CITIES IN AFRICA

PART 2: CLIMATE CHANGE

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LEFT: Workers clean solar panels at Keshavpuram power station in New Delhi
ABOVE: Flooded streets in Abidjan, Côte d'Ivoire

PHOTOS: GETTY

BUILDING LOW CARBON CITIES

Africa's cities are among the most vulnerable to the effects of climate change. Creating low carbon economies is the only way to meet climate challenges while addressing broader developmental concerns

BY ELEANOR WHITEHEAD

The climate change debate has traditionally evoked images of vulnerable rural populations; the phrase conjures pictures of parched earth and the isolated smallholder farmers dependent on it. But in a world in which half of the population is urban, that paradigm is changing. Cities represent not only hotspots for vulnerability to changing weather patterns, but also key centres for innovative response. Climate change and cities are inextricably linked, and nowhere is this truer than in Africa – one of the world's fastest urbanising regions.

Cities are also key sources of carbon output. Across the world they are estimated to generate up to 80 percent of greenhouse gas emissions. For the most part, developing country cities account for a fraction of the resource consumption and carbon emissions of their higher-income counterparts. According to the C40 Cities Climate Leadership Group – a network committed to reducing emissions and increasing energy efficiency in member cities – daily water use per capita, for instance, varies from about 450 litres in US and Canadian C40 cities to just over 100 litres in African member cities.

Yet while their contribution to climate change has been low, Africa's cities are among the world's most vulnerable to changing weather patterns. Across the continent urban migration often outpaces city authorities' ability to provide formal housing. Those living in informal or illegal settlements lack drainage, piped water, sanitation or durable roads. In coastal Lagos, for instance – sub-Saharan Africa's largest, and one of the world's fastest growing cities – low income residents living in improvised housing above the water are exposed to the highest risk of flooding.

A number of the continent's biggest cities, from Dar es Salaam and Durban, to Alexandria and Accra, are at risk from rising sea levels, and the effects of climate change stretch well beyond flooding through to urban food security, pollution and health risks, and building and infrastructure degradation. The risks to long-term development are substantial.

In Africa, where emissions remain relatively low, climate change response in the past has focused on adaptation rather than mitigation. A number of cities operate disaster risk reduction programmes, aimed at assessing the threat associated with extreme weather conditions, activating early warning systems and managing challenges when they arise – often with the aim of protecting low-quality housing from being destroyed.

Today, that reality is changing. Africa's mayors, increasingly aware of the nexus between poverty reduction and climate change mitigation, are more engaged than before. "You might expect that the African cities are particularly focussed on adaptation and resilience rather than reducing their carbon emissions, but that doesn't seem to be the case," says Mark Watts, director of the energy consulting team at design, engineering and consultancy firm Arup – which partners with the C40 to tackle climate change.

"The real reason for this is energy security. All of these cities have huge problems with energy supply to rapidly expanding populations; they are concerned about the rising cost of fossil fuel energy; to a certain extent aware of long-term risk from pollution if they go down a fossil fuel route; and most certainly there is now a recognition of the huge opportunity at the moment for investment in renewable energy."

While awareness around mitigating as well as adapting to climate change is rising, constructing smart, sustainable cities raises serious challenges – even for urban planners and local governments in the most developed economies. In Africa, where land rights are often tenuous and settlements informal, synching energy efficient buildings with other areas of the urban landscape such as transport, utilities providers and telecoms to create holistic low carbon economies may seem like an overwhelming task.

But low carbon growth will yield benefits beyond climate change response for Africa's cities. It will bring much needed economic growth, create new jobs, and boost incomes. If environmental degradation and poverty are correlated, so too is there a link between low carbon investment and broader development.

"What people need to escape poverty is energy, mobility and services – and in a lot of cases in Africa it is the environment that is providing those things," says Anton Cartwright, a researcher at the African Centre of Cities' Climate Change ➟

CityLab. "Those are the reasons that people are moving to cities, and all those things have quite close ties to emissions. But there are available technologies in Africa for providing those things in a low carbon way. It's about infrastructure and energy, and because these things aren't in place there is a massive opportunity for investment."

The green shift

Smart energy development, in particular, is increasingly forthcoming. According to advisory firm Frost & Sullivan, the total investment into renewable power in Africa is expected to grow to $57.7bn by 2020, from $3.6bn in 2010. These investments could increase energy efficiency, but also reduce some of the costs of large grids in the same way the mobile phone cut the need for telephone wires.

Public sector support of this kind of smart energy growth will be key to the successful development of Africa's cities. "The cell phone market has penetrated Africa so rapidly and effectively, and I think there is something to be learned in terms of policy and incentives from this that could benefit renewable energy," says Mark Redwood, a programme manager at the International Development Research Centre.

Organisations such as the C40 are supporting member African cities in driving the shift towards lower carbon economies. The network has worked with Johannesburg, for instance, to create substantial sustainable housing developments in some of its townships and launch Africa's first bus rapid transit system. These buses will carry an annual 135m passengers by 2013; and by taking the city's "taxivans" off the roads, the project is expected to reduce they city's carbon emissions by 1.3m tonnes by 2020, the group says.

But beyond developing cities being recipients for OECD climate technology, there is a real opportunity to leapfrog established growth paths and become innovators in their own right. By capturing part of the global low carbon value chain, some of the world's poorest countries can create a comparative advantage.

"The reality is that some of our developing cities are really pushing ahead of the others. Leapfrogging is where I think developing cities have a real advantage," says Simon Reddy, C40's executive director. "In São Paulo, landfill gas capture and energy generation supplies 7 percent of the city's electricity needs. There are a lot of developed cities, which have spent considerable amounts of time and money and investment into their existing systems that don't have that, and the cost of installing that now would be prohibitive for them. Developing country cities are able to take the best practices and move ahead into new technologies that some of us are still dreaming about."

PHOTOS: GETTY/CORBIS

ABOVE: A power plant on the South African coast
LEFT: Wind turbines in the Ngong hills, south-west of Nairobi, which are owned and run by Kenya's main power generating company Kengen

This technology could be applied to a city such as Addis Ababa – one of C40's members – agrees Arup's Mr Watts. "In Addis there is very little collection of waste and no treatment – there's just one great big dump at the edge of the city," he explains. "So there's a massive opportunity there. Given the relatively low electricity demand present, you could quite feasibly see 20 percent of electricity demand being met through energy from waste."

The same leapfrogging could apply to more efficient water systems, he says: "Addis's water leakage rate is about 50 percent and, given that there is so much development capital at the moment and so much new infrastructure being put in place, there are great opportunities to embed right from the start the Berlin or Copenhagen, Tokyo style constant monitoring of the pipes which has reduced their leakage rates to just one or two percent."

But while pockets of good practice exist, climate-smart growth has remained elusive on any serious scale. The Clean Development Mechanism, which aims to generate low carbon growth by supporting sustainable projects in developing nations, has largely failed to benefit Africa, often because governments cannot afford application fees. Progressing towards overarching green urban economies would demand that local governments assess every economic opportunity against climate change criteria.

QUICK STAT

57.7bn

The amount to which investment into renewable energy is expected to grow by 2020

Source: Frost & Sullivan

The very newest cities in Africa present the most viable examples of integrated climate-smart development. Tatu City, a $5bn new town just north of Nairobi which will be home to more than 60,000 residents, has been granted private municipality status by the Kenyan government. With carbon saving initiatives tied into contracts issued to developers, a holistic sustainability framework is integrated into the city's development.

Renaissance Partners, the investment arm of Moscow-based Renaissance Group which is managing the project, says that by installing solar water heating in both commercial and residential buildings and banning the use of air-conditioners in commercial buildings, the city will take up to 60 percent of its potential electricity usage off the grid. Every building will be fitted with rainwater harvesting and greywater recycling systems. Tatu City's buildings will also integrate retail, offices and residential space in order to ensure the most efficient use of resources.

"For most cities the problem has been scaling up and then 24 hour usage. A developed city like Washington just functions for nine hours of the day. Everybody fights to get in and out in rush hours, there is all this traffic, carbon emissions and energy levels up – and for the next 15 hours that infrastructure stands dead," says Arnold Meyer, head of real estate at Renaissance Partners.

"That's why it is so important now with new developments in Africa to get them fully integrated with mixed-use buildings – that way the structure, the infrastructure and utilities are being utilised 24 hours a day. Otherwise you're going to build offices in the central business district using huge lengths of roads, water pipes, electricity cabling, and you've got to duplicate all of that again in the residential suburb. If you can merge them, the savings and the economies that start being at play are significant."

Renaissance Partners plans to build three more cities in Ghana and the DRC. The group is lining up a further pipeline of projects in Kigali, Addis Ababa, Dakar and Port Harcourt, as it seeks to benefit from Africa's fast urbanisation. "Governments can't fund this kind of work because they've got too many other issues to address and thinking about low carbon is too long term. But that is where this golden opportunity is now for private commerce to create these enclaves," Mr Meyer says.

"And the private sector is in a position where with only a few principles you are laying the foundation which innovation can only build on. Because that's the amazing thing with cities: they are magnets for competition and innovation and creativity. We see now that where there is more funding available for green buildings, work in two, three years leapfrogs with more and more innovation. That's the beauty with the new cities in Africa – being able skip a whole 20-25 year development curve which other cities have gone though by retrofitting."

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Mark Kenber

Chief Executive Officer, The Climate Group

"Those who have reduced their emissions way beyond what Kyoto requires have either made, or saved, money in the process; sometimes in the billions of dollars"

INTERVIEW BY DAVID ANDERTON

PHOTOS: THE CLIMATE GROUP

Cities are the defining centres of human activity for the 21st century. Between 1950 and today, the number of urban dwellers worldwide has mushroomed from just 750m to around 3.5bn. By 2050, two thirds of an estimated global population of 9bn will live in cities.

They are already the lifeblood of the modern economy. The world's 50 largest cities alone have a combined gross domestic product of $9,600bn. Conversely, they also generate about 2.6bn tCO2e annually – more than all countries except the United States and China.

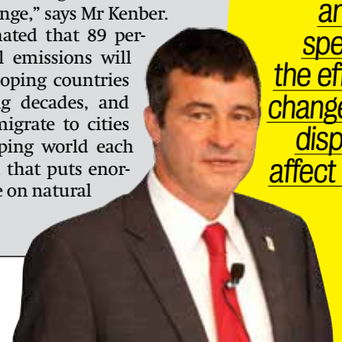
"We are increasingly an urban dwelling species," says Mark Kenber, chief executive of the Climate Group – a global initiative which brings together governments, public figures and businesses with the objective of developing low carbon strategies for growth. "Therefore the effects of climate change on people will disproportionately affect those in cities."

This is a pertinent message for sub-Saharan Africa. While the continent's contribution towards global emissions is estimated to be around 4 percent, it is also the world's most vulnerable region to climate change. Fifteen of the world's twenty megacities are at risk from rising sea levels – Cairo and Lagos are in this category, and will be joined with Kinshasa by 2025. In coastal North African cities, a 1-2 degree increase in temperature could lead to sea level rise potentially exposing 25m residents to flooding.

"If you think about where many cities are located, they are often in costal areas for historical reasons, trade and navigation, and so on and so forth. In many cases the coastal areas are those most vulnerable to the impact of rising sea level, a result of climate change," says Mr Kenber.

It is estimated that 89 percent of global emissions will be from developing countries in the coming decades, and 70m people migrate to cities in the developing world each year – a trend that puts enormous pressure on natural resources.

"We are increasingly an urban dwelling species. Therefore the effects of climate change on people will disproportionately affect those in cities"



Yet Mr Kenber has no doubt that cities are also an indispensable part of any effort to drive the adaptation and mitigation agenda. "Urban areas are hubs of innovation, hubs of financing and investment, and therefore while there is the potential for cities, and the increased economic growth that accompanies them, to drive emissions up they also have huge potential to keep emissions down. They can use energy and the atmosphere more effectively."

Far from being a problem, highly concentrated populations provide "very big bang for your buck" in efforts to design more energy efficient urban systems.

The extent to which this can happen in low income regions is, however, debatable. Cities in sub-Saharan Africa are already heavily overburdened – an estimated 72 percent of all urban dwellers live in slums. They are also woefully under-funded. The infrastructure requirements are immense. The estimated price tag of meeting electricity and water demands alone stands at $34bn per year. Total spending on infrastructure in Africa currently stands at $45bn, with a financing deficit of close to $50bn. Under such circumstances, investing in technologies required for so called "smart" or "low carbon" growth – usually more expensive than conventional technologies – may seem unrealistic.

This is a line of argument that Mr Kenber summarily rejects, saying that "the climate group would argue that long-term prosperity and long-term economic development, particularly in poor areas, must be in a low carbon way. Otherwise the impacts of climate change will overshadow and undermine any short-term progress you make on economic growth and poverty reduction."

Being able to make the required investments to implement such strategies in a cost efficient way is imperative in a region such as sub-Saharan Africa, where finances are already unable to meet existing demand through more conventional, and emission heavy technologies such as coal fired power plants.

Private investment into the continent is surging and could make up for some of these shortcomings. Yet persuading businesses to make additional investments into climate adaptation and mitigation initiatives is far from given.

Undeterred by the suggestion that low carbon strategies may be out of the fiscal reach of cities in Africa, Mr Kenber challenges what he calls a "false dichotomy" between such investments and running a profitable business.

"It doesn't have to be [an imposition], in fact low carbon strategies can be business enhancing and there are lots of examples." The Climate Group has published a series of reports entitled *Carbon Down Profits Up*, which showcase examples of companies that have cut emissions without any detrimental impact on their business.

On the contrary, the reports "showed that those who have reduced their emissions way beyond what Kyoto requires have either made, or saved, money in the process; sometimes in the billions of dollars," Mr Kenber says.

This "false dichotomy" extends to the oft-stated gap between "rich" and "poor" countries in discussions about climate change adaptation and mitigation efforts, he argues.

"There is an idea that you have to get rich before you can do something about the climate. While I think that myth has been broadly debunked it is still believed by some that the economy and the environment are not natural bedfellows, indeed that they are inimical to each other."

He believes that while not all mechanisms and technologies available to cities in developed markets will be readily transferable to a developing world setting, the priorities are no different – priorities that he believes "can be done in a way that is consistent with our climate change objectives".

He concedes that "it would be naive to suggest that all of the actions that you need to take to combat climate change come at no cost – which is patently not the case," but remains optimistic about the possibilities that municipal leaders in developing countries face in terms of low carbon growth strategies.

"You need leadership from the top that says 'this is of strategic importance' and communicates to the population that this is not just a move to some liberal position on climate change, but is actually about strengthening the city's development going forward."

CITIES AND CLIMATE CHANGE

67% Urban areas account for 67% of global energy-related greenhouse gases

72% The amount of cities' energy demand which is met by coal, oil, and natural gas – the main contributors to greenhouse gas emissions

80%
The amount of global energy production consumed by cities. They account for a roughly equal share of global greenhouse gas emissions

GLOBAL EMISSIONS BY SECTOR

- **POWER** 26%
- **INDUSTRY** 19%
- **LAND-USE CHANGE AND FORESTRY** 17%
- **AGRICULTURE** 14%
- **TRANSPORTATION** 13%
- **RESIDENTIAL AND COMMERCIAL BUILDING** 8%

CO_2 The world's 50 largest cities, with more than 500m people, combined generate about 2.6bn tCO2e annually, more than all countries, except the United States and China

FUNDS FOR MITIGATION AND ADAPTATION

$100bn Potential available funding

$275bn Estimated required funding

89%
Until 2030, 89% of estimated increases in CO2 emissions will come from developing countries

90%
Over the same period, 90% of the world's urban population growth will occur in the least developed countries

THE GROWING NUMBER OF URBAN DWELLERS

2050 Over 6bn

2011 3.5bn

1950 750m

360 million
The approximate number of urban residents living in coastal areas less than 10 metres above sea level; making them vulnerable to flooding and storm surges

15 of 20 megacities
15 of the world's 20 megacities are at risk from rising sea levels. These include Cairo and Lagos, which will be joined by Kinshasa by 2025

50 largest cities
The world's 50 largest cities alone have a cumulative GDP of $9,600bn

70 million
The number of people in the developing world who move to urban areas each year

1-2°C increase
Increase of just 1-2 degrees celsius could lead to rising sea levels, potentially exposing 25m residents to flooding in North Africa

The future
By 2070 almost all cities in the top flooding risk category will be located in developing countries

Source: Unep/World Bank

CDM FOR CITIES

Integrating a more explicit urban focus into international climate financing mechanisms could be essential to formulating low carbon growth paths in the world's fastest growing cities

BY DAVID ANDERTON

Cooking stoves supplied by a Clean Development Mechanism project in Lusaka, Zambia

PHOTOS: CORBIS/GETTY

The need for climate mitigation and adaptation strategies within Africa's fast growing urban environment is widely recognised, not least because of the risks posed by the effects of climate change. The UN estimates that by 2050 low-elevation coastal regions will be home to 71 percent of the continent's 1.1bn strong urban population.

Yet the financing needed to tackle climate change severely outstrips available resources. According to UN and World Bank estimates, the current available funds for mitigation and adaptation, not limited to cities, amount to just $9bn per year, with the total need as high as $275bn per year. By comparison, the estimated cost of attaining the Millennium Development Goals by 2015 is $40bn-$60bn per year.

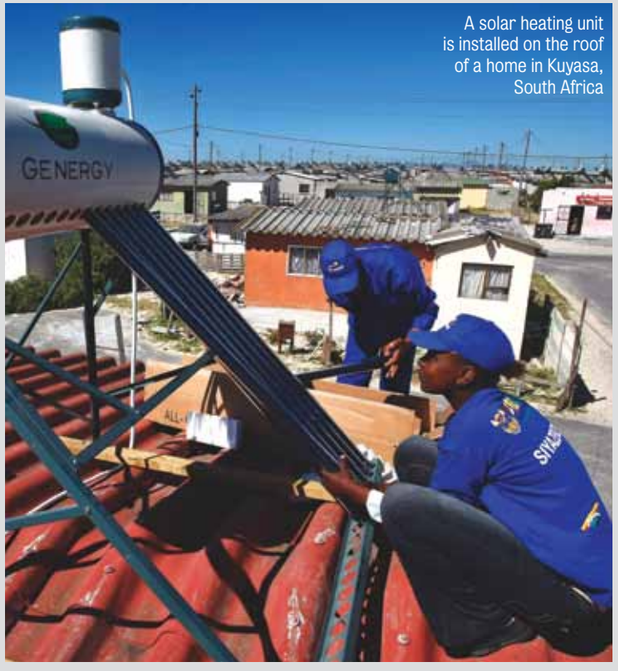
Refocusing international climate financing mechanisms by changing incentive structures, and allowing cities to better leverage such tools, could be central to addressing this shortfall.

The Clean Development Mechanism, created under the Kyoto Protocol, aims to provide a framework to promote emission reducing projects in developing countries – in turn supporting efforts to ensure sustainable development. The CDM has attempted to re-align investment incentives across the developing world by providing tradable emission reduction credits to certified programmes.

While other approaches such as Nationally Appropriate Mitigation Actions (NAMAs) and Low Carbon Development Strategies (LCDS) have featured in international climate change negotiations, the CDM constitutes the core of global financing mechanisms. It is particularly worrying, then, that the mechanism has been met with significant scepticism amongst emerging markets, and its impact has so far been limited, particularly in cities.

"There are challenges," says Daniel Hoornweg, lead urban specialist for cities and climate change at the World Bank. "The concept of developing a new approach for cities remains extremely important. Out of 4,800 registered CDM projects worldwide, only 5 percent are registered with cities, and yet cities are generating the lion's share of emissions."

One project that managed to, eventually, be recognised by the CDM is the Kuyasa low-cost urban housing energy upgrade project outside of Cape Town, South Africa. The initiative provides informal settlers with insulated ceilings, a solar water heater and energy efficient lighting to reduce the risks associated with traditionally used wood-fired stoves.



A solar heating unit is installed on the roof of a home in Kuyasa, South Africa

"If you think about what [the project] does to reduce the burning... it cleans the air and reduces the carbon – dramatically improving the quality of life. This is a brilliant idea and yet they had a tremendous problem getting the CDM to recognise it," explains Dr Rohit Aggarwala, special advisor to the C40 Cities Climate Leadership Group. "Previously the CDM had no way to admit projects like this and give credit. And this is exactly the kind of project that is going to be most appropriate to cities, especially developing ones."

Fostering a more explicit urban focus will require significant restructuring of the existing financing frameworks. Since the Copenhagen Accord, several countries, with support from Unep and UN Habitat, have made moves to promote a so called 'city-wide' approach to financing frameworks.

This proposes expansion of the CDM's 'Programme of Activities' approach, to enable aggregation of city-based GHG mitigation initiatives broadly covered by five sectors: energy, transport, solid waste, water and wastewater, and urban forestry. The process requires obtaining benchmarks for greenhouse gas emissions in a given city, and measuring the success of initiatives against these, allowing carbon finance to move beyond its current single project framework.

Such an approach offers a practical tool for cities looking to access financing for adaptation and mitigation efforts, says the World Bank's Mr Hoornweg.

"Its power comes from its ability to send pricing signals and also its ability to encourage. The powerful part of carbon finance is that it is basically output assistance: you do it, you get the funds," he adds.

There are hopes that this city-wide approach to climate change financing can be advanced during December's COP 17 summit in Durban, South Africa. A dedicated mayor's task force on urban poverty and climate change has been set up to discuss how financing mechanisms can support urban development in low income regions.

"It is extremely important for city officials or people who want to bring in new programmes to use the city-wide process as catalytic investment to make those changes," says Mr Hoornweg, suggesting that such an approach will help to add momentum to low carbon growth initiatives.

"The key challenge is for the public sector to be able to leverage the private sector and incentivise them to actually develop along a sustainable or low carbon path," adds Ajay Narayanan, head of climate business and sustainability at the International Finance Corporation.

"The question is how can you maximise the amount of public sector investment while minimising the amount of concessionality you have to provide to actually get the private sector interested?"

Incorporating initiatives such as the city-wide approach to climate financing will be essential to achieve such an outcome, says Mr Hoornweg, who argues for more urgency around the issue of climate change response in regions such as sub-Saharan Africa. "From our perspective the issue with low income cities and rapidly urbanising cities is that lots of people are talking about long term targets as far ahead as 2030. But there are 500,000 people a day moving to, or being born into cities now. Cities are being built today and they are locking in their entire infrastructure."

By 2035, the year in which more than half of sub-Saharan Africans are estimated to be living in urban centres, "it is basically going to be too late", he says.