, the Johannesburg Road Agency has been installing solar power signals at key city intersections. The Johannesburg Development Agency, which receives 2009. In addition to saving energy, the signals 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 to 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.

Green initiatives: The city of Johannesburg is keen to promote solar power as a way to reduce carbon emissions and cut electricity costs. The city has received funding from the Danish Development Agency, have spent US\$1.2 million installing solar water heaters in 700

New initiatives: The city is trying to reduce urban sprawl by rehabilitating under-populated city centre neighbourhoods and building new high-density and mixed-income housing developments with access to municipal services and public transport links. To this end, the Johannesburg Development Agency, which receives 2009. In addition to saving energy, the signals 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 to 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

Transport: Above average

Although the city has an estimated 6.8 km per square kilometre of bus routes, far more than

Performance

● Johannesburg ● Other cities

	well below average	below average	average	above average	well above average
Energy and CO ₂		●●●●●	●●●●●	●●●●●	●●
Land use	●	●●●●●	●●●●●	●●●●●	●
Transport	●	●●●●●	●●●●●	●●●●●	
Waste	●●	●	●●●●●	●●●●●	●
Water	●	●●	●●●●●	●●●●●	
Sanitation	●●	●●	●●●●●	●●●●●	
Air quality		●●●●●	●●●●●	●●●●●	
Environmental governance	●	●●●●●	●●●●●	●●●●●	●
Overall result	●●	●●	●●●●●	●●●●●	

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

the Index average of 2.7 km, public transport in the city is often unreliable or unsafe. This means personal vehicles, for those who can afford them, and mini-bus taxis for the less well-off, clog city streets. However, the city has worked to improve, introducing a bus rapid transit system and a high-speed train line to the airport (see “green initiatives” below). Both of these initiatives have helped extend fast, safe and affordable transport options.

Green initiatives: There are two recently launched major public transport initiatives in Johannesburg, both of which were driven in part by South Africa’s hosting of the 2010 World Cup. The first is the high-speed train line, the Gautrain, which links downtown Johannesburg to Pretoria. It is already operational though work is underway on one final station. The train also connects the Johannesburg’s Sandton

Waste: Average
The city generates 401 kg per person of waste each year, very much in line with 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 rather than curb-side collection. Over the past year, the city is rapidly running out of landfill space and the population is growing.

Green initiatives: In a bid to increase recycling, the city is drafting new regulations to make the collection of waste into recyclables a legal requirement for residents and businesses. Non-compliance could possibly be punishable by fines or criminal prosecution. Pikitup, the city’s

Johannesburg’s water from as far away as Botswana. Johannesburg performs better than the Index average for water leakage, at 25% compared with the Index average of 30%. Plans are underway to introduce meters, improve billing and water delivery services, which have had a reputation for administrative errors in past years. Regarding policy, the municipality monitors surface water, ground water and wastewater for multiple pollutants and quality levels by taking water samples from about 150 different points in the city. It has also placed sensors in key areas to detect sewer overflows and pump-station failures. Furthermore, the city promotes public awareness of water conservation. **Green initiatives:** Tackling the looming threat of acid mine drainage will be one of the biggest challenges for the city’s water department in the

Sanitation: Average
An estimated 92% of the population has access to clean toilets, according to a 2007 community survey, well above the Index average of 84%. Unlike other parts of South Africa, Johannesburg does not have open toilets, and most people use a well-developed network of air monitoring stations, the city measures sulphur dioxide, carbon monoxide and ozone emissions from vehicles, industry and domestic heating. Despite aggressive action in this area, air quality issues still persist, and Johannesburg faces the same challenges as most large cities in reducing air pollution. Vehicle emissions are growing and air pollution is posing a real health risk to residents, particularly people who live in areas where paraffin stoves are commonly used for heating and cooking. Dependence on fossil fuels for generating electricity also contributes to air quality issues.

Green initiatives: In 2008 the water department committed US\$139 million in its capital budget to improving water infrastructure and sewer networks. Work is still ongoing, though exact details are difficult to obtain. In addition, the city promotes proper sanitation at water events such as the annual Water Festival held in April.

Air quality: Above average
Johannesburg’s above average performance in the air quality category is driven by its strong commitment to improve air quality, including round-the-clock stringent air quality monitoring efforts. Despite a well-developed network of air monitoring stations, the city measures sulphur dioxide, carbon monoxide and ozone emissions from vehicles, industry and domestic heating. Despite aggressive action in this area, air quality issues still persist, and Johannesburg faces the same challenges as most large cities in reducing air pollution. Vehicle emissions are growing and air pollution is posing a real health risk to residents, particularly people who live in areas where paraffin stoves are commonly used for heating and cooking. Dependence on fossil fuels for generating electricity also contributes to air quality issues.

Green initiatives: In 2003 the city launched its Air Quality Management Plan, which has been updated several times and forms part of the 2040 Growth Development Strategy launched in 2011. The city is proposing to add five air quality monitoring stations to the existing six. Officials are also in the process of establishing an air pollution control bylaw that will set acceptable industry and commercial emission levels. However, they have not specified when the new rules are expected to come into force.

Environmental governance: Above average
The city government has several departments focusing on different aspects of environmental management, while various regional and neighbourhood entities work in tandem with the municipal authorities to carry out policies and enforce regulations. Although the city government must work under national law, it sets its own environmental objectives and management plans. Johannesburg has one of the best records on environmental monitoring in the Index: the municipal government regularly monitors environmental performance and publishes information on progress. The latest iteration was in 2008, when it published the State of the Environment Report.

Green initiatives: Johannesburg’s Growth Development Strategy, launched early August 2011, aims to set out a clear strategy for the city’s management. It 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.



business district to OR Tambo International Airport. The second major initiative is the Rea Vaya bus rapid transit system. Construction began in 2006, with the first route connecting the densely populated township of Soweto with downtown Johannesburg. The 25 km route has 18 station 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 300 km and become a transport option for 80% of the city’s residents. Officials say it is the single biggest initiative to tackle greenhouse gas emissions 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 their private vehicles, the city would cut its CO₂ emissions by 1.6 million tonnes by 2020.

Water: Average
Johannesburg residents consume 349 litres of water per person per day, versus the Index average of 187 litres. An estimated 98% of the population has access to potable water, more than the Index average of 91%. Most of Johannesburg’s water supply is delivered from the Vaal Dam, 50 km away. In order to meet growing demand and address concerns about industrial contamination from past mining operations, the city has considered long-term plans to

decade, and responsibility for the programme has been scaled up to the central government. In early 2011 the national Department of Water Affairs announced plans to install a US\$25 million pump to divert acid mine water from the city’s water sources. As part of its 2011 revised Growth and Development Strategy 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 is currently canvassing for ideas about how rainwater harvest scheme will operate and details are yet to be announced. In addition, the city puts on a Water Festival aimed at promoting water conservation, with educational and family activities hosted by the city and private companies that sponsor the event.

Quantitative indicators

Category	Indicator	Johannesburg	Year*	Source
ENERGY and CO ₂	Proportion of households with access to electricity (%)	84.2	90.0 2010	National Department of Cooperative Governance and Traditional Affairs
	Electricity consumption per capita (GJ/inhabitant)	6.5	6.6 2007	State of Energy Report 2008
	2 emissions from electricity consumption per person (kg/person)	983.9	1,483.8 2007	State of Energy Report 2008
LAND USE	Population density (persons/km ²)	4,578.1	2,363.5 2007	EIU calculation
	Population living in informal settlements (%)	31.8	31.8 2007	State of Energy Report 2008
	Green spaces per person	73.6	230.7 2007	State of Energy Report 2008
TRANSPORT	Length of mass transport network ¹ (km/km ²)	2.7	16.8 2003	Johannesburg Integrated Transport Plan 2003-2008
	Superior public transport network ² (km/km ²)	0.07	0.08 2010	Metrobus & Gautrain
WASTE	Waste generated per person (kg/person/year)	404	401.3 2007	State of Energy Report 2008
WATER	Population with access to potable water (%)	91.9	98.3 2007	Community survey 2007
	Water consumption per person (litres per person per day)	183	348.7 2008	Johannesburg Water – Annual Report 2007/08
	Water system leakages (%)	25.1	25.1 2008	Johannesburg Water – Annual Report 2007/08
SANITATION	Population with access to sanitation (%)	84.1	91.9 2007	Community survey 2007

All data applies to Johannesburg unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) Number of bus routes (448) multiplied by average bus route (25 km). 2) There are no subway or tram lines. 3) Data refer to “unaccounted for water”



Transport: Average

With over six million cars on the road every day, Lagos's thoroughfares are congested and polluted. The public transport system, consisting mainly of tens of thousands of privately owned buses, is not directly controlled by city officials. Rail works are limited, although the city introduced bus rapid transit in 2008 to tackle the huge transit challenges (see "green initiatives" below). As a result, the city's public transport network is considerably shorter than the Index average, measuring 0.1 km per square kilometre, compared with the Index average of 2.7, though recent years. As part of this programme, Lagos has established one of the biggest ports in Africa and converts 800 tonnes of municipal solid waste into fertiliser each day. Lagos State Waterways Authority is considered one of the best in the world using the city's waterways for transport and 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 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 and 120 million passengers used the system in the two years of operation, reducing carbon emissions by an estimated 13%.

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 117 litres. An estimated 88% of the population has access to potable water, versus the Index average of 91%. The city's main water sources are rivers and it does not suffer from water scarcity. The delivery system to provide water to ends is sufficient, with treatment plants sufficient to supply the population. The state government set out a five-year sanitation plan in 2010, which includes the construction of 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

Waste: Above average

Lagos generates an estimated 276 kg of waste per capita annually, less than the Index average of 408 kg. Municipal solid waste is disposed of at the state's three landfills and two temporary sites. City officials have stated a goal to make Lagos Africa's cleanest city by 2012, and are working with the World Bank and the Clinton Foundation to establish modern, efficient waste management infrastructure. Still, only about 10% of the city's rubbish is currently collected. Waste pickers operate informally, although the city has tried to curb their activities currently in use, though the city has considered this as a long-term strategy.

Along with improved electricity supply to the water plants, will dramatically improve Lagos's water delivery system. Desalination plants are currently in use, though the city has considered this as a long-term strategy.

Green initiatives: The Lagos Megacity Project is the overarching waste policy of the state. One of the most notable initiatives of the past decade was the waste-to-wealth programme to convert various types of waste into usable materials. The programme was initiated in 1999 but has gathered momentum in recent years. As part of this programme, Lagos has established one of the biggest ports in Africa and converts 800 tonnes of municipal solid waste into fertiliser each day. Lagos State Waterways Authority is considered one of the best in the world using the city's waterways for transport and built jetties intended for ferry transport.

Sanitation: Average

As 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. The state government set out a five-year sanitation plan in 2010, which includes the construction of 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

The exact nature of enforcement is unknown, but noncompliance is subject to prosecution. 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.

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 at non-industrial locations around the city, but the system is far from complete. All pollutants are regularly monitored in industrial areas. Nevertheless, citizens, non-governmental organisations and other stakeholders have been involved, to the extent, regarding decisions on projects largely on refining petrochemicals, Lagos will have a major environmental impact. One of the major challenges in improving air quality is the regularisation of the Environmental Rights Action, 2013. In another initiative, the National Environmental Standards and Regulations Enforcement Agency, and the Lagos State Environmental Protection Agency launched a competition on environmental protection in July 2011 for senior secondary schools, in an effort to improve awareness. The competition is aimed at encouraging school children to adopt healthful environmental practices.

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.

Quantitative indicators

Category	Indicator	Lagos	Index	Year*	Source
ENERGY and CQ	Proportion of households with access to electricity (%)	84.9	99.8	2003	UN Habitat
	Electricity consumption per capita (GJ/inhabitant)	0.8	4	2010	Lagos Bureau of Statistics
	2 emissions from electricity consumption per person (kg/person)	983.9	35.9	2009	Lagos Bureau of Statistics
LAND USE	Population density (persons/km ²)	4,572	2,957.2	2010	EIU calculation
	Population living in informal settlements (%)	66.0	10	2006	World Bank
	Green spaces per person	73.6	33.8	2009	Lagos Commissioner for the Environment
TRANSPORT	Length of mass transport network ² (km/km ²)	2.7	0.1	2009	Lagos Metropolitan Area Transport Authority
	Superior public transport network ³ (km/km ²)	0.07	0.01	2010	Lagos Metropolitan Area Transport Authority
WASTE	Waste generated per person (kg/person/year)	276	0.8	2009	Lagos Waste Management Authority
WATER	Population with access to potable water (%)	88.2	2	2003	UN Habitat
	Water consumption per person (litres per person per day)	90.1	2	2009	GM Water Corporation
	Water system leakages (%)	30.0	3	2009	GM Water Corporation
SANITATION	Population with access to sanitation (%)	82.9	9	2003	UN Habitat

All data applies to Lagos unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) Lagos State. 2) National electricity generation mix used at city level. 3) There are no subway, tram or light-rail lines. 4) Unclear whether data refers to "unaccounted for water" or "system leakage".

kilometre, the length of Luanda's mass transport network is much shorter than the average, at 2.7 km per square kilometre. Luanda is also one of only a handful of cities in the Index that has yet to embark on building a superior public transport network (defined as subway, tram, light rail or bus rapid transport). Luanda's roads are invariably clogged by traffic. Office workers living in the new suburbs of Talatona, just 15 km south of Luanda, face a three-hour commute into the city centre each morning. 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 in the environment. Cycling is also impossible due to the level of congestion, poor driving, bad road surfaces and high temperatures. There are some policies to reduce traffic congestion, although road tolls and pedestrian areas are reported at 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 centre. It is one of only three cities in the Index that enforces environmental standards for the disposal of waste in landfill and incineration sites. Littering is also banned. For all that, however, significant waste problems remain. Private

companies are responsible for weekly rubbish collection in most parts of the inner city, but demand for waste on Luanda's streets are a common sight. In informal settlements, waste collection is usually dumped in open spaces, often blocking them and causing flooding. And the law against littering is generally ignored. Luanda has no recycling schemes and waste goes to a single landfill some 20 km outside the city centre. There have also been several public pledges about recycling bus lanes, introducing maritime taxes and generally reducing city centre congestion. 2008 and since then officials have held several workshops on the topic, but no concrete plans or policies have emerged. In June 2011 Bevcam, a South African canned-beverage manufacturer, launched a programme called Reclatas to recycle aluminium drinks cans produced by its recently-opened Luanda factory. This is the first initiative of its kind in the city, but the company has not released any more details. The Provincial Government of Luanda (GPL) runs billboard, television and radio campaigns, often involving pop stars, to try to discourage street littering.

Waste: Average

Poorer cities tend to generate less waste. Luanda follows that trend and waste per capita in Luanda is an estimated 292 kg every year, which is lower than the average of 408 kg and much lower than in other South African cities. Luanda also has a well for its waste collection and disposal policy. It is one of only three cities in the Index that enforces environmental standards for the disposal of waste in landfill and incineration sites. Littering is also banned. For all that, however, significant waste problems remain. Private

Green initiatives: The national government has nearly finished a major road linking the town of Cacucaco to the north of Luanda and the new government housing developments in the east, and to the suburbs of Bié and Talatona in the south. The national government has longer-term plans for a metro system in Luanda but there is no current strategy to publish its 2009-2012 plan for transport development in Angola, which discusses "establishing strategies and plans", and developing better systems and services as well as an "integrated transport network". There are few concrete plans in the document, however. There have also been several public pledges about introducing bus lanes, introducing maritime taxes and generally reducing city centre congestion. 2008 and since then officials have held several workshops on the topic, but no concrete plans or policies have emerged. In June 2011 Bevcam, a South African canned-beverage manufacturer, launched a programme called Reclatas to recycle aluminium drinks cans produced by its recently-opened Luanda factory. This is the first initiative of its kind in the city, but the company has not released any more details. The Provincial Government of Luanda (GPL) runs billboard, 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 lack 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 average is more than nine times that amount. The government water company, Empresa de Aguas de Luanda (EPAL), says it only supplies water to around 131,000 households in a city 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: There are some local government campaigns, and television and radio advertisements to discourage people from urinating and defecating in the open air, with some linked to wider health campaigns run by agencies like UNICEF. Construction of latrines in informal settlements has been left largely to non-governmental organisations, such as Development Workshop, and individuals.

Green initiatives: The national Ministry of Health, UNICEF, and other international and national non-governmental organisations run campaigns to encourage people to use sterilisation products to avoid cholera and other water-borne infections. EPAL and the Environment Ministry run water-conservation awareness campaigns through posters, television ads and radio ads encouraging people, for example, not to wash their cars with buckets in the street, because it wastes water.

Sanitation: Average Luanda's sprawling musseques bring inevitable sanitation challenges. UN Habitat estimates 92%



Air quality: Below average

There is no formal monitoring of air pollution in Luanda but the level of contamination is likely high given the huge volume of vehicles on the roads, the heavy reliance on diesel-powered generators and the number of air conditioning systems in operation. There are no specific initiatives in place to improve air quality in the city, although Luanda makes some effort to inform citizens about the dangers of air pollution. There is no regular monitoring of on-site sanitation facilities, either in homes or communal areas.

Environmental governance: Well below average

Luanda is the only city in the Index that falls into the well below average category for environmental governance. There is some citizen involvement in decision-making for projects that might have a major environmental impact other than that Luanda fails to pick up any points in this category. Developing a strong environmental agenda is, understandably perhaps, not a top priority for Luanda, particularly work on this is still ongoing.

Quantitative indicators

Category	Indicator	Luanda	Average	Year*	Source
ENERGY and CQ	Proportion of households with access to electricity (%)	84	75.5	2006	UN Habitat
	Electricity consumption per capita (GJ/inhabitant)	1.05	4	2009	EDEL (state electricity company)
	2 emissions from electricity consumption per person (kg/person)	983.9	2.7	2009	EDEL (state electricity company)
LAND USE	Population density (persons/km ²)	4,572	554.3	2008	EIU calculation
	Population living in informal settlements (%)	69	48.0	2006	Care International Report
	Green spaces per person (m ²)	73.6	0.1	2007	Dept de Servicios Comunitarios
TRANSPORT	Length of mass transport network ² (km/km ²)	2.7	0.2	2010	TCUL (public bus operator)
	Superior public transport network ³ (km/km ²)	0.07	0.00	2009	Caminho de Ferro Luanda
WASTE	Waste generated per person (kg/person/year)	292	408	2009	ELISAL (Empresa de Limpeza e Saneamento de Luanda)
WATER	Population with access to potable water (%)	51	92	2006	UN Habitat
	Water consumption per person (litres per person per day)	20	200	2009	Development Workshop Angola (NGO) 2009 report
	Water system leakages (%)	29	9	2009	Development Workshop Angola (NGO) 2009 report
SANITATION	Population with access to sanitation (%)	92	4	2006	UN Habitat

All data applies to Luanda unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) National electricity generation mix used to estimate city data. Almost all electricity in Angola is generated from hydro (IEA). 2) Luanda province. 3) There are no subway, tram, light-rail or BRT lines.



Maputo Mozambique

African Green City Index

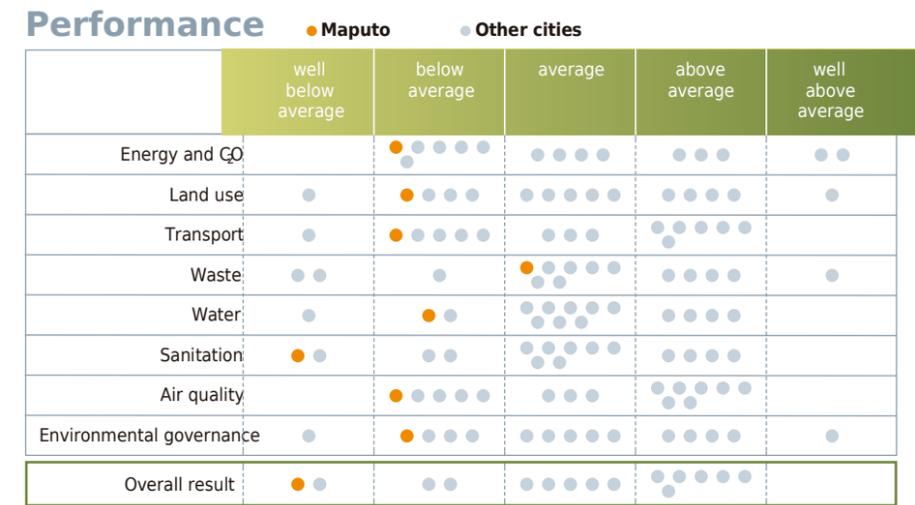
Background indicators

Total population (million)	1.2
Administrative area (km ²)	300
Population density (persons/km ²)	4,100

Maputo, the capital of Mozambique and its largest city, is home to 1.2 million residents, making it the second smallest city in the African Green City Index. Also, in 2008 Maputo's municipal council approved a master plan to guide the city's urban planning. 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 challenge for Maputo, with officials prioritising rural reconstruction and other categories, it excels in the area of electricity 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 2017. Also, in 2008 Maputo's municipal council approved a master plan to guide the city's urban planning. 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 challenge for Maputo, with officials prioritising rural reconstruction and other categories, it excels in the area of electricity 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),

consumption, at less than 1 gigajoule, is a challenge of sprawl is increasing, with many well below the Index average of 6.4 gigajoules per worker in Maputo choosing to live in Matola, a Residents and businesses in the city centre have a fairly separate city of about 700,000 people access to fairly dependable power through the national power utility, Electricidade de Mocimboa do Mundo Bank concluded that Maputo and Matola bique (EDM), but the situation is much less new form a single metropolitan area despite the able in informal settlements. These areas, which of formal metropolitan governmental structures dominate the city's landscape, are largely disconnected 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:** Maputo's master plan calls for the "massive regularisation" of informal settlements, which means that ownership rights will be granted. The provision of ownership rights will increase residential security of tenure, a new plan to connect informal settlements to the grid through a pre-paid system of electricity which leads to increased household income and vision, in which users buy a specific amount of energy credit up front, similar to a pre-paid

Performance



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

ronmental footprint, they also illustrate the significant percentage of the population lacks access to basic services. The city has the most room for improvement in sanitation, where a percentage of inhabitants left without access to sanitation services. **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 an estimated 115 square metres of green space per person, compared with the Index average of 74 square metres. Maputo has at least a dozen parks and gardens in the city centre, as well as a few coastal ecological zones. However, Maputo would benefit from stronger policies at containing urban sprawl. Indeed, the environmental footprint, they also illustrate the significant percentage of the population lacks access to basic services. The city has the most room for improvement in sanitation, where a percentage of inhabitants left without access to sanitation services. **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 an estimated 115 square metres of green space per person, compared with the Index average of 74 square metres. Maputo has at least a dozen parks and gardens in the city centre, as well as a few coastal ecological zones. However, Maputo would benefit from stronger policies at containing urban sprawl. Indeed, the

three-wheeled motorised rickshaws, called txopelas, have also become popular. Maputo has a long way to go in terms of transport, but the city appears poised to improve its performance in this area in the coming years as urban transport is a major priority of the World Bank sponsored PROMAPUTO project.

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 rest were scheduled to arrive later in 2011.

Waste: Average

The city produces an estimated 294 kg of waste per person per year, well below the Index average of 408 kg. Households and businesses pay a waste collection fee, which is collected through the electricity company. This fee is based on energy consumed, on the logic that consumers using less energy also produce less

plastic bags. By December 2010 the program was extended to include the majority of the formal neighbourhoods, according to city officials. **Water: Below average** Until December 2010, the city's water system was operated by a private company under a concession contract that was scheduled to end in 2014. However, because of concerns over performance, the public Water Supply Investment Fund (FIPAG) assumed control of the city's public water system in January 2011. Currently, UN Habitat estimates that only 88% of Maputo's population has access to potable water compared with the Index average of 91%. Because of the city's water market, primarily in informal settlements that are not yet connected to the water supply system. These operators use traditional methods, including the provision of untreated water from shallow wells, which is served by both a sewage system and water suppliers serve as much as 25% of Maputo's water market, primarily in informal settlements that are not yet connected to the water supply system. These operators use traditional methods, including the provision of untreated water from shallow wells, which is served by both a sewage system and

water to end users. The improvement of the city's water supply and services is also a priority of the World Bank's PROMAPUTO programme. **Sanitation: Well below average** Sanitation is a major challenge for Maputo. Only an estimated 49% of the city's population has access to sanitation, compared with the Index average of 84%. Informal settlements frequently lack access to sanitation services; residents instead use latrines that are not only insufficient in number and sometimes shoddily constructed, but also subject to collapse during periods of heavy rainfall and flooding. Even in the city centre, which is served by both a sewage system and septic tanks linked to the storm-water drainage network, inadequate infrastructure and maintenance remain persistent problems. This often leads to raw sewage emptying into the nearby Maputo Bay. Though overlapping national and local institutional roles have somewhat inhibited progress on sanitation policies to date, the plans are in place to promote environmentally sustainable sanitation services under the PROMAPUTO umbrella (see "green initiatives" below). **Green initiatives:** The improvement of sanitation services is a priority of the World Bank's PROMAPUTO plan over the next five years. The city is in the process of developing a city-wide Sanitation Strategy through consultation with donors and non-governmental organisations. Since 2004 a raft of national-level sanitation policies have been drafted: a Seven Cities Sanitation Strategy (2004), which included Maputo and Matola; a Strategic Plan of Urban Sanitation (2006); and a National Water Policy (2007), which had implications for Maputo's

water to end users. The improvement of the city's water supply and services is also a priority of the World Bank's PROMAPUTO programme.

Sanitation: Well below average

Sanitation is a major challenge for Maputo. Only an estimated 49% of the city's population has access to sanitation, compared with the Index average of 84%. Informal settlements frequently lack access to sanitation services; residents instead use latrines that are not only insufficient in number and sometimes shoddily constructed, but also subject to collapse during periods of heavy rainfall and flooding. Even in the city centre, which is served by both a sewage system and septic tanks linked to the storm-water drainage network, inadequate infrastructure and maintenance remain persistent problems. This often leads to raw sewage emptying into the nearby Maputo Bay. Though overlapping national and local institutional roles have somewhat inhibited progress on sanitation policies to date, the plans are in place to promote environmentally sustainable sanitation services under the PROMAPUTO umbrella (see "green initiatives" below).



sanitation services. Though strategies and policies have proliferated at the national level, a city-level sanitation strategy is a necessary first step to creating synergy among public officials, communities and non-governmental organisations.

Air quality: Below average

The main sources of air pollution are informal shared taxis, chapas, that ply the streets as well as aluminium and cement factories. The city has not yet created an air quality monitoring system. Independent air pollution studies in Maputo indicate "exceedingly high" concentrations of particulate matter. Developing enforceable regulatory standards is among the challenges city officials will face in the years ahead.

Environmental governance: Below average

The city has experienced a degree of institutional reform from the first phase of the World Bank supported PROMAPUTO programme. This includes the establishment of the Maputo municipal council, which now oversees environmental decision-making. Though the council has the ability to issue environmental licenses and monitor water and sanitation quality, its staff of employees and is limited in its ability to implement environmental policies. In the future, the enlargement of this agency, both in terms of staff and authority, will be a key indicator of Maputo's effectiveness in environmental governance.

Green initiatives: In 2011 the Maputo municipal council's environmental department launched an awareness campaign to educate students about the importance of protecting the environment. According to the department's director, representatives have visited most of Maputo's schools, highlighting the importance of planting trees and keeping beaches clean. The department also initiated a tree-planting programme in schools and by mid-2011 an estimated 2,800 trees had been planted. Another new initiative concerns climate change. Because it is a coastal city, Maputo is extremely vulnerable to rising sea levels, flooding and erosion. In April 2010 UN Habitat signed an agreement with city officials to conduct a study on the potential impact of climate change on Maputo and suggest ways to address the risks. The city hopes to develop a climate change adaptation plan based on the results of the research.



waste. However, only about 19% of Maputo's generated waste is collected and the city currently lacks environmental standards for waste disposal. Most collected waste is deposited in Hulene, a large open-air dump that extends 17 hectares on the outskirts of the city and is widely considered a threat to public health. Maputo officials intend to close Hulene by 2014 and open a new sanitary landfill in the nearby city of Matola. This costly project will rely on central government funding and approval from Matola, which has not yet consented.

Green initiatives: For informal settlements, which lack proper roads, in 2007 the city piloted a project to contract with micro-enterprises to collect household waste on foot, going door-to-door

of water from the water company or the distribution of piped water from bore holes. These methods, though undoubtedly entrepreneurial, have potentially negative implications for public health and groundwater sustainability, and are also more expensive than the public water system. In Maputo an estimated 50% of water is lost to leakages, compared with the average of 30%. The city's per capita water consumption is an estimated 99 litres per person per day, almost half the Index average of 187 litres.

Green initiatives: City officials are currently studying and piloting alternative methods for water distribution. Recently FIPAG began collaborating with the small water providers to formalise, legalise and professionalise their operations.

the progress on sanitation policies to date, the plans are in place to promote environmentally sustainable sanitation services under the PROMAPUTO umbrella (see "green initiatives" below). **Green initiatives:** The improvement of sanitation services is a priority of the World Bank's PROMAPUTO plan over the next five years. The city is in the process of developing a city-wide Sanitation Strategy through consultation with donors and non-governmental organisations. Since 2004 a raft of national-level sanitation policies have been drafted: a Seven Cities Sanitation Strategy (2004), which included Maputo and Matola; a Strategic Plan of Urban Sanitation (2006); and a National Water Policy (2007), which had implications for Maputo's

Quantitative indicators

Category	Indicator	Maputo	Average*	Source	
ENERGY and CQ	Proportion of households with access to electricity (%)	28.8	2003	UN Habitat	
	Electricity consumption per capita (GJ/inhabitant)	0.8	6.4	2006	Electricidade de Mocambique - Annual Statistical Report 2007
	2 emissions from electricity consumption per person (kg/person)	983	0.04	2009	Electricidade de Mocambique - Annual Statistical Report 2007
LAND USE	Population density (persons/km ²)	4,147.4	2006	EIU calculation	
	Population living in informal settlements (%)	70.0	31	2010	World Bank
	Green spaces per person	114.9	2009	Directorate of Urban Plannification and Environment	
TRANSPORT	Length of mass transport network ² (km/km ²)	2.7	0.0	2011	-
	Superior public transport network ³ (km/km ²)	0.07	0.60	2011	-
WASTE	Waste generated per person (kg/person/year)	293	907	2010	Maputo Waste Management Department
WATER	Population with access to potable water (%)	82.8	1.2	2003	UN Habitat
	Water consumption per person (litres per person per day)	99	187	2010	Mozambique Country Water Resources, Assistance Strategy
	Water system leakages (%)	50.0	2009	Fundo de Investimento e Patrimonio de Abastecimento de Agua	
SANITATION	Population with access to sanitation (%)	48.8	1.1	2003	UN Habitat

All data applies to Maputo unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) National electricity generation mix used to estimate city data. Almost all electricity in Mozambique is generated from hydro (IEA). 2) There are no dedicated bus routes in Maputo. 3) There are no subway, tram, light-rail or BRT lines. 4) Unclear whether data refer to "unaccounted for" or "system leakage"



Nairobi Kenya

African Green City Index

Background indicators

Total population (million)	3.1
Administrative area (km ²)	700
Population density (persons/km ²)	4,500

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 is well over 1,000 metres above sea level resulting 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 African cities, growth remains haphazard and unplanned. A wide range of challenges still confront Nairobi, including a low level of access to electricity and relatively weak policies covering public transport and air pollution.

Energy and CQ: Below average

Although Nairobi generates 62% of its electricity from renewables, mostly hydro and 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 the lack of new initiatives are underway. The reliance on renewable energy is a Russian-financed project called the Tatu City. Designed around the concept of efficient urban development, plans call for the city to accommodate 62,000 residents while preserving wetlands, forest areas and other green spaces on the property. City officials are planning the prototype of the African city of the future, which it will be predominantly self-sufficient.

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 built in the 1980s, measures 0.09 km per

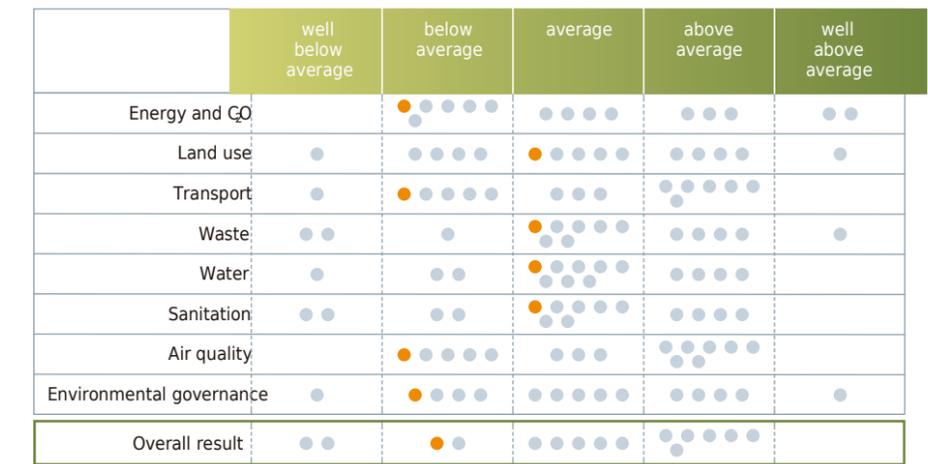
Land use: Average

The city has relatively strong regulations protecting trees and pay for patrolling the area. The green spaces and environmentally sensitive areas, but the total amount of green space is below the Index average of 74 square metres. Nairobi also has a park and surrounding new developments, and the city has encouraged lobbying by developers to cut back on the park. The tree planting is also part

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. Finally, 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 small part of the energy mix in Kenya, national officials are looking at ways to diversify energy sources because of unreliable rainfall.

Green initiatives: The Kenya Wildlife service in partnership with private companies is managing the Green Line Project, an initiative to plant 30 km of the perimeter of Nairobi National Park in the south of the city. The programme began in 2010 with the planting of several thousand trees, and organisers continue to raise money from the private sector to plant more trees and pay for patrolling the area. The city is to create a visible boundary between the park and surrounding new developments, and discourage lobbying by developers to cut back on the park. The tree planting is also part

Performance





source, the Nairobi River, using support from the United Nations Environment Programme, which is headquartered in Nairobi. In addition, the Nairobi City Water and Sewerage Company has increased the supply and quality of water in recent years. Nevertheless, the city is likely to face water shortages unless major capital investments are made into new reservoirs. At the same time, piped water is currently somewhat unreliable and expensive. An estimated 50% of the system's water is lost to leakages, well above the Index average of 30%. Addressing these issues effectively, and tackling a dropping water table believed to be the result of unregulated bore hole drilling, will be critical tasks for local government officials in years to come.

Green initiatives: The Ngong, Mathare and Nairobi rivers meet in Nairobi and flow from there to the Indian Ocean. The three rivers are clogged with waste and during rains the rivers are thick with human excrement washed out of informal settlements. The Nairobi River Basin initiative, run by the Kenya Ministry of Environment, aims to recover the rivers, providing clear flow through the city, and increasing land and recreational value along the river bank. Initial surveys have been completed. There is no deadline year to finish the entire project, but initiative planners hope to have reclaimed city centre sections of the river before 2020. Some progress has been made clearing the Nairobi River around the municipal dump at Dandora in the east of the city.

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, and has established a policy to reduce, recycle and re-use waste.

square kilometre, just over the Index average of 0.07 km per square kilometre, although only wealthier residents and businesses that can afford to pay for it. There is some recycling of electrical waste, glass, paper and plastics, but this is also conducted by private waste-management companies. The city government has made several positive strides - it monitors the application of traffic light sequencing and to introduce some limited-vehicle zones as positive steps.

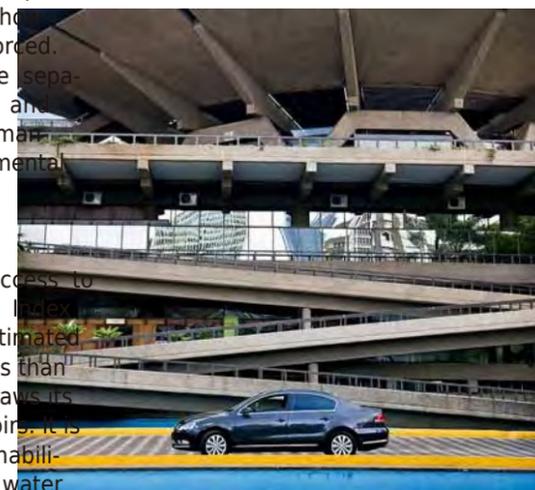
Green initiatives: Nairobi is seeing major investment in its road network. A ring road planned since the 1970s will finally be built by 2012. Even more significant is an eight-lane superhighway linking Nairobi to the neighbouring town of Thika. This US\$310 million project looks likely to be finished by 2012. The project will set new standards for Kenyan roads and includes underpasses and footpaths.

Waste: Average

Nairobi residents generate an estimated 318 kg of waste annually, compared with the Index average of 408 kg, although collection remains limited to about 40% of the total waste generated. Collection consists mainly of private tractors picking up, sorting and transporting the trash to landfills outside the city. Because of this, waste collection in the city is not a widely

Water: Average

An estimated 93% of residents have access to potable water, narrowly more than the Index average of 91%. The city consumes an estimated 12-litres of water per person per day, less than the Index average of 187 litres. Nairobi draws its water supply from local rivers and reservoirs in the middle of a major project to rehabilitate and conserve the city's main surface water



water 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 informal settlements during dry months. It is hoped that new limits on importing old cars will improve air quality. Challenges remain, of course. New development in Nairobi is supposed to be better than the agency's effectiveness, but the agency's results. The city lacks an air quality code and monitoring in Nairobi is conducted only on an ad hoc basis, which negatively affects 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 2010 Nairobi's annual environmental budget was about US\$5.9 million, or roughly 5% of the annual city authority budget of US\$107 million. Challenges remain, of course. New development in Nairobi is supposed to be better than the agency's effectiveness, but the agency's results. The city lacks an air quality code and monitoring in Nairobi is conducted only on an ad hoc basis, which negatively affects placement in this category.

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 hydro power 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, Nairobi is supposed to be over New York and Geneva, Nairobi is the world headquarters of the organisation's environmental and urban planning programmes. The UN agency in Gigiri was overhauled in 2011 with energy neutral 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

Category	Indicator	Nairobi Average	Year*	Source
ENERGY and CQ	Proportion of households with access to electricity (%)	75.0	2010	University of Nairobi, Department of Urban and Regional Planning
	Electricity consumption per capita (GJ/inhabitant)	6.5	2008	International Energy Association
	CO ₂ emissions from electricity consumption per person (kg/person)	918.5	2008	International Energy Association
LAND USE	Population density (persons/km ²)	4,509.0	2007	EIU calculation
	Population living in informal settlements (%)	50.0	2010	University of Nairobi, Department of Urban and Regional Planning
	Green spaces per person	7.37	2009	UN Environmental Programme
TRANSPORT	Length of mass transport network (km/km ²)	2.7	2009	Kenya Bus Service Management Ltd
	Superior public transport network (km/km ²)	0.07	2009	Kenya Railways Corporation
WASTE	Waste generated per person (kg/person/year)	317.5	2008	City of Nairobi Environmental Outlook 2007
WATER	Population with access to potable water (%)	93.3	2003	UN Habitat
	Water consumption per person (litres per person per day)	111.5	2005	City of Nairobi Environmental Outlook 2007
	Water system leakages (%)	50.0	2007.5	City of Nairobi Environmental Outlook 2007
SANITATION	Population with access to sanitation (%)	82.9	2003	UN Habitat

All data applies to Nairobi unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) National data used as proxy for city level data. 2) National electricity generation mix used to estimate city level CO₂ emissions (51) multiplied by average length of bus routes for other cities in the Index (26 km). 4) There are no subway, tram or BRT lines



Pretoria

South Africa

African Green City Index

Background indicators

Total population (million)	2.3
Administrative area (km ²)	2,200
Population density (persons/km ²)	1,100

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 connected to Johannesburg and also connected to the Gauteng Province, and was expanded with some mixed results in the individual eight categories: it achieves above average results in transport, air quality and environmental governance. 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

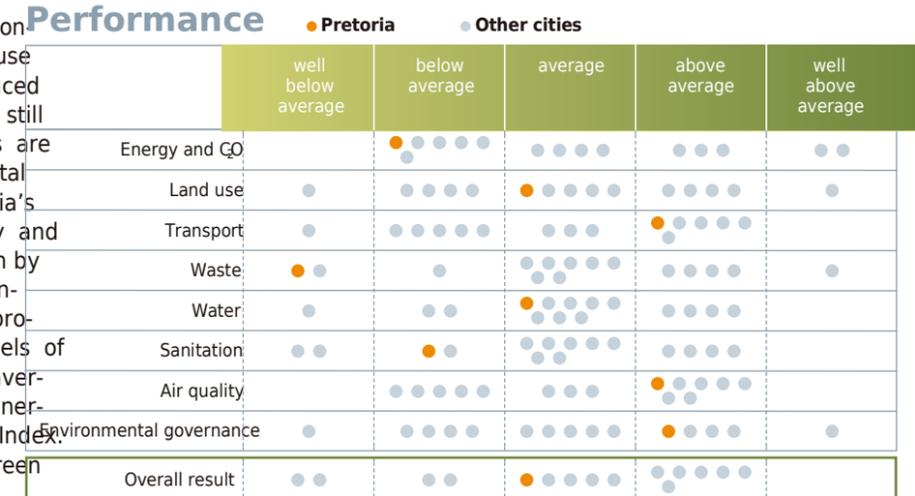
Energy and CO₂: Below average to create jobs and tackle high levels of unemployment, people in the target communities have been trained to install the heaters themselves. However, the city has set a target to increase this to 100% of households by April 2016.

Land use: Average The centre of Pretoria is not densely populated - nearly twice the Index average of 6.4 gigajoules per person - 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, government, business, labour, communities including sanitation and electricity. Regarding other stakeholders, among other goals. The document says the city should discourage the use of inefficient and high-polluting fuels, proposing a number of sprawl-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.

Green initiatives: During the past two years the city has installed more than 12,000 water heaters in a number of communities in affluent residents is in close proximity to the metropolitan area through an investment by the national Department of Energy. As well as address the legacy of Apartheid planning that deliberately created black townships without access to basic services on the peripheries apart from their initial installation and are popular among lower-income households. In a bid to provide electricity and water

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 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.

Performance





supplies, tarring roads and replacing shacks with brick houses) by the end of 2016, and delivering more services to less developed townships. Pretoria. The system also includes buses linking Gautrain stations to locations in the city centre.

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 transportation for those who can afford them. 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 (IRPTN). At the heart of the system 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 IRPTN the city also plans to assess ways to reduce traffic congestion and connect different forms of public transport. In another initiative, the Gautrain, a high-speed line linking Pretoria to downtown Johannesburg, is already operational, although construction continues on one station. The new service offers a long-awaited

Waste: Well below average

The city's result in this category is due to a high level of waste generation, at 1,070 kg per person per year. This is the highest rate in the Index well above the average of 408 kg. However, the South African cities in the Index generate relatively high levels of waste. The city's waste management division responsible for collection, transportation, treatment and disposal of the high level of waste generated in the city could improve its waste management and recycling policies. There is an informal sector of about 6,000 waste collectors who collect refuse through bins and collect items they can sell to recycling firms but the city lacks regulations governing this group. Pretoria also lacks standards governing disposal of industrial hazardous waste, paper and cardboard.

Water: Average

An estimated 97% of Pretoria residents have access to potable water, compared with the Index average of 91%. Additionally, Pretoria implemented a water quality policy and standards in 2010 for the level of pollutants in surface and drinking water. It also boasts the second lowest leakage rate in the Index, at 18%, compared with the Index average of 30%. The city is working to improve further, however. To meet the stated goal of providing potable water for all residents by April 2016, the city is investing R35 million to upgrade the water system, although few details are available about what

programmes entails. Pretoria consumes 220 litres of water per person per day, above the Index average of 187 litres. The city's environmental policy includes a goal to reduce water consumption.

Sanitation: Below average

Aside from the investments in the water system, the city is raising public awareness around water efficiency. The Water-Wise section on its website offers tips on how to save water in the home, including encouraging homeowners to turn taps off whenever possible and take quick showers, and asking residents to use indigenous plants in their gardens, since they tend to use less water than non-indigenous breeds. The city could improve its waste management and recycling policies. There is an informal sector of about 6,000 waste collectors who collect refuse through bins and collect items they can sell to recycling firms but the city lacks regulations governing this group. Pretoria also lacks standards governing disposal of industrial hazardous waste, paper and cardboard.

Air quality: Above average

The city's strong performance in this category is a reflection of a robust set of policies to ensure high ambient air quality. The national Department of Environmental Affairs' weather service regularly monitors air quality and publishes results

online. Several monitoring stations around the municipality test for sulphur dioxide, nitrogen dioxide, suspended particulate matter, suspended fine particulate matter and carbon monoxide. The environmental management department is responsible for all environmental policy and information, management systems, audit and promotion, as well as the day-to-day management of parks, cemeteries, urban forestry, strategic open place planning, air quality, climate change and sustainable energy policies. The waste management manages waste collection and recycling. In 2001 the city published a State of the Environment Report, which was followed in 2005 by the integrated environment policy and planning were covered in the 2011 Integrated Development Plan. There is also a provincial-level Gauteng State of the Environment Report, which was published in 2004. The city has a public participation process in place for projects with an environmental impact.

Green initiatives:

The city has an Air Quality Management Plan (AQMP) that aims to minimise the negative impact of air pollution on people's health and wellbeing, and on the environment. 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 environment

management department under which two environmentally related divisions: environmental management and waste management. The environmental management department is responsible for all environmental policy and information, management systems, audit and promotion, as well as the day-to-day management of parks, cemeteries, urban forestry, strategic open place planning, air quality, climate change and sustainable energy policies. The waste management manages waste collection and recycling. In 2001 the city published a State of the Environment Report, which was followed in 2005 by the integrated environment policy and planning were covered in the

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 environment concerns into urban development initiatives and functions, although few specific details are available about how this policy has been implemented.

Quantitative indicators

Category	Indicator	Pretoria	Average	Year*	Source
ENERGY and CQ	Proportion of households with access to electricity (%)	84.7	78.0	2010	National Department of Cooperative Governance and Traditional Affairs
	Electricity consumption per capita (GJ/inhabitant)	12.0	4	2005	State of Energy Report 2006
	CO ₂ emissions from electricity consumption per person (kg/person)	983.0	47.6	2005	State of Energy Report 2006
LAND USE	Population density (persons/km ²)	4,578	1,066.3	2007	EIU calculation
	Population living in informal settlements (%)	26.8	8	2007	Community Survey 2007
	Green spaces per person (m ²)	73.6	39.2	2005	2005 Report - Proposed Tshwane open space framework
TRANSPORT	Length of mass transport network ² (km/km ²)	2.7	6.4	2010	Tshwane Bus Service
	Superior public transport network ³ (km/km ²)	0.07	0.304	2010	Sapromo Magazine, Pretoria
WASTE	Waste generated per person (kg/person/year)	1,070	0.8	2005	Tshwane environment education and awareness strategy - appendix to report 2005
WATER	Population with access to potable water (%)	97	2	2007	Community Survey 2007
	Water consumption per person (litres per person per day)	319.7	2	2008	Miyawater
	Water system leakages (%)	18	0	2009	Department of Water Affairs - 2009 Water Services Development Plan
SANITATION	Population with access to sanitation (%)	76	3	2007	Community Survey 2007

All data applies to Pretoria unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) City of Tshwane Metropolitan Municipality. 2) Number of routes (545) multiplied by average length of bus routes in Cape Town, Durban and Johannesburg (26 km). 3) There are no subway, tram or light rail lines



Tunis

Tunisia

African Green City Index

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. However, 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. Tunis has the longest superior mass transit network in the Index, with a well-developed system of light rail and suburban trains. 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

Background indicators

Total population (million)	1.0
Administrative area (km ²)	200
Population density (persons/km ²)	4,700

e = EIU Estimate

electricity consumption, compared with the Index average of 984 kg. Most of the city's electricity is generated using natural gas, with renewable power in the mix, but solar production has been increasing in recent years. Tunisia 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. 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 programme, supported by organisations such as the environment ministry. The scheme includes loans and subsidies to offset the cost of 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, Project Oukalas, three new neighbourhoods were built to accommodate some 100 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 fully pedestrian. The organisation also listed and restored landmarks, including the Tunis municipal theatre and the central market.

Performance



age for energy and CO₂ to relatively high levels, the national government wants to increase its renewables from 0.5% of production to 10% by 2020. In addition, the World Bank financed a programme to examine how Tunisia and the rest of the region can adapt infrastructure for the potential effects of climate change. 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 fully pedestrian. The organisation also listed and restored landmarks, including the Tunis municipal theatre and the central market.

Energy and CO₂: Below average Tunisia 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 to increase access to electricity, exceeding the Index average of 84%. Air conditioning in the summer also drives up Tunis's electricity demand. Tunis has an estimated 1,044 kg of CO₂ per capita from well below the Index average of 74 square metres of green space per person.

Land use: Average Tunisia 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 1.5 square metres of green space per person, compared with the Index average of 1.5 square metres per person.

Transport: Above average Tunis residents have the choice of bus, light rail and suburban rail services. The city's light rail



Green initiatives: The city is investing US\$2 million 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 extension. Two further extensions are under way. An additional suburban network is planned. The city also plans to introduce 14 new corridors totalling 90 km.

Water: Average

Water resources in Tunisia 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. Tunisia's water system leaked 173 kg of waste annually, compared with the Index average of 408 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 strategy for waste management in 1995 to upgrade infrastructure and management practices (see "green initiatives"). In large part, these investments have paid off in terms of waste generation and improved cost management. The PRONAGDES waste management programme was followed by a second programme covering the 2007-16 period and



by a high rate of access and strong policies. In 2002 five fixed stations had been established, including three in Greater Tunis at Bab Alioune, Bab Bhar and Ghazela. A total of 15 stations are now being completed nationally, nine of which are located in Greater Tunis in Bab Soudun, El Mourouj, Ariana, El Nahli, Ben Arous and Radès. The government plans to extend the network to a total of 25 stations by the end of 2011.

Air quality: Above average

As in the water category, Tunis city officials conduct regular air quality monitoring in locations around the city and many international agencies have extended monitoring in locations around the city and loans and financial assistance to upgrade water 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 Development Agency is financing a programme to expand and rehabilitate 19 treatment stations and 130 pumping stations throughout Tunisia. Additionally, the government is prioritising the local eco-system.

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 Alioune, Bab Bhar and Ghazela. A total of 15 stations are now being completed nationally, nine of which are located in Greater Tunis in Bab Soudun, El Mourouj, Ariana, El Nahli, Ben Arous and Radès. The government plans to extend the network to a total of 25 stations by the end of 2011.

Environmental governance: Average

The city's environmental policy is managed by the national ministry of environment, with different state-owned agencies carrying out specific policies in different areas. The overturning of the regime of Zine El Abidine Ben Ali in January 2011 and the replacement of the government by an interim regime means that environmental governance is currently in a state of flux.

Green initiatives: The Tunis International Centre for Environmental Technologies (CITET), a national agency, was created in 1996 to develop qualifications for better mastery of environmental technologies to ensure sustainable development in Tunisia as well as the Arab and Mediterranean region. The organisation promotes environmental issues in the private sector, offers training and distance learning programmes to raise awareness about the environment, and helps companies comply with international environmental standards. The National Agency for Energy Conservation (ANME), established in 1985, aims at improving the level of energy efficiency and diversifying energy sources around Tunisia. In addition, the Association de Sauvegarde de la Médina de Tunis (ASM) serves as a meeting point and research centre on urban, architectural and socio-economic aspects of the old centre of Tunis.

system, known as the Métro Léger de Tunis, known as the Programme National de Gestion et Durabilité des Déchets (PRONGIDD), have also received input from Tunisia's international partners.

Green initiatives: PRONGIDD focuses on the financing, collection, transport and recycling of waste, and on promoting private sector involvement and cooperation between municipalities. The nationwide programme contains a series of key targets, including reducing household waste by 20% by changing consumption patterns, increasing composting levels by 15% and ensuring 100% of municipalities have access to transfer stations and landfill facilities. Additionally, the framework calls for: raising private sector participation in waste collection and structure development to 30%, closing 70% of the city's performance in this category is driven

Quantitative indicators

Category	Indicator	Tunis average*	Year*	Source
ENERGY and CO ₂	Proportion of households with access to electricity (%)	99.0	2010	Goliath Business Knowledge
	Electricity consumption per capita (GJ/inhabitant)	18.1	6. 2008	Annuaire Statistique de la Tunisie 2008
	CO ₂ emissions from electricity consumption per person (kg/person)	1,044.7	2008	2006 IPCC Guidelines for National Greenhouse Gas Inventories
LAND USE	Population density (persons/km ²)	4,469.1	2009	EIU calculation
	Population living in informal settlements (%)	25.0	38 2001	Tunis City Development Strategy Report 2001
	Green spaces per person (m ²)	73.14	5 2004	l'Institut National de la Statistique
TRANSPORT	Length of mass transport network (km/km ²)	2.7	2.3 2008	Société du Métro léger de Tunis
	Superior public transport network (km/km ²)	0.07	0.27 2008	Société du Métro léger de Tunis
WASTE	Waste generated per person (kg/person/year)	172.5	07 2002	Mediterranean Environmental Technical Assistance Program Report 2002
WATER	Population with access to potable water (%)	99.7	1.2 2009	Société Nationale d'Exploitation et de Distribution des Eaux
	Water consumption per person (litres per person per day)	299.3	87.2 2008	Ministry of Environment
	Water system leakages (%)	28.4	30 2008	Ministry of Environment
SANITATION	Population with access to sanitation (%)	95.0	4.1 2009	Office National de l'Assainissement

All data applies to Tunis unless stated otherwise below. * Where data from different years were used only the year of the main indicator is listed. e = EIU Estimate. 1) National data used as proxy for city data. 2) Tunis district level (CO₂) Greater Tunis. 5) There are no subway, tram or BRT lines

Publisher: Siemens AG
Corporate Communications and Government Affairs
Wittelsbacherplatz 2, 80333 München
For the publisher: Stefan Denig
stefan.denig@siemens.com
Project management: Karen Stelzner
karen.stelzner@siemens.com
Contact Siemens Africa: Jose Machado
josemachado@siemens.com

Economist Intelligence Unit project manager: Emily Jackson, Frankfurt
Editorial office: Jason Sumner, Vanessa Barchfield, Economist Intelligence Unit,
London and Vienna
Research: Harald Langer, John McNamara, Economist Intelligence Unit, London

Picture editing: Stephanie Rahn, Publicis Publishing, München
Layout: Rigobert Ratschke, Seufferle Mediendesign GmbH, Stuttgart
Graphics: Jochen Haller, Seufferle Mediendesign GmbH, Stuttgart
Printing: BechtleDruck&Service, Zeppelinstraße 116, 73730 Esslingen

Photography: Pius Utomi Ekpei (Lagos), Zacharias Garcia (Alexandria, Cairo, Casablanca,
Tunis), Sala Lewis (Dar es Salaam), Kostadin Luchansky (Luanda), Martin Steffen (Accra),
Sven Torfinn (Addis Ababa, Nairobi), Kevin Wright (Cape Town, Durban, Johannesburg,
Maputo, Pretoria)

Photo credits: Whilst every effort has been made to identify the owners of copyrights,
it can't be avoided that some copyright may be missing. In such a case and after checking
proof of ownership, an appropriate fee will be paid.

Any exploitation and usage which is not explicitly allowed by copyright law, in particular
reproduction, translation, storage in electronic database, on the internet and copying onto
CD-ROMs of this print work requires prior consent of the publisher.

Whilst every effort has been taken to verify the accuracy of this information,
neither Siemens AG, The Economist Intelligence Unit Ltd. nor its affiliates can accept
any responsibility or liability for reliance by any person on this information.

Munich, Germany, 2011

© 2011 by Siemens AG. All rights reserved.

Order no.: A19100-F-P185-X-7600

www.siemens.com/greencityindex