



# Energy towards sustainable cities





## Introduction

The aim of sustainable development is to integrate economic vitality, ecological integrity and social equity. All aspects of city energy management – productive, inclusive, well-governed and sustainable – thus have sustainability aspects embedded within them. As a key service provider (water, waste removal, energy, clean air, housing, transport) local government is an important locus for addressing sustainability. South Africa’s laws and policies require integration of sustainable development concerns within local level strategic planning and decision-making.<sup>1</sup> Sustainability, and by extension sustainable energy development, is a mandate of local government.

The sustainable city issues highlighted within this chapter look specifically to areas of energy management that have direct impact on the local and global natural resource base, predominantly through the “waste” products of city energy consumption: notably global greenhouse gas (GHG) emissions, local air pollution and radioactive waste.

South Africa’s six big metros have an average carbon emissions level of 6.5 tonnes per person a year – higher than the global average, but below the European and North American averages. This per capita footprint is substantially higher within industrial cities and substantially lower amongst the non-industrial towns. Although using relatively more diesel and petrol, electricity contributes substantially to the global carbon emissions of the study cities. This is largely due to the heavy carbon footprint of our dirty, coal-fired electricity. It should also be noted that this study has not factored in the higher carbon emissions within local production of liquid fuels through liquefaction, which would increase the carbon footprint of these fuels to some degree. In the aggregate, the South African economy

exhibits a comparatively high level of CO<sub>2</sub> emissions related to energy consumption per unit of economic value created.

Local air quality has recently become an important area of environmental management for cities. Cities exhibit a wide variation in levels of air quality monitoring, and there is currently little consistency amongst city reporting measures, making data collection and comparison difficult. The City of Cape Town is currently the only city that has high level radioactive waste awaiting disposal within the city region.

### ISSUE: City global emissions levels

Climate change – the rapid increase in global temperatures and related weather pattern changes caused by the enormous increase in global greenhouse gas emissions through human activity – is an accepted fact amongst scientific and political leaders. Climate change will have far-reaching, often disastrous, impacts on the planet and all living here. Inevitably it will be the poor, with the least resources to handle disaster, that will be most heavily impacted. South Africa ranks 18<sup>th</sup> in the listing of countries with the highest greenhouse gas emissions.

### Measure: City carbon emissions by fuel type and sector

Identifying fuel types responsible for emissions enables more effective strategic planning around sustainable fuel use. Although coal-fired electricity only accounts for 32% of total South African city energy consumption, due to the efficiency of generation largely owing to the low-grade coal used as fuel for most generation, electricity comprises 66% of carbon dioxide emissions (Table 4.1,

<sup>1</sup> See relevant laws listed in Annexure A.

Table 4.1: Carbon emissions in study cities by end-use\* fuel type, 2004

Fuel	CO2 tonnes/yr	%
Electricity	102,536,369	66
Petrol	16,611,724	11
Diesel	10,592,249	7
Paraffin	1,140,868	1
LP Gas	514,243	0
Jet fuel	5,219,851	3
Heavy furnace oil	1,217,702	1
Coal	15,979,685	10
Natural gas	2,199,180	1
RE	0	0
<b>Total</b>	<b>155,912,874</b>	<b>100</b>

Source: Derived from data gathered in City Energy Review, 2006

\*Note that this does not include the consideration of manufacture of a significant proportion of SA liquid fuels from coal and natural gas. This would increase CO2 emissions attributable to liquid fuels by a factor of between 2 and 3 for those fuels manufactured from these sources.

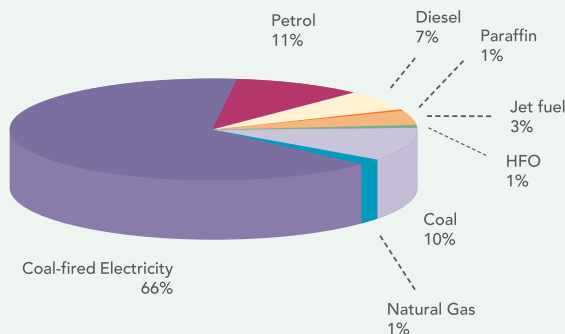
Figure 4.1). By contrast, petrol and diesel, which make up 37% of consumption, contribute only 18% to total carbon emissions.<sup>2</sup>

### Measure: Carbon emissions by sector<sup>3</sup>

Understanding sectoral contributions to global emissions enables effective management for reaching target emissions reductions. Sector carbon emissions (Figure 4.2) point to the high impact of the residential, manufacturing and transport sectors. Within the metro and non-industrial cities (Figures 4.3 and 4.5) these sectors contribute, roughly, a third each towards total emissions. Once the heavy industrial towns are included, however, the shift is substantially towards manufacturing (industrial) as the major carbon-emitting sector (Figure 4.4). All sectors offer important energy efficiency opportunities.

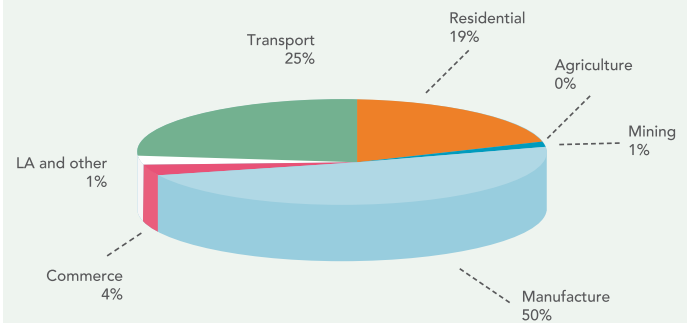
The 2005 National Energy Efficiency Strategy of the Department of Minerals and Energy (DME) addresses many of these areas, but implementation of interventions has been fairly limited. An examination of the list of activities in the Department of Environmental Affairs and Tourism (DEAT) climate change programme does not appear to reveal adequate measures to address the relative importance of the role energy production and consumption play in climate change.

Figure 4.1 Study cities Carbon Emissions by Fuel Type, 2004



Source: Derived from data gathered in City Energy Review, 2006

Figure 4.2 Study cities carbon emission by sector, 2004



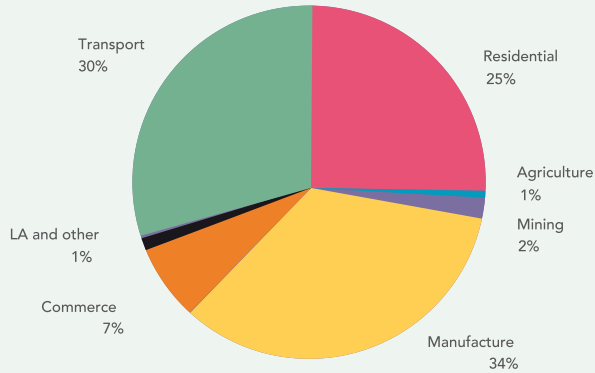
Source: Derived from data gathered in City Energy Review, 2006



<sup>2</sup> See note earlier on synthetic fuels manufactured from coal and natural gas.

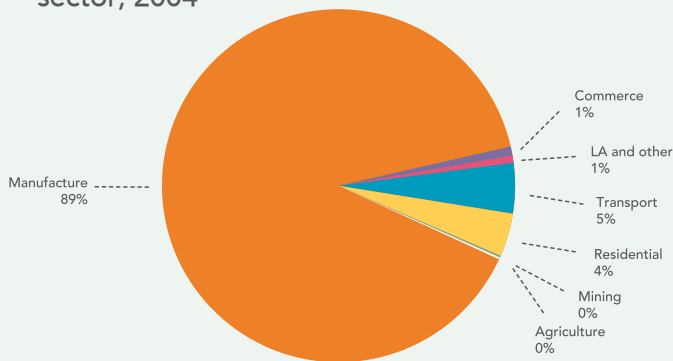
<sup>3</sup> The values below are slightly under-reported for households because paraffin use is under reported. However, in percentage terms, the under reporting of CO2 emissions attributable to transport, owing to non-provision for the CO2 emissions in synthetic fuel manufacture, the net effect is probably that all other sectors, which rely far more on liquid fuels as an input, are larger than shown.

Figure 4.3 Metro carbon emissions by sector, 2004 (excl Johannesburg and eThekweni)



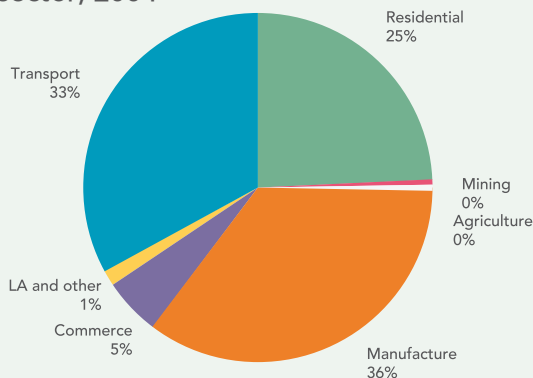
Source: Derived from data gathered in City Energy Review, 2006

Figure 4.4 Industrial towns carbon emissions by sector, 2004



Source: Derived from data gathered in City Energy Review, 2006

Figure 4.5 Non-industrial towns carbon emissions by sector, 2004



Source: Derived from data gathered in City Energy Review, 2006

## Measure: Carbon dioxide emissions per capita

Carbon emissions (in tonnes/capita/year) provides a measure of the levels of carbon dioxide emissions from energy use that is comparable across cities – nationally and internationally. Of course the measure needs to be interpreted with caution – level of emissions is affected by a variety of factors: quality of fuel, level and type of industry. It also says nothing about absolute levels of carbon emissions. These may increase substantially, while per capita emissions drop, if population growth is substantial.

Table 4.2 indicates that global greenhouse gas emissions for the 15 study cities averaged 8.1 tonnes carbon per capita. This is close to the published South African average of 8.4 tonnes per person a year and twice the published global average of 4 tonnes a person a year. This figure is also above the Western European average of 7.9, but below the North American average of 15.9 tonnes/person/year. Such comparisons are interesting, but of limited use because of the range of factors affecting this measure including significant differences in scale, levels of economic development, structures of economies, geography and climate. For example, countries in very cold climatic zones with sparse populations could be expected to require significantly higher energy services to provide equivalent overall service standards to densely-populated countries in temperate zones.

Large variations occur between the South African study cities. When disaggregated, the six big metros average 6.5 tonnes per person a year – higher than the global average, but below the European and North American averages. The non-industrial cities average 3.4 tonnes per person, just below the global

Table 4.2 South African city CO<sub>2</sub> emissions per capita (tonnes), 2004

	Population	Total CO <sub>2</sub> emissions	CO <sub>2</sub> /capita (tonnes)
SOUTH AFRICA	46,586,607	391,327,499	8.4
<b>Metros</b>			
City of Cape Town	3,069,404	19,736,885	6.4
City of Johannesburg	3,585,545	19,944,863	5.6
City of Tshwane	1,678,806	13,537,109	8.1
Ekurhuleni	2,761,253	22,917,257	8.3
eThekweni	3,269,641	18,405,182	5.6
Nelson Mandela	1,013,883	4,754,204	4.7
sub total metros	15,378,532	99,295,500	6.5
<b>Industrial towns/cities</b>			
uMsunduzi	562,373	3,543,806	6.3
Saldanha Bay	79,315	3,923,771	49.5
Sedibeng	883,772	25,257,942	28.6
uMhlatuze	360,002	16,816,074	46.7
sub total industrial towns/cities	1,885,462	49,541,593	26.3
<b>Non-industrial towns/cities</b>			
Buffalo City	702,671	2,449,144	3.5
King Sabata	421,233	713,526	1.7
Mangaung	662,063	2,495,297	3.8
Potchefstroom	129,075	634,580	4.9
Sol Plaatje	196,846	882,234	4.5
sub total non-industrial towns/cities	2,111,888	7,174,781	3.4
<b>Total emissions for review towns and cities</b>	<b>19,375,882</b>	<b>156,011,874</b>	<b>8.1</b>

Source: Derived from data gathered in City Energy Review, 2006

average. The poorer, more rural municipality of King Sabata provides a stark contrast to national and city averages, with the GHG emissions of just 1.7 tonnes a year – on par with the African average of 1.1 tonnes per person/year. The high per capita emissions within the industrial cities indicate heavy, energy-intensive industry.

### Measure: Carbon dioxide emissions per unit of economic value created

The amount of emissions per unit of economic value created provides an indication of relative energy efficiency and longer-term sustainability. As with the energy per capita measure, this measure needs to be interpreted and used with due regard for its underlying meaning and its limitations. In general, a trend where the incremental increase in CO<sub>2</sub> emission would decrease as total economic value creation increased would be more sustainable than a trend where the incremental CO<sub>2</sub> increase in emissions did not decrease.

#### Data comment

*The CO<sub>2</sub> emission data was calculated from energy-use data. CO<sub>2</sub> emissions were calculated by multiplying fuel and electricity consumption data by emissions factors. The emission factors used for electricity are South African electricity coefficients and Intergovernmental Panel for Climate Change (IPCC) coefficients for other fuels, as listed within the IPCC Guidelines for National Greenhouse Gas Inventories, 1996.*

Figure 4.6 Carbon emissions per capita, 2004



Source: Derived from data gathered in City Energy Review, 2006

However, the relationship between energy use, CO<sub>2</sub> emissions and the creation of economic value depends on complex relationships between many factors. These factors need to be understood to assess the meaning of measures of CO<sub>2</sub> emissions per unit of economic value in terms of sustainability.

In the aggregate, the South African economy exhibits a comparatively high level of CO<sub>2</sub> emissions related to energy consumption per unit of economic value created. As noted above, assessments and comparisons done using the CO<sub>2</sub>/unit of economic value created have to be viewed with caution. Because of economic linkage between cities, economic value created with relatively low CO<sub>2</sub> emissions in one city might depend on the economic value created with much higher emissions in another. For example, while the City of Johannesburg measures 9.6 tonnes CO<sub>2</sub>/R100,000 compared with 133,6 CO<sub>2</sub>/R100,000 for Sedibeng (Table 4.3), the City of Johannesburg derives components of its economic value creation through provision of low-energy-intensity services to high-energy-intensity industries in Sedibeng. There are backward linkages between low-energy-intensity service industries in City of Johannesburg and high-energy-intensive industries in Sedibeng. Thus, the cities cannot be seen in isolation. Use of this measure to assess sustainability needs to incorporate an understanding of the structure of the productive economy and linkages between cities and regions.

Table 4.3 South African cities CO<sub>2</sub> emissions per economic unit of value added (tonnes CO<sub>2</sub>/R100,000), 2004

City of Cape Town	13.7
City of Johannesburg	9.6
City of Tshwane	12.7
Ekurhuleni	24.9
eThekwini	15.6
Nelson Mandela	13.8
sub total metros	14.1
uMsunduzi	
Saldanha Bay	30.2
Sedibeng	133.6
uMhlatuze	140.1
sub total industrial	123.1
Buffalo City	106.9
King Sabata	
Mangaung	16.7
Potchefstroom	15.4
Sol Plaatje	13.9
sub total non-industrial towns	15.7
Average	13.0

Source: Derived from data gathered in City Energy Review, 2006

## THE BUCKET BRIGADE: CHALLENGING INDUSTRY AND FIGHTING AIR POLLUTION IN THE SOUTH DURBAN BASIN

*Desmond D'Sa and Karen Read, South Durban Community Environmental Alliance*

Maria Sundram lives in the South Durban Basin. She is 12 years old and suffers from asthma. At her school 52% of educators and learners suffer from this disease. Findings, confirmed by the Nelson Mandela Medical School, have also shown that leukaemia rates amongst young children in the area are 24 times higher than the national average. These figures correspond with the high levels of benzene recorded near one of the local refineries. The benzene levels were

8 times higher than anywhere else in South Africa, and compared to a busy, four-lane highway in Detroit in the United States of America.

The South Durban Basin stretches from the Durban Harbour down the south coast to Amanzimtoti North. It is made up of six major industrial belts. The informal market gardeners and homesteads that once existed here were relocated in the 1930s to make way for industrial development. And the stamp of apartheid planning persists: the 285,000 people living alongside two major oil refineries, a paper mill, sugar mill and host of chemical companies are mainly black and mainly poor. Just last year, the Engen

oil refinery released toxic gases that affected school children and community members in the area.

The South Durban Basin Spatial Development Framework (SDBSDF) aims to address the bad planning of the past. It is badly needed, but has been contested by residents who felt that there was no meaningful public participation, or public input in the formulation of background documents. Their experience is that the muscle of big industry persists.

The South Durban Community Environmental Alliance (SDCEA) was formed in 1996 in response to the host of environmental and health issues affecting the community, like the asthma affecting Maria and her two sisters. The SDCEA is



made up civic, faith-based and environmental groups and the organisation uses advocacy and lobbying to promote environmental justice and sustainable development.

A particular challenge to the SDCEA has been proving that air pollution levels are unacceptably high and are the root cause of the health issues within the community. The organisation has had to challenge the assumption that air quality can only be measured by experts with expensive, high-tech equipment and has set out to provide alternative air pollution figures.

The Bucket Brigade is a community monitoring network established by groundWork to enable residents to take a more proactive approach to industrial pollution. Its inception began when Bobby Peek, director of local NGO groundWork, met Denny Larson of the Global Monitoring Network. In 2000 Denny came to South Africa to assist with air pollution monitoring training and technology development, and the Bucket Brigade was born.

This air quality monitoring technology uses simple plastic buckets. A clear plastic bag, purged with nitrogen to separate the captured gases, is placed inside the bucket and, using a small hand-held pump, air is sucked out of the bag and bucket to create a vacuum. Once the valve is opened, air is sucked into the plastic bag or “lung”. This air sample is then sent either to the United States of America or Umgeni Water in South Africa for testing. These tests compare well with samples taken with other air monitoring equipment. However, cost prevents too many samples being taken and they are generally reserved for pollution incidents. The bucket technology has spread and bucket brigades now operate in other parts of the country and the world.

A sample taken in South Durban resulted in a local refinery being fined and was a catalyst for the Multi-Point Plan – aimed at introducing cleaner fuels into the basin.

SDCEA campaigns to promote development options that have people – not industry – at the centre. Such development needs to explore the use of alternative, cleaner fuels; it needs to ensure local jobs are created without compromising the health of local people; it needs to involve people in planning and decision-making; strong, enforceable legislation needs to apply a single standard for industry across the world.

Maria Sundrum recently spoke at an Arbour day function, condemning industries for poisoning communities and the environment. More and more young people, like Maria are speaking out at every possible opportunity. SDCEA believe strongly in the potential of the youth to lead us to a different, brighter future.



## ISSUE: Local air quality

Local air pollutants have adverse health impacts, particularly in the area of respiratory ailments, and airborne particulate matter is associated with cancer. Negative effects of air pollution have been estimated to cost South Africa more than R4 billion a year. There is also a significant negative impact on vegetation in South African cities, which needs to be explored if this problem is to be dealt with.



Local emissions refer to those that affect the air quality in the city area and have direct local environmental and health impacts. These include nitrogen and sulphur oxides ( $\text{NO}_2$  and  $\text{SO}_2$ ), volatile organic compounds (VOCs), and particulate matter. The recently promulgated National Environment Management: Air Quality Act, 2004, replaced the outdated Air Pollution Prevention Act of 1965, and redefined air quality pollution and decentralized air quality management responsibilities from the national to the local authority level. The Act requires that local authorities develop air quality management plans; that all significant local emission sources are identified, quantified and addressed and that emission reduction and management planning is done by the owner or those responsible for sources. Ambient Air Quality Guidelines have been established in terms of the Act and these include target levels for a number of pollutants based on and in line with international standards and best practice. The target levels have been established with the aim of driving emission reductions. The Act involves a shift from source-based air pollution control to a receiving environment approach to air quality management in terms of which the impact rather than extent of pollution is monitored and management priority is established in terms of greatest impact on health and environment.

Petrol and diesel play a large and important role as transport fuels and local emissions resulting from use of these fuels have a significant negative impact on air quality in many cities. Petrochemical plants, coal-fired power stations, minerals processing, other manufacturing industries and coal and wood fuel use for heating and cooking are other major sources of local emissions.

Particularly high levels of local air pollution have been recorded in and around the industrial areas of eThekweni (chemicals and refineries), Sedibeng, uMhlatusi and Ekurhuleni (power stations, minerals processing, chemicals and manufacturing industries). A large number of poor households experience high levels of indoor air pollution associated with the use of coal, wood and paraffin for cooking, heating and (to a lesser extent) lighting. This is particularly severe in areas that experience cold winter conditions and where cheap coal is available, for example Sedibeng, areas of City of Johannesburg and Ekurhuleni. In Cape Town high levels of indoor air pollution are attributable to woodfuel use rather than coal.

Cities have different emphases in terms of local pollutants, depending on local geography, spatial layout, climate and emission sources. It has been the experience that cities have

very different capacities in terms of measuring air pollution, despite the promulgation of the new Act and consequent establishment of common measures for reporting.

An important aspect of the Air Quality Control Act is the emphasis on access to information. The Act requires that industries and mining operations maintain emissions inventories and make available source and emissions data.



Table 4.4 Study city PM<sub>10</sub>, SO<sub>2</sub> and NO<sub>2</sub> emissions per annum, 2004 (and/or associated air quality monitoring information)

City	Data comment	PM <sub>10</sub> (tpa)	NO <sub>2</sub> (tpa)	SO <sub>2</sub> (tpa)
Buffalo City	No data reported	-	-	-
City of Cape Town	Detailed data (but provided in emissions ug/m3). City has a number of monitoring stations and a well established Air Quality Monitoring Network and research is being undertaken into local air quality issues – notably in relation to the Brown Haze phenomenon and high levels of pollution in the Khayelitsha area. Air Quality Monitoring Network report on NO <sub>2</sub> , SO <sub>2</sub> , PM <sub>10</sub> , O <sub>3</sub> .			
Johannesburg	This data for 2005. Air quality monitoring is outsourced.	3,220	-	-
Tshwane	Fairly high level of data sourced through National Source Inventory Data Base (1995), Air pollution permit certificates for a few scheduled processes, the NEDLAC-commissioned “Dirty Fuels” project, coal sales information (2003/4) and fuel sales information from SAPIA (2004). Data disaggregated by sector, however, not considered complete, particularly in terms of industrial process emissions and non-domestic fuel burning appliances. Data only as guidance, not verified. Report on TSP, PM <sub>10</sub> , SO <sub>2</sub> , NO <sub>2</sub> , CO, CH <sub>4</sub> , CO <sub>2</sub> , TOC, NMTOC, Benzene, Formaldehyde, Aceraldehyde, Lead, N <sub>2</sub> O.	7,034	62,755	32,515
Ekurhuleni	For 2004-5. Have four Ambient Air Monitoring Stations in place. However Quality Control section experiencing problems with management of data in these stations. No detailed data obtained for this report.	20,417	-	-
eThekweni	Produced a first Air Quality Annual Report for 2004 (Transport Department). Have twelve ambient Air Quality Monitoring stations in their air quality monitoring network which reports on CO <sub>2</sub> , NO <sub>2</sub> , SO <sub>2</sub> , CO, O <sub>3</sub> , PM <sub>10</sub> , TRS. Data presents detailed accounting in ppm for 2004.			
King Sebata	No data reported.	-	-	-
Mangaung	State of Environment Report provides figures for SO <sub>2</sub> , NO <sub>2</sub> (but in emissions ug/m3) for one month in 2003. Level of regular monitoring unclear.			
uMsunduzi	No data reported.			
Nelson Mandela	No data reported.			
Potchefstroom	No data reported.			
Saldanha	No data reported.			
Sedibeng	Has been declared a DEAT hotspot. Two Air Quality Monitoring stations have been established (one in Vanderbijlpark, one in Meyerton). Detailed report conducted for LRC on local air quality: Air Quality Situation Assessment for the Vaal Triangle (MTX/02/LRC-1b, Feb 2004). No data reported.			
Sol Plaatje	No data reported. No monitoring occurs.			
uMhlatuzi	No data reported, but definitely occurs at a detailed level. Strong focus on SO <sub>2</sub> monitoring. Richards Bay Clean Air Association is a local authority, civil society and business initiative aimed at provided sound information on local air quality.			

Source: Derived from data gathered in City Energy Review, 2006



## Measure: PM10, SO<sub>2</sub>, NO<sub>2</sub> emissions (tonnes) per annum

Efforts to source standardized data relating to SO<sub>2</sub>, NO<sub>2</sub> and PM10 levels from the sixteen cities yielded few results. Table 4.4 collates the various city responses to questions around air quality monitoring and the request for data on the measure.

### Data comment

*Much needs to be done to systematize and consolidate measurement and reporting of ambient pollutant levels.*

## ISSUE: Energy-generation related radioactive waste

The major environmental waste from nuclear-fired electricity is that of radioactive waste. “Low” level wastes are buried, but the disposal of high level waste – due to its extremely hazardous nature – has not been authorized anywhere on the globe. This means that all high level waste remains stored at the point of energy generation, within the power station itself. Where this is within proximity to a city it becomes a city issue that requires attention, awareness and disaster management strategies.

## Measure: High level radioactive waste awaiting disposal

Currently only the City of Cape Town has a nuclear power station within the 100km radius

used within this study to define a “local” energy generation supply. The City of Cape Town had difficulties in obtaining information on the quantity of “high level” waste from Koeberg Power Station.

### Data comment

*Information on high level waste awaiting disposal within a 100km radius of a City should be publicly available.*

## ISSUE: ‘Urban sprawl’

Developing “compact cities” – with reduced transport needs, smaller per capita built environment, easier service provision – has been identified as an important aspect of sustainable city development.

Cities that develop in a compact way, building upwards rather than outwards, also serve to minimize their impact on valuable surrounding agricultural lands and natural habitats. Compact city development also works



Table 4.5 South African city population density, 2001

	Population density (people per km <sup>2</sup> )
SOUTH AFRICA	38
City of Cape Town	1,228
City of Johannesburg	2,181
eThekweni	1,427
Ekurhuleni	1,435
City of Tshwane	764
Nelson Mandela	519
uMsunduzi	868
Saldanha Bay	42
Sedibeng	210
uMhlatuze	452
Buffalo City	279
King Sabata	139
Mangaung	105
Potchefstroom	48
Sol Plaatje	105

Source: Derived from data gathered in City Energy Review, 2006

towards ensuring that all residents have access to the city and its opportunities. Without such an approach the result is perpetuation of urban sprawl. However, it is important that cities develop safe, green spaces within in order for density to be livable and sustainable.

### Measure: Number of people per square kilometer

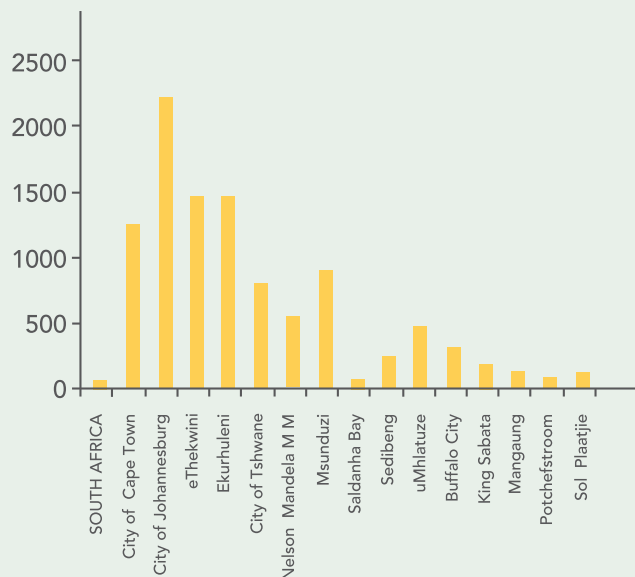
For smaller cities, population density is a good an indicator of compactness. However, larger cities need to consider additional measures, and more complex calculations, to provide an indication of sprawl.

On average the big metros have a far higher density of settlement than the other cities (Figure 4.7). With wall-to-wall municipalities, however, there is a situation where smaller cities “occupy” similar size areas to larger metros (on the ground these include a small city node with a surrounding rural community), which to some extent skews the notion of city density. This measure requires further work.

### Key policy issues

South Africa ranks 18th in the listing of countries with the highest greenhouse gas emissions.

Figure 4.7 South African city population density, 2001



Source: Derived from data gathered in City Energy Review, 2006



Our cities per capita carbon footprint average 8 tonnes/person—in line with our national average. This average hides a high level of variation – with industrial areas emitting extremely high levels, metros substantial and the poorest town on par with the very low African average. Our poorest cities are low carbon emitters, however the impacts of global warming are likely to be felt by the poorest, raising the issue of internal “Kyoto-style” commitments across our cities. Capacity with regard to local air quality monitoring varies substantially across cities and air quality itself varies hugely within cities – with persons living along busy intersections, close to industrial areas, or in areas with heavy dependence of wood and coal stoves being far more vulnerable to air pollution and related health impacts.

Energy efficiency needs to be implemented within cities through a variety of mechanisms: electricity stepped tariffs, solar water heater programmes, building efficiency standards, appliance labeling programme roll out, industrial efficiency programmes (currently an initiative of national government, but cities possibly need to play a role in this). The development of public transport and non-motorised transport promotion are key. Town planning for sustainable development is well covered in the city-planning discipline. South African cities need to implement best-practice. Energy and pollution are key aspects but there are general economic development considerations that are equal if not more powerfully compelling drivers.

## BISASAR ROAD: THE CHALLENGE OF SUSTAINABLE DEVELOPMENT

*Vanessa Black, Independent consultant and environmental activist*

Durban's Bisasar Road landfill – the biggest in Africa – covers 50 hectares and produces 7,000m<sup>3</sup> of methane gas an hour. The stench and hazards of the dump – imagine 22,000 tonnes of rotten eggs, industrial waste, raw sewage and toxic medical waste – have long been resisted by the neighbouring Clare Estate. This Indian community was created during the violence of forced removals and remains subjected to the toxic pollution of the dump, the sickly sweet chemical mist raining down from the line of perfume rods.



Today a new community, a 5,000-strong informal settlement, clings precariously to the steep slopes



off Kennedy Road below the landfill. This “African” community has grown since the Group Areas legislation fell away and black people were able to move closer to town. Condemned through poverty and marginalisation to live alongside, work and scavenge on the dump, this community stands in stark contrast to the wealth in nearby Clare Estate. This contrast is echoed in their support for the continued operation of the dump and newly proposed landfill gas project.

For years energy activists have lamented the waste of methane gas produced in landfill sites and flared (burnt off in a controlled waste), suggesting that this should be liquefied and bottled like LPGas. Prospects of global climate change and finance made available in recent years have provided a new impetus to capture landfill gas. The “Durban landfill gas to

energy project” planned by eThekweni Solid Waste would therefore seem to be a timely and simple solution to several problems. In fact, Bisasar Road has come to symbolise the complexity of issues facing sustainable development in South Africa.

The project involves installing a pipe system to capture the landfill gas, which will be burnt to produce electricity in a purpose-built, spark-ignition engine located on the landfill site. To make the project economically viable, the World Bank has offered subsidisation through its “Prototype Carbon Fund” (PCF), a fund set up to exploit the carbon trading market provided for by the CDM. Investors in the fund will take the “credit” for the carbon emission reductions from this gas project to offset against the emissions reduction targets they are required to meet under the Kyoto Protocol. This is “cheaper” than making carbon savings in their own countries or enterprises.

A condition to this trade is that projects must contribute to sustainable development in the host country. However there are no global criteria for this and the local definition remains broad. The Bisasar Road landfill and proposed gas project does not contribute any kind of positive development for the “Indian” community that have lived alongside this dump for decades. On the contrary, air pollution from the power generator will now add to existing toxicity. One of the most outspoken and virulent campaigners against the ongoing environmental racism perpetrated through the dump, Sajida Khan, discovered she has cancer in 1996. She has also lost her nephew to leukaemia. Ms Khan and other members of the community blame the dump for the high incidence of cancer as well as other diseases in their community. The municipality promised to close the dump by 1996, but reneged on this promise.

The landfill will continue to produce methane gas for many years after it is closed, so in theory the

gas project should have no bearing on decisions to close the landfill. In practice, however, the dump will produce 12.5% more methane for “sale” in the carbon market if it continues to run. Although the municipality insists that a phased closure of the dump has already begun, comments by officials and World Bank documents seem to confirm the Indian community’s worst fears: that in addition to producing additional toxic air pollutants, the gas project will also extend the life of the landfill for another 15 to 21 years.

On the other hand, the project brings promise of untold opportunity for Kennedy Road dwellers. The City and the World Bank have promised the community jobs for 50 unskilled workers for the lifespan of the gas project, and bursaries for three youngsters from the settlement to study engineering. The Bank has also promised to pay R6 million worth of carbon credits upfront, so that this can be invested in local sustainable development. The promise of upliftment has spread like wildfire in the Kennedy Road community and grown in the retelling, so that some community expectations run to jobs for all, 50 bursaries and the R6 million being spent exclusively on a library, schools and new housing for the community of Kennedy Road.

eThekwini municipality have yet to present a detailed plan for how the R6 million will be spent and where. However, looking around Kennedy Road, it is easy to see why people would jump at these opportunities. Shacks are rickety and overcrowded; few have electricity and toilets. There are steep and muddy pathways to just four communal water taps on the edge of the settlement. The leader of the Kennedy Road community, S’bu Zikode, has said “The people who want to stop this project are the high-class people, the people who got it all ... If it means that only a few people are going to benefit, it means a lot to us, it means a lot to someone who is unemployed”.

Divisions between the communities have deepened. In the context of frustration and suspicion, impor-

tant questions about long-term sustainable development become easily obscured. Could the needs of all communities be better met through better choices within the project, such as piping the gas into nearby gas pipelines, or bottling of liquid gas to supply the local communities with free cooking gas? Longer term, creative thinking on the part of the City could look to improving the waste management system with organic waste separately collected and processed to facilitate more efficient methane capture, saving landfill space and preventing the stench at landfills. Formal and much more dignified jobs could be created for the Kennedy Road community to recover recyclables from dry waste.

Perhaps the most important question is this - will the projects resulting from the money we earn in this carbon trade be worth both the health of the people around Bisasar Road, and our long term survival? Are we continuing to let industrialised countries off the hook for growing carbon emissions while encouraging our own culture of consumption?



#### REFERENCES

- Department of Minerals and Energy. (n.d.). *The South African DNA Project Approval Process: Sustainable Development Criteria*. Retrieved November 24, 2005 from <http://www.dme.gov.za/cdm>
- eThekwini Municipality. (2005). *Sustainability Best Practice Portfolio 2005/6: Special Edition – Climate Change*.
- Many of the facts in this case study have been drawn from the following articles in Bond, P and Dada, R (Ed.). (2005), *Trouble in the Air: Global Warming and the Privatised Atmosphere*. Durban: Centre for Civil Society, University of KwaZulu-Natal.
- Erion, G. *Low hanging fruit always rots first: South Africa's crony carbon market*. (p 88–131)
- Dada, R. *Bisasar Community Buy-in?*. (p 80–84)
- Reddy, T. *Durban's perfume rods, plastic covers and sweet-smelling toxic dump*. (p 65–76)

## SUSTAINABLE ENERGY IMPACTS THROUGH ECO-HOUSING

*Nomathemba Mblanga*

Kagiso Tau and his family moved into the Moshoeshoe Eco-village in Kimberly in 2002. “This has been a definite improvement in my family’s quality of life,” says Kagiso. “The money we have saved on energy costs has allowed us to buy more new household appliances and better quality furniture.” Moshoeshoe Eco-village is a rent-to-buy housing scheme developed through a partnership between the Swedish International Development Co-operation Agency (SIDA) and the Sol Plaatje Municipality in the Northern Cape Province.

The eco-village boasts passive thermal design features: the buildings are designed with a compact form to minimise the heat gains and losses through the roofs and walls, buildings have ceilings and appropriate roof overhangs to help control the inside temperature, and appropriately sized and placed windows allow for extensive use of natural daylight. These features reduce the need to use energy for heating and lighting. The eco-village also uses only LPGas for cooking on the four-plate stoves provided, and water is heated using solar water heaters.

Kagiso lives with his wife and two sons. Although both he and his wife are teachers, Kagiso is quick to point out that the household is still burdened with a number of debts at the end of each month. Luckily, running out of energy at month-end is not one of their worries.

Kagiso estimates that his household spends less than 2% of their monthly income on energy. He has noticed that the house is warmer in winter and cooler in summer, compared to their previous residence in Galeshewe, and this means less energy is needed for heating and cooling. Kagiso estimates that the use of electricity, supplemented with LPGas and solar power, has resulted in savings for the household of up to R1,750 per year. These savings have allowed the family to invest in other assets for the house.

Kagiso says he and his wife previously hesitated to spend money on furniture and appliances for their rental house.

The rent-to-buy scheme has translated into a feeling of ownership, and the knowledge that the house will belong to them in four years time has led them to want to attain “a certain standard of living”. This has resulted in the family veering away from the use of dirtier fuels such as paraffin and coal. The energy savings also reduce reliance on these fuels, improving the air quality and household safety and conditions.

An energy study conducted in Kimberley compared energy use between low-income electrified households in Galeshewe and the Moshoeshoe Eco-village. Findings indicated that energy consumption between the two housing types was similar (approximately 400KWh per month). However the energy services and costs to each household were different. The use of cleaner fuels in Moshoeshoe households – LPGas, electricity, and solar heating – mean that air quality is far better here, reducing respiratory illness and damage to household furniture. “Free” solar water heating means that energy can be used elsewhere, such as on appliances. LPGas is an efficient fuel for cooking, allowing more cooking to take place per unit of energy than paraffin. The study indicated that alternative energy sources (such as those found within the eco-village) can be used to meet a suppressed energy demand attributed to poverty, without actually increasing total energy consumption.

Awareness gained through living in the eco-village has resulted in greater household energy efficiency. Kagiso says his family always makes sure that when boiling water they only pour the amount they need into the kettle to save energy. They only use CFL lights in the bedrooms, however, due to their chandelier and “fancy lights” in the other rooms, conventional bulbs are used in the rest of the house. Kagiso is hesitant about replacing these lights as he states it is “necessary to trend set with appliances” now that they have moved into a more upmarket residential area.