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Greenhouse Gas Emission Baselines and Reduction Potentials from Buildings in South Africa

A Discussion Document

United Nations Environment Programme

Sustainable United Nations

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development through partnership

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Note: The opinions expressed in this report are those of the author and do not necessarily reflect the opinions of those who were consulted or their organizations.

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Chapter 1

Key Outcomes: Summary for Decision-makers

Key Outcomes: Summary for Decision-Makers

The Intergovernmental Panel on Climate Change (IPCC) has highlighted the important role of buildings in climate change and stated in its fourth assessment report that the building sector not only have the largest potential for significantly reducing greenhouse gas emissions but also that this potential is relatively independent of the cost per ton of CO_2-eq achieved.

However, despite the obvious need and opportunities for reducing energy consumption in buildings, the potential remains largely untapped in most countries, and the UNEP Sustainable Building and Construction Initiative (SBCI) notes that the barriers to energy-efficient buildings will not be removed unless Governments take action. UNEP SBCI released in September 2007 a global review of lessons learned from the use of existing policy instruments in more than 50 countries around the world and this report concludes that many policy instruments are not only effective in achieving emission reductions but they also result in net savings to society.

The important role of buildings and climate change has been highlighted at several side events at the UNFCCC COP 14 in Bali in December 2007 and in Poznán in December 2008 under the theme "Construction Counts for Climate", and the important role of buildings in climate change is likely to receive increasing prominence in the renegotiation of the Kyoto Protocol.

In support of highlighting the important role of buildings in climate change, UNEP SBCI has begun a series of country specific reports on "Greenhouse Gas Emission Reduction Potentials from Buildings" of which this South African report has been undertaken in collaboration with the Construction Industry Development Board (cidb). This report aims to provide:

- a summary quantification of the influence of buildings on climate change in South Africa;
- base-line average emissions and relevant performance from selected building types;
- priorities for policy makers;
- opportunities for business;
- priorities for building design and construction;
- knowledge gaps, needs for research and development; and
- post 2012, how global emissions protocols could help.

The report concludes that the operation of non-residential and residential building sectors account for around 23% of total emissions. Of this, non-residential sector accounts for around 10% of total emissions and the urban and rural high-medium income residential sectors account for around 8%. In addition, it is estimated that the manufacture of building materials accounts for around 5% of total emissions.

Based on historical trends and anticipated government investment programmes, it is likely that investment in residential and non-residential buildings will grow on average at around 2% per year between 2008 and 2050 which would result in the total building stock doubling by 2050. If CO_2 emissions were unchecked, this would result in a twofold increase in emissions!

Estimates using current technologies suggest that energy efficiencies of around 40% to 50% could be obtained in new buildings in the commercial sector and around 30% to 40% in the residential sector, which can be impacted on through a range of policy instruments. Notwithstanding this, a major hurdle is the ability to effect energy changes in existing buildings and scenarios currently being used in South Africa suggest that overall reductions in energy use that could be achieved from existing buildings would only amount to around 10%. Under this scenario, it is estimated that existing buildings would still account for around 50% of annual emissions from this sector by 2050.

The commercial and the high-medium income residential sectors, together with the materials manufacturing sector, are therefore clearly sectors that require specific focus in terms of energy efficiency and reduction of greenhouse gas emissions.

The report then investigates the policy initiatives in South Africa furthering energy efficiency and reduction of greenhouse gas emissions, and it is noted that South Africa has a relatively well-developed climate change, energy-efficiency policy and legislative framework in place that will impact on the building sector, albeit that some of this is being driven by short-term energy management requirements. Importantly, the need for action to address climate change and energy efficiency is well recognised in the public and corporate sectors, and there are many examples at national, provincial and local level where the public sector is beginning to demonstrate leadership.

However, the challenge remains translating intent into action.

The report then concludes with high-level recommendations for furthering energy efficiency and reducing greenhouse gas emissions in the building sector, namely:

- Prioritising the building sector: A clear statement on the recognition of the importance of the building sector in terms of opportunities for energy efficiency and emission reduction potential is required.

- A national focus on the building sector: A need exists for a national public/private coordinating partnership for climate change in the building sector.

- Translating intent into action: Accelerated and focused attention needs to be given to translating existing policy into regulation and translating intent into action. Specifically, SANS 204 needs to be made mandatory and several of the initiatives identified in the national Energy Efficiency Strategy need to be developed and implemented (including labelling schemes, energy reporting and auditing) as soon as possible.

- Focusing on retrofitting: An increasing focus on retrofitting of public and private sector buildings is required.

- Leadership by example: Government needs to lead by example by setting best practice standards for new government buildings and (within resource constraints) by enhancing the government programme for retrofitting existing buildings. In addition, government needs to promote those best in class buildings as demonstration projects.

- Economic Instruments: The DEAT/NT process which will lead to National Budget interventions which support sustainable development should take cognisance of the building sector.

Chapter 2

Background and Scope of the Report

Background and Scope of Report

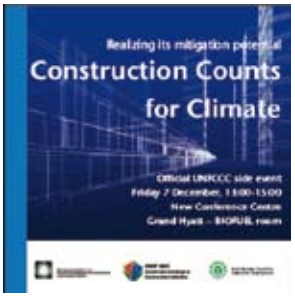
2.1 THE KYOTO PROTOCOL AND THE BUILDING AND CONSTRUCTION SECTOR

An internationally held view is that buildings are responsible for more than one third of total energy use and associated greenhouse gas emissions in society, both in developed and developing countries[1]. Energy is mainly consumed during the use stage of buildings for heating, cooling, ventilation, lighting, appliances, etc. A smaller percentage, normally 10% to 20%, of the energy consumed is used for materials manufacturing, construction and demolition.

The Intergovernmental Panel on Climate Change (IPCC) highlighted this important role of buildings in climate change and stated in its Fourth Assessment Report[2] that the building sector not only have the largest potential for significantly reducing greenhouse gas emissions but also that this potential is relatively independent of the cost per ton of CO_2-eq achieved. This is partly due to the fact that most measures aimed at greenhouse gas emission reduction from buildings also result in reduced life-cycle costs which over time off-sets increased investment costs.

However, despite the need and opportunities for reducing energy consumption in buildings, the potential remains largely untapped in most countries.

The UNEP Sustainable Building and Construction Initiative (SBCI) notes that the barriers to energy-efficient buildings will not be removed unless governments take action and some governments have already started to address this issue. UNEP SBCI released in September 2007 a global review of lessons learned from the use of existing policy instruments in more than 50 countries around the world. The report concludes that many policy instruments are not only effective in achieving emission reductions but they also result in net savings to society.



The important role of buildings and climate change has been highlighted at several side events at the UNFCCC COP 14 in Bali in December 2007 and in Poznán in December 2008 under the theme "Construction Counts for Climate" by the The Marrakech Task Force on Sustainable Buildings and Construction (MTF-SBC)/Finland, The Sustainable Buildings and Construction Initiative (SBCI)/UNEP, and the World Building Council for Sustainable Development (WBCSD).

The important role of buildings in climate change is likely to receive increasing prominence in the renegotiation of the Kyoto Protocol.

1 After UNEP SBCI (2008). http://www.unepsbci.org/aboutSBCI/Background/

2 IPCC (2007). Climate Change 2007, 4th Assessment Report. Intergovernmental Panel on Climate Change. http://www.ipcc.ch/

2.2 SCOPE OF REPORT

UNEP SBCI has begun a series of country specific reports on "Greenhouse Gas Emission Reduction Potentials from Buildings" of which this is the South African report that has been undertaken in collaboration with the Construction Industry Development Board (cidb). This report aims to provide:

- a summary quantification of the influence of buildings on climate change in South Africa;
- base-line average emissions and relevant performance from selected building types;
- priorities for policy makers;
- opportunities for business;
- priorities for building design and construction;
- knowledge gaps, needs for research and development; and
- post 2012, how global emissions protocols could help.

The report draws extensively on published information in South Africa and in particular the following:

- South Africa's *Long Term Mitigation Scenarios* (LTMS)[3];
- various technical reports from the Energy Research Centre (ERC)[4],[5];
- published information on energy use in South Africa from the Department of Minerals and Energy (DME) and Eskom; and
- *State of Energy in South African Cities 2006; Setting a Baseline*[6].

In addition, input has been obtained from the Department of Minerals and Energy and the Department of Environment and Tourism, and their support is acknowledged.

3 Scenario Building Team (2007). Long Term Mitigation Scenarios: Technical Summary. Department of Environment Affairs and Tourism, Pretoria, October 2007. http://www.erc.uct.ac.za/Research/LTMS/LTMS-intro.htm

4 ERC. Long Term Mitigation Scenarios. Energy Research Centre, University of Cape Town. http://www.erc.uct.ac.za/Research/LTMS/LTMS-intro.htm

5 Winkler, H (ed) (2006). Energy Policies for Sustainable Development in South Africa; Options for the Future. Energy Research Centre, University of Cape Town. April 2006.

6 SEA (2006). State of Energy in South African Cities 2006; Setting a Baseline. Published by Sustainable Energy Africa, 2006. http://www.sustainable.org.za

Chapter 3

Context

Context

3.1 OVERVIEW

By UN classification, South Africa is a middle-income country with an abundant supply of resources, well-developed financial, legal, communications, energy and transport sectors, a stock exchange that ranks among the top twenty in the world, and a modern infrastructure supporting an efficient distribution of goods to major urban centres throughout the entire region. South Africa is ranked 20th in the world in terms of GDP (PPP) as of 2007.

Advanced development is significantly localised around four areas namely Johannesburg/Pretoria, Cape Town, Durban and Port Elizabeth. Beyond these four economic centres, development is marginal and poverty is still prevalent despite government efforts. Consequently the vast majority of South Africans are poor. However, key marginal areas have recently experienced rapid growth.

Statistics

Area: 1 221 037 km^2

Population: 47 900 00 (2008 estimate)

Population Density: 39/km^2

GDP (PPP) (2007 estimate):

- Total: $467.381 billion (25th)
- Per capita: $9 767 (76th)

GDP (2007 estimate):

- Total: $283.071 billion (30th)
- Per capita: $5 915 (68th)

Gini (2000): 57.8 (high)

HDI (2007): 0.674 (medium) (121st)

Source: After Wikipedia

i) Administrative and Social

South Africa is divided into nine fully integrated provinces, which are further subdivided into 52 districts, six metropolitan and 46 district municipalities. The 46 district municipalities are further subdivided into 231 local municipalities. The six metropolitan municipalities perform the functions of both district and local municipalities.

Administrative Boundries of South Africa

Even though South Africa has the seventh highest per capita income in Africa, it suffers from large income gaps and a dual economy marking it as a developing country. South Africa has one of the highest rates of income inequality in the world. A

decade of continual economic growth has helped to lower unemployment but daunting economic and social problems remain.

Other problems being experienced in South Africa include crime, increasing corruption, HIV/Aids and significant skills shortages due, in part, to an ongoing "brain drain" of skilled persons.

ii) Economic

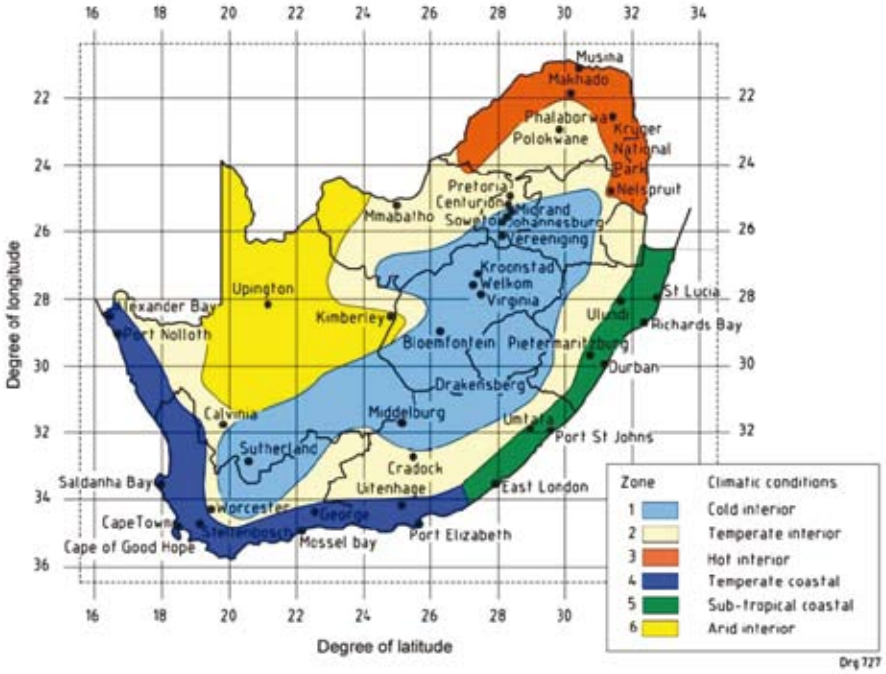
The South African Rand (ZAR) is the most actively traded emerging market currency in the world. However, the volatility of the Rand has affected economic activity; falling sharply during 2001 but it has since recovered and is currently trading at around 10 ZAR to the dollar (December 2008).

Principal international trading partners of South Africa – besides other African countries – include Germany, Japan, Switzerland, the United Kingdom and the United States. Chief exports include corn, diamonds, fruits, gold, metals, minerals, sugar and wool. Machinery and transportation equipment make up more than one-third of the value of the country's imports. Other imports include chemicals, manufactured goods and petroleum.

iii) Climate

South Africa is situated in a subtropical location and the climate is moderated by the ocean on three sides of the country and the altitude of the interior plateau. The interior of the country is characterised by warm temperate conditions, a temperate coastline on the south-west and subtropical coastline on the south-east. The interior of the country is typically cold in winter at night.

Climatic Zones of South Africa



Source: SANS 204

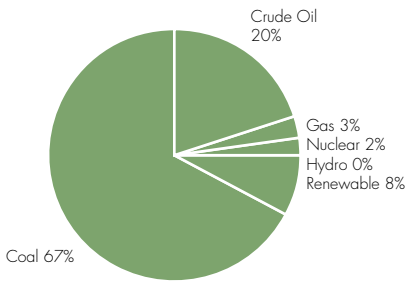
Average Temperature and Rainfall for Johannesburg			
Month	Average Daily Maximum (°C)	Average Daily Minimum (°C)	Average Monthly (mm)
January	26	15	125
February	25	14	90
March	24	13	91
April	21	10	54
May	19	7	13
June	16	4	9
July	17	4	4
August	19	6	6
September	23	9	27
October	24	11	72
November	24	13	117
December	25	14	105

Source: SA Weather Services

iv) Energy

The primary energy source in South Africa is coal which accounted for 67% of primary energy supply in 2006[7]. The major portion of this coal is converted into electricity. The largest producer of electricity in South Africa is the state-owned supplier Eskom, which generates approximately 95% of electricity used in South Africa (and approximately 45% of electricity used in Africa).[8]

Total Primary Energy Supply; 2006 (TJ)		
Source	TJ	%
Coal	3 721 156	67%
Crude Oil	1 115 574	20%
Gas	160 318	3%
Nuclear	109 375	2%
Hydro	9 895	0%
Renewable	430 427	8%
Total	5 546 744	100%



Source: Aggregate Energy Balances 2006, DME

7 South Africa. Department of Minerals and Energy (DME) (2006). Aggregate Energy Balances 2006. Pretoria. http://www.dme.gov.za/energy/documents.stm

8 Eskom (2008). Annual Report 2008. Eskom, Johannesburg. http://financialresults.co.za/eskom_ar2008/ar_2008/index.htm

Eskom; Statistics

- One of the top 13 utilities in the world by generation capacity
- Generates approximately 95% of electricity used in South Africa
- Generates approximately 45% of electricity used in Africa
- Electricity customers: 4 152 312
- Electricity sales: 224 366 GWh
- Nominal capacity: 43 037 MW
- Net maximum capacity: 38 744 MW
- Power lines: 366 203 km (all voltages)
- Carbon dioxide emissions: 224 Mt
- Total water consumption: 322 666 ML

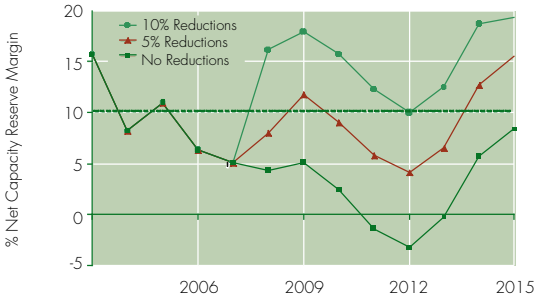
Source: Eskom Annual Report 2008

Source: Eskom
Date: 2008/12/08

A recent phenomenon being experienced is that after unsuccessful attempts by the government to encourage private construction of electricity generation capacity, Eskom started experiencing a lack of capacity in the electrical generating and reticulation infrastructure in 2007. This has led to an inability to meet the routine demands of industry and consumers, resulting in countrywide rolling blackouts. Eskom is negotiating power savings from key consumer groups and is targeting 10% reductions from the manufacturing, mining and commercial sectors.

This lack of generation capacity is likely to last until 2012 when Eskom's new Madupi power station, which is presently under construction, is expected to come on line. As a result of these power shortages, new industrial, mining and even large commercial developments are being prioritised for power connections and are being delayed where Eskom cannot meet the new power requirements.

Eskom Generation Capacity Reserve Margin



Source: Eskom

Indirectly, these power shortages have significantly raised the awareness for energy efficiency in South Africa.

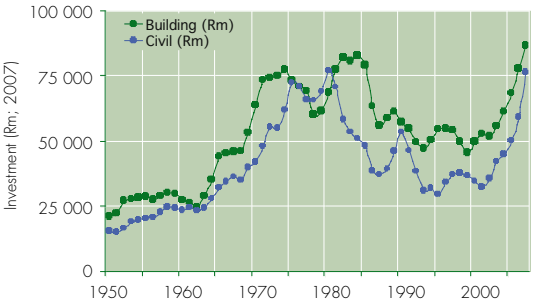
3.2 THE BUILDING SECTOR

i) Economic Activity

An overview of investment in building (residential and non-residential) and civil engineering activity, excluding additions and alterations, is shown in the adjacent figure[9],[10],[11] (in 2007 Rands). Investment in the building and civil engineering sectors in 2007 amounted to about R277 billion p.a. excluding unrecorded additions and alterations. Unrecorded additions and alterations amounted to about another R30 billion.

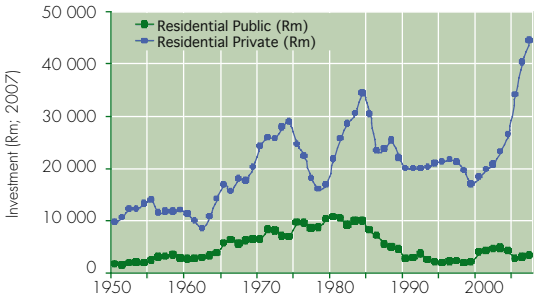
A more detailed breakdown of investment in residential and non-residential buildings is given in the following figures and tables.

Investment in Building and Civil Engineering

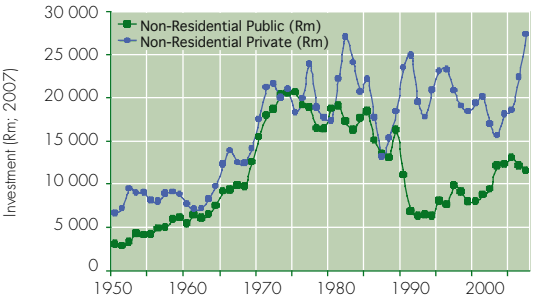


Source: SARB (2007)

Investment in Residential Buildings

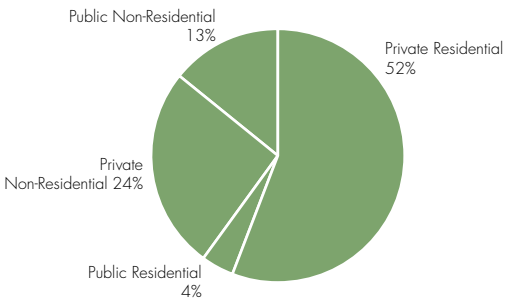


Investment in Non-Residential Buildings



Investment in Building by Sector: 2007

Sector	Rm	%
Private Residential	57 061	51%
Public Residential	12 896	11%
Private Non-Residential	27 403	24%
Public Non-Residential	14 787	13%
Total	112 148	100%



9 After BMI-BRSCU. BMI- Building Research Strategy Consulting Unit (PTY) Ltd. http://www.bmi-brscu.co.za

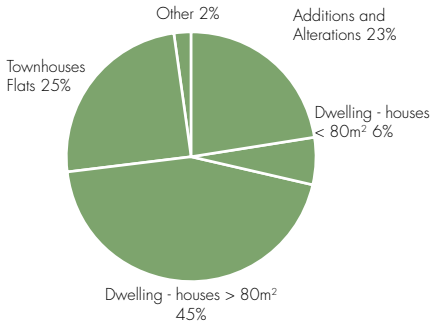
10 SARB (2007). Quarterly Bulletin, December 2007. South African Reserve Bank, Pretoria. http://www.reservebank.co.za

11 cidb (2007). The Building and Construction Materials Sector, Challenges and Opportunities. Construction Industry Development Board, Pretoria. http://www.cidb.org.za

The private sector is the largest investor in the residential and non-residential sectors and a breakdown of investment in the residential sector in 2007 is shown below. Around 45% of investment by value is in residential units greater than 80m² (middle- and upper-income housing) and around 30% of investment in multi-unit townhouse and flats.

Investment in Private Residential by Segment: 2007

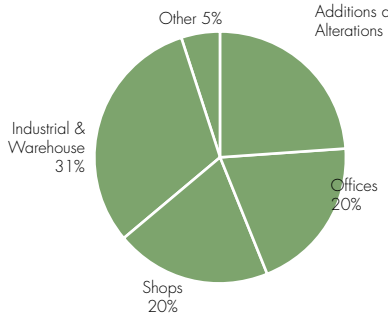
Segment	Rm	%
Dwelling-houses < 80m²	4 232	7%
Dwelling-houses > 80m²	24 585	43%
Townhouses and Flats	14 265	25%
Other (Incl. Hotels and Casinos)	914	2%
Additions and Alterations	13 065	23%
Total	57 061	100%



Private sector investment in non-residential buildings amounts to about 33% in industrial and warehouse buildings, about 22% in shops (retail) and 20% in offices.

Investment in Private Non-Residential by Segment: 2007

Segment	Rm	%
Offices	6 920	20%
Shops	6 918	20%
Industrial and Warehouse	10 800	31%
Other	1 921	5%
Additions and Alterations	8 391	24%
Total	34 951	100%



ii) Residential Building Stock

The dominant form of residential housing in South Africa is illustrated in the following figures and includes:

- middle- and upper-income free-standing single- or double-storey housing units, typically constructed from clay or cement bricks with cement tile roofs;
- middle-income higher-density single- or double-storey townhouses, typically constructed from clay or cement bricks with cement tile roofs;
- low- and middle-income multi-storey units (flats), typically reinforced concrete with clay or masonry brick infill;
- low-income single-storey housing units (typically less than 80m²), typically constructed from clay or

cement bricks with corrugated iron roofs (and without ceilings);

- informal housing units, typically corrugated iron with limited or no services; and
- rural and traditional housing, often constructed from earth and with limited or no services.

Residential Housing in South Africa

Dwelling Units ≥ 80m²

Townhouses

Flats

Dwelling Units < 80m²

Informal Dwelling Units

Rural/Traditional Housing

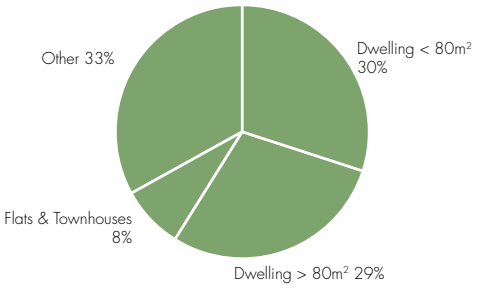
The total residential building stock in South Africa amounted to about 12.5 million units in 2006 of which about 8.5 million are formal units and about 4 million units are backyard properties, informal and squatter units, and traditional housing[12]. The most prevalent type of dwelling unit is a house or brick structure on a separate stand or yard, which reflects an historic preference of homeowners for this type of unit. There has, however, been a trend away from this preference over recent years as homeowners have increasingly appreciated the benefits of living in flats, townhouses and cluster units.

12 After BMI-BRSCU. BMI- Building Research Strategy Consulting Unit (PTY) Ltd. http://www.bmi-brscu.co.za

Total Residential Building Stock (2006)

Segment	Number (millions)	%
Dwelling-house < 80m²	3.8	30%
Dwelling-house => 80m²	3.6	29%
Flats and townhouses	1.0	8%
Other [1]	4.1	33%
Total	12.5	100%

Note: 1: Includes backyard properties, informal and squatter units, and traditional/rural housing

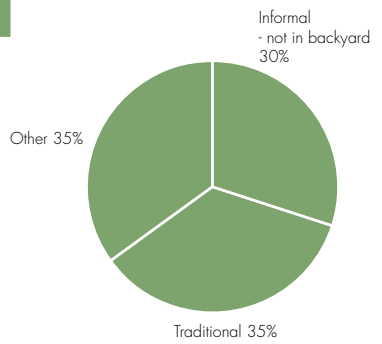


Source: BMI-BRSCU, StatsSA 2008

A breakdown of the non-traditional residential building stock in 2001 (the most recent available) is given below, from which it can be seen that about 30% of the residential housing stock is informal dwellings and shacks in largely squatter settlements and a further 10% informal dwellings and shacks in backyards. This sector is the focus of the government's housing programme.

Informal/Non-Traditional Residential Building Stock (2001)

Segment	Number (millions)	%
House/flat/room in backyard	0.4	9%
Room/flatlet not in backyard but on shared property	0.1	3%
Informal dwelling/shack in backyard	0.5	10%
Informal dwelling/shack not in backyard	1.4	30%
Traditional dwelling/hut/structure made of traditional materials	1.7	36%
Caravan or tent	0.03	1%
Private ship/boat	0.004	0%
Not applicable (collective living quarters)	0.6	12%
Total	4.6	100%



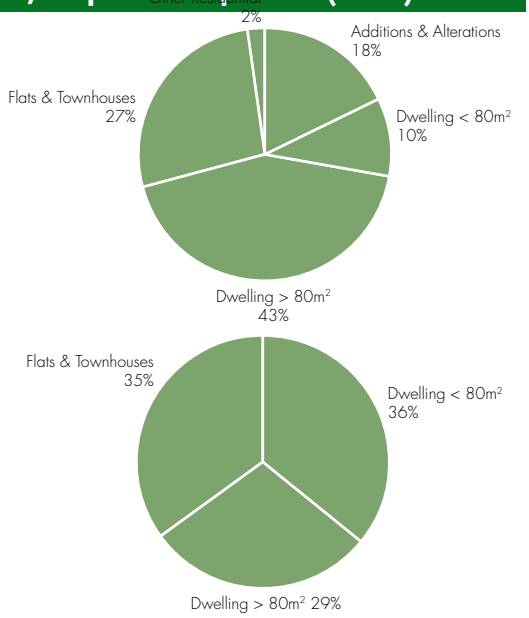
Source: StatsSA (2001)

A breakdown in the current trend in delivery of residential buildings is given below, in which the proportion of formal dwelling units, as derived from building plans completed for the major municipalities in 2007, is shown. The current delivery confirms the trend towards higher density units with flats and townhouses accounting for about 27% of new floor space or about 29% of the number of units being built. Low-income housing (less than 80m²) accounts for about 43% of the floor space or about 36% of the number of units being delivered.

Residential Buildings, Plans Completed; Major Municipalities (2007)

Segment	m² %
Dwelling-house < 80m²	10%
Dwelling-house => 80m²	44%
Flats and Townhouses	27%
Other Buildings	2%
Additions and Alterations	18%
Total	100%

Segment	Number %
Dwelling-house < 80m²	36%
Dwelling-house => 80m²	29%
Flats and Townhouses	35%
Total	100%



Source: StatsSA 2008

A detailed breakdown of housing delivery in different residential market segments for 2006 is given in the following table.

Housing Stock by Market Segment

Household Income pm (R)	Average Size (m²)	Cost (R/m²)	Ave. house price (incl. land) (Rk)	Type	Units	Rm
1 – 499	25.12	845	30 – 35	Lower-Lower	19 298	410
500 – 799	26.7	943	35 – 40	Lower-Lower	41 195	1 037
800 – 1 499	29.24	1 029	40 – 50	Medium-Lower	77 751	2 340
1 500 – 1 999	31.79	1 403	50 – 70	Medium-Lower	32 473	1 448
2 000 – 2 499	43.21	1 459	70 – 90	Upper-Lower	25 608	1 614
2 500 – 3 499	59.83	1 547	90 – 110	Upper-Lower	33 030	3 057
3 500 – 5 999	81.55	1 662	110 – 180	Lower-Middle	18 988	2 574
6 000 – 8 999	125.28	1 622	180 – 300	Middle-Middle	13 335	2 709
9 000 – 10 999	154.51	1 591	300 – 350	Upper-Middle	6 668	1 639
11 000 +	223.18	3 855	350 +	Lower-Middle-Upper-Luxury	16 379	14 092
Total					284 726	30 922

Source: BMI-BRSCU

iii) Non-Residential Building Stock

Information on the non-residential building sector stock is very difficult to obtain and reference has to be made to a wide variety of sources.

The South African Property Owners Association (SAPOA) Office Vacancy Survey provides an estimate of office space available in South Africa by province which has been adjusted (upwards) by the BMI-BRSCU. It is estimated that in 2006 there was some 13 million m^2, the bulk of the space is A-Grade accommodation. 64% of the space is in Johannesburg and Environs. The Shopping Centre Directory currently lists 325 centres larger than 10 000m^2 in the current issue. In addition (in 2006), it was estimated that close to 400 000m^2 of new space was planned or under construction.

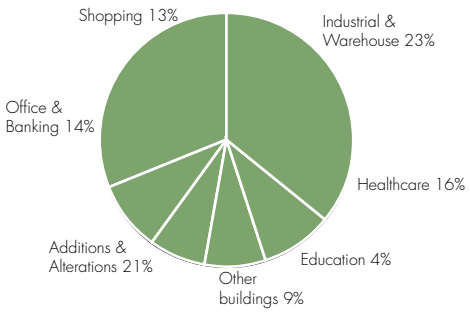
Companies are the largest owners (46%) followed by Institutions (such as Liberty, Old Mutual, Sanlam) (24%) and Property Fund and Trusts (19%). Private individuals own some 6% of the Shopping Centres listed.

There is a dearth of information on the industrial and warehousing sector. The information on Building Plans Passed (BPP) and Buildings Completed (BC) provides an indication that industrial and warehousing space has been constructed over the last 12 years at more than shopping or office space. Accordingly it is estimated that industrial and warehouse space in South Africa amounts to about 21.6 million m^2.

Information on the stock of public buildings is difficult to obtain and estimates of public buildings has been obtained from the Department of Public Works (DPW) and the LTMS Technical Appendix[13]. The following table provides a summary of non-residential building stock by segment.

Total Non-Residential Building Stock (2006)

Segment	m^2 * 1 000	%
Office and Banking	13 028	14%
Shopping	12 066	13%
Industrial and Warehouse	21 624	23%
Healthcare	15 300	16%
Education	3 600	4%
Other Buildings	8 478	9%
Additions and Alterations	19 294	21%
Total	93 390	100%



Source: BMI-BRSCU

iv) Beyond 2012

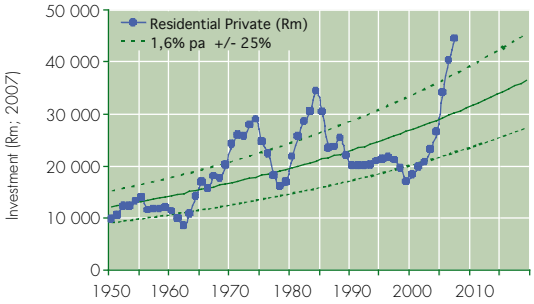
South Africa is currently experiencing a significant increase in infrastructure investment, driven by both public and private sector investment, the likes of which have not been experienced since the 1960s

13 Energy Research Centre (2007). Long Term Mitigation Scenarios: Technical Appendix, Department of Environment Affairs and Tourism, Pretoria, October 2007. http://www.erc.uct.ac.za/Research/LTMS/LTMS-intro.htm

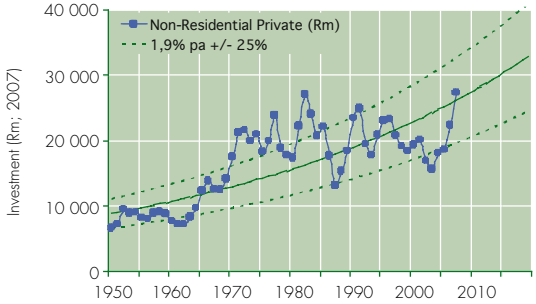
and 1970s. Forecasts for the future are important for the industry but become increasingly difficult for long-term forecasts. Various forecasts have been produced for infrastructure investment into the future in South Africa, one such forecast being that by BMI-BRSCU[14], supported by research by the Medium-term Forecasting Associates.

A more macro-forecast of the future can be seen by considering the long-term growth rate in public and government residential and non-residential investment separately, as shown below. The long-term growth rate for private sector residential investment is around 1.6% p.a. which is closely related to the overall population growth rate. The long-term growth rate for private sector non-residential investment is around 1.9% p.a. The investment cycles around the long-term growth rates are typically around ±25% of the long-term trend.

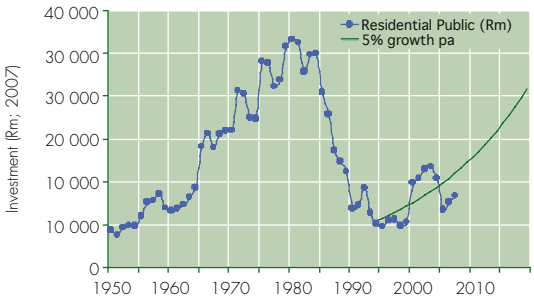
Investment in Private Residential



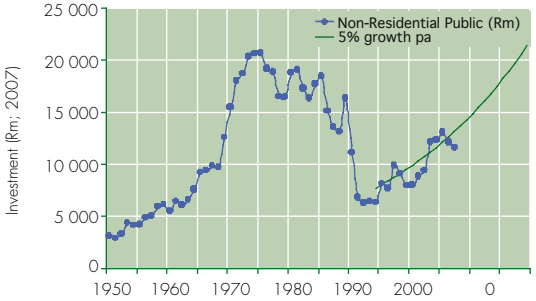
Investment in Private Non-Residential



Investment in Public Residential



Investment in Public Non-Residential



To place this into perspective, a 2% growth per year between 2008 and 2050 would result in the total building stock doubling by 2050. If CO_2 emissions were unchecked, this would result in a twofold increase in emissions!

3.3 Sustainable Development Priorities

The negotiated outcome of the World Summit on Sustainable Development (WSSD) held in September 2002, the Johannesburg Plan of Implementation (JPOI) sets out 37 targets for achieving sustainable

14 BMI-BRSCU (2007). Strategic Research into the Opportunities for Job Creation, New Enterprise Development and Empowerment in the Value System of the Building and Construction Industry. Produced by BMI Building Research Strategy Consulting cc for the Department of Trade and Industry and the Construction Industry Development Board, May 2007. www.cidb.org.za

development inclusive of the Millennium Development Goals. In response to the WSSD, South Africa has developed a *National Framework on Sustainable Development*[15] which sets out South Africa's national vision for sustainable development and specifies strategic interventions in order to re-orientate South Africa's development path in a more sustainable direction.

The Framework notes that "Sustainable development is about enhancing human well-being and quality of life for all time, in particular those most affected by poverty and inequality. Resource use efficiency and intergenerational equity are the core principles."

The Framework sets out South Africa's vision for sustainable development, a set of principles that must guide all decisions and actions taken to achieve the vision and five priority areas for strategic intervention, namely:

- enhancing systems for integrated planning and implementation;
- sustaining ecosystems and using natural resources efficiently;
- economic development via investing in sustainable infrastructure;
- creating sustainable human settlements; and
- responding appropriately to emerging human development, economic and environmental challenges.

Key elements for strategic interventions of particular relevance to this report include:

- Air quality: A multi-pronged strategy is required that should include a national investment in air quality monitoring, a national commitment to decrease oil imports by a certain date, and an acceleration of investments into clean coal technologies, ecologically sustainable biofuels and renewable energy sources.
- Energy efficiency: Given the economic implications and potential risks of reducing oil imports and switching to cleaner and renewable energy sources it is important that strategy development and setting of targets is supported by thorough research and consultation on, for example, the costs and benefits of switching to cleaner technologies, alternative energy sources and the cost of developing sufficient production capacity.
- Economic and fiscal instruments: A process to make an economic case for the environment has already been initiated by DEAT. This includes a joint project with National Treasury to identify specific budgetary considerations to promote sustainable developments as was indicated by Minister Manuel in the 2008 Budget Speech.
- Public Spending and Procurement: In 2007, the Department of Environmental Affairs and Tourism initiated a joint process with National Treasury which will lead to National Budget interventions which support sustainable development, with a long-term view of making an economic case for the environment. "Green procurement" policies have been adopted and implemented across various institutions in both the public and private sectors.

Since 1994, the South African Government has introduced a suite of regulatory and institutional reforms

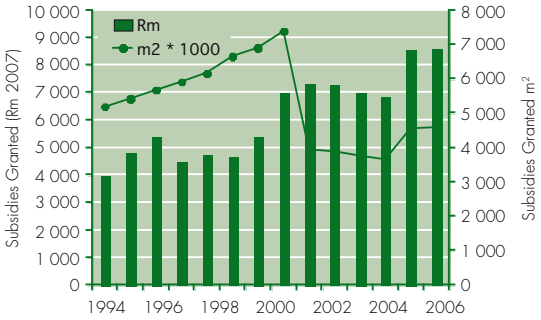
15 South Africa. Department of Environmental Affairs and Tourism (DEAT) (2008). People-Planet-Prosperity: A National Framework for Sustainable Development in South Africa. Pretoria. http://www.environment.gov.za/HotIssues/2008/nfsd/nfsd.html#

to give statutory effect to sustainable development, regulate resource use and support implementation. Specific reforms of specific relevance to the present report are highlighted in the following sections.

i) Sustainable Human Settlements

The Comprehensive Plan for the development of sustainable human settlements provides strategic and programmatic shift from housing to sustainable human settlements. The Department of Housing (DoH) has introduced an inclusionary housing framework to accelerate housing delivery and address backlogs which aims to create sustainable settlements. It includes a social contract known as "Breaking New Ground (BNG)" that involves collaboration between the department and its partners in the housing sector value chain. One of the commitments in BNG specifically commits government and its housing sector partners to achieving MDG goals in respect of housing and sustainable settlements.

Housing Subsidy Grants



Source: BMI-BRSCU

An integral component of addressing the housing backlogs in South Africa is a Housing Subsidy grant by Government to qualifying beneficiaries for housing purposes[16]. The grant is not paid in cash to beneficiaries. The grant is either paid to a seller or a house, or in new developments, the grant is used to construct a house that comply with the minimum technical and environmental norms and standards which is then transferred to the qualifying beneficiary. The current maximum value of the subsidy is R43 506 and the houses which are currently being constructed are typically two bedroom, 40m^2 units[17].

An overview of subsidy grants from 1994 to 2007 is given in the previous figure[18].

A useful overview of South Africa's housing policy and sustainable human settlements can be found in the report *Sustainability Analysis of Human Settlements in South Africa*, undertaken by CSIR Boutek for the national Department of Housing in 2002[19], as part of the Department's international commitments under Agenda 21 and the Habitat Agenda.

16 South Africa. Department of Housing (DoH) (2008). Breaking New Ground in Housing Delivery. Pretoria. http://www.housing.gov.za

17 South Africa. Department of Housing (DoH) (2008). Breaking New Ground in Housing Delivery. Pretoria. http://www.housing.gov.za

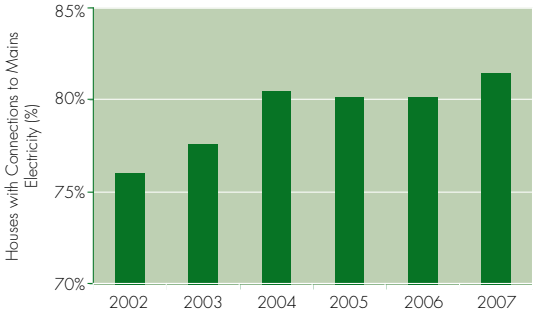
18 After BMI-BRSCU. BMI- Building Research Strategy Consulting Unit (PTY) Ltd. http://www.bmi-brscu.co.za

19 CSIR (2002). Sustainability Analysis of Human Settlements in South Africa. Prepared for the Department of Housing by CSIR Building and Construction Technology. http://www.sustainablesettlement.co.za/docs/sus_analysis.html

ii) Free Basic Electricity

At the time of the democratic elections in 1994, large parts of the urban and rural poor and low-income population did not have access to electricity and it is the government's intention to achieve universal household access to basic electricity. In response, the Integrated National Electrification Programme (INEP) is aimed at improving the socio-economic conditions of households and communities[20]. In April 2002, the Department of Minerals and Energy (DME) took over responsibility for funding the INEP from Eskom.

Houses with Connections to Mains Electricity



Source: P0318: General Household Survey 2007, StatsSA

In support of the INEP, the National Electricity Basic Services Support Tariff Policy [PDF] was gazetted in July 2003. The policy aims to bring relief, through government intervention, to low-income households and to ensure optimal socioeconomic benefits from the INEP. Qualifying customers are eligible for 50 kWh of free electricity a month. By providing this basic service, the government hopes to offer social relief to those who earn less than the national minimum wage levels. Although users have access to a basic quantity of 50 KWh per household per month in terms of the policy, users will pay the normal tariff for any consumption exceeding 50 KWh per month.

Recognising that the Free Basic Electricity (FBE) suffers in most areas because of limited grid availability, the government has also introduced the Free Basic Alternative Energy policy.

While national government is responsible for policy and guidelines in respect of Free Basic Electricity, local government is responsible for implementation of the FBE with the aid of guidelines from national government.

20 South Africa. Department of Minerals and Energy (DME) (2008). Integrated National Electrification Programme. Pretoria. http://www.dme.gov.za/energy/elect_inep.stm

Chapter 4

Base-line: The Building Sector's Contribution to National Greenhouse Gas Emissions

Base-Line: The Building Sector's Contribution to National Greenhouse Gas Emissions

4.1 ENERGY USE IN THE BUILDING SECTOR

Statistics of energy use in South Africa are limited and often contradictory. Specifically, the final energy consumption according to fuel use obtained from the Aggregate Energy Balances for South Africa in 2006[21] is given in the following table.

Energy Consumption per Sector by Fuel Type (TJ)

Sector	Electricity	Renewable and Waste	Coal	Petroleum Products	Gas	Total
Commercial	103 798		76 302	30 287	864	211 251
Residential	142 815	190 400	152 604	38 867		524 686
Transport	12 527			714 069		726 596
Manufacturing	306 459		446 682	15 470	101 920	870 531
Mining	113 412		53 282	32 388	2 900	201 982
Other	97 649		861	82 825		181 335
Total	776 661	190 400	729 730	913 905	105 685	2 716 381

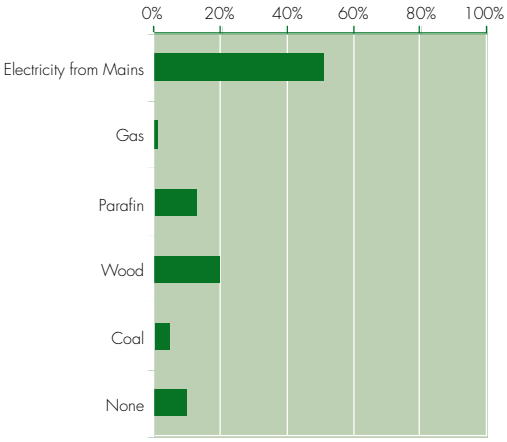
Source: Aggregate Energy Balances 2006, DME

The high use of coal and renewables given above for the residential sector in particular is, however, not collaborated by other sources. In particular, the *General Household Survey* for 2007[22] is shown below. Specifically, it is seen that 58% of all households use electricity from mains for heating, 18% use wood and only 4% use coal. Similarly, 66% of all households use electricity from mains for cooking, 14% use wood and only 2% use coal.

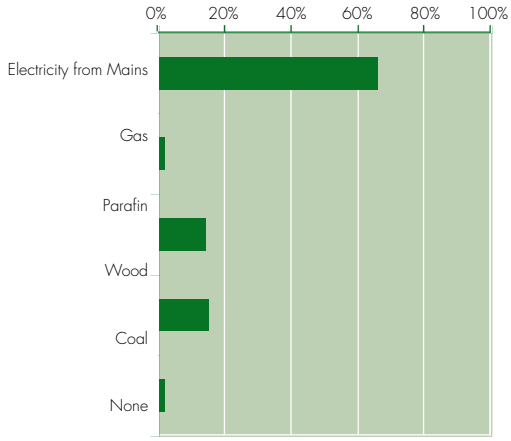
21 South Africa. Department of Minerals and Energy (DME) (2006). Aggregate Energy Balances for South Africa, 2006. Pretoria. http://www.dme.gov.za/energy/documents.stm

22 StatsSA (2007). General Household Survey 2007, P0318. Statistics South Africa. http://www.statssa.gov.za/publications/statsdownload.asp?PPN=P0318&SCH=4187

Household Energy Sources for Heating



Household Energy Sources for Cooking



Source: P0318: General Household Survey 2007, StatsSA

Furthermore, it should be noted that coal used in the residential environment has low energy conversion efficiencies[23].

The fuel use in the residential sector has therefore been reduced in line with the energy sources for heating and cooking given above, weighted by the household energy consumption patterns given in Section 4.2 to follow.

The use of coal in commercial buildings, which also appears to be contradictory to current practices, has been adjusted in the present study to bring it into line with studies reported by the Energy Research Centre[24] which form the basis of the South Africa's Long Term Mitigation Scenarios (LTMS[25]).

The resulting final energy consumption per sector by fuel type used in the present investigation is given in the following tables.

23 Winkler, H (ed) (2006). Energy Policies for Sustainable Development in South Africa; Options for the Future. Energy Research Centre, University of Cape Town. April 2006.

24 Winkler, H (ed) (2006). Energy Policies for Sustainable Development in South Africa; Options for the Future. Energy Research Centre, University of Cape Town. April 2006.

25 Scenario Building Team 2007. Long Term Mitigation Scenarios: Technical Summary. Department of Environment Affairs and Tourism, Pretoria, October 2007. http://www.erc.uct.ac.za/Research/LTMS/LTMS-intro.htm

Energy Consumption per Sector by Fuel Type (TJ)						
Sector	Electricity	Renewable and Waste	Coal	Petroleum Products	Gas	Total
Commerce	103 798	0	34 599	30 287	864	169 549
Residential	142 815	21 422	2 856	38 867	0	205 960
Transport	12 527	0	0	714 069	0	726 596
Manufacturing	306 459	0	446 682	15 470	101 920	870 531
Mining	113 412	0	53 282	32 388	2 900	201 982
Other	97 649	0	861	82 825	0	181 335
Total	776 661	21 422	538 280	913 905	105 685	2 355 953

Source: After Aggregate Energy Balances 2006, DME (adjusted)

Energy Consumption per Sector by Fuel Type (% per Fuel Type)						
Sector	Electricity	Renewable and Waste	Coal	Petroleum Products	Gas	Total
Commerce	13%	0%	6%	3%	1%	7%
Residential	18%	100%	1%	4%	0%	9%
Transport	2%	0%	0%	78%	0%	31%
Manufacturing	39%	0%	83%	2%	96%	37%
Mining	15%	0%	10%	4%	3%	9%
Other	13%	0%	0%	9%	0%	8%
Total	100%	100%	100%	100%	100%	100%

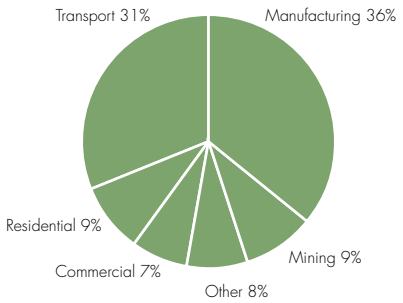
Source: After Aggregate Energy Balances 2006, DME (adjusted)

Energy Consumption per Sector by Fuel Type (% per Sector)						
Sector	Electricity	Renewable and Waste	Coal	Petroleum Products	Gas	Total
Commerce	61%	0%	20%	18%	1%	100%
Residential	69%	10%	1%	19%	0%	100%
Transport	2%	0%	0%	98%	0%	100%
Manufacturing	35%	0%	51%	2%	12%	100%
Mining	56%	0%	26%	16%	1%	100%
Other	54%	0%	0%	46%	0%	100%
Total	33%	1%	23%	39%	4%	100%

Source: After Aggregate Energy Balances 2006, DME (adjusted)

A summary of the overall energy consumption per sector follows below, which shows that the building sector accounts for about 16% of total energy use and about 31% of total electricity use.

Final Energy Consumption; 2006 (TJ)		
Sector	TJ	%
Commerce	169 549	7%
Residential	205 960	9%
Transport	726 596	31%
Manufacturing	870 531	37%
Mining	201 982	9%
Other	181 335	8%
Total	2 355 953	100%



Source: After Aggregate Energy Balances 2006, DME (adjusted)

A comparison between the final energy demand used above and the energy demand used in the preparation of South Africa's Long Term Mitigation Scenarios (LTMS)[26] is shown below, from which it is seen that the present energy consumptions are consistent with those used in the LTMS.

Final Energy Consumption; 2006 (TJ)				
	Present Study		LTMS	
Sector	TJ	%	TJ	%
Commercial	169 549	7%	117 000	5%
Residential	205 960	9%	222 000	9%
Transport	726 596	31%	720 000	29%
Manufacturing	870 531	37%	1 332 000	53%
Mining	201 982	9%		
Other	181 335	8%	124 000	5%
Total	2 355 953	100%	2 515 000	100%

A further comparison is given below, in which the electricity use used in the present study is compared against energy use provide by ESKOM. Noting that ESKOM is not the sole producer of electricity, it is seen that there is reasonable consistently between the present study and the ESKOM statistics.

Electricity Consumption; 2006 (TJ)				
	Present Study		ESKOM	
Sector	TJ	%	TJ	%
Commercial	103 798	13%	68 543	10%
Residential	142 815	18%	116 522	17%
Transport	12 527	2%	13 709	2%
Manufacturing	306 459	39%	335 859	49%
Mining	113 412	15%	123 377	18%
Other	97 649	13%	27 417	4%
Total	776 661	100%	685 426	100%

26 Energy Research Centre (2007). Long Term Mitigation Scenarios: Technical Appendix, Department of Environment Affairs and Tourism, Pretoria, October 2007. http://www.erc.uct.ac.za/Research/LTMS/LTMS-intro.htm

4.2 BREAKDOWN OF ENERGY USE IN BUILDINGS

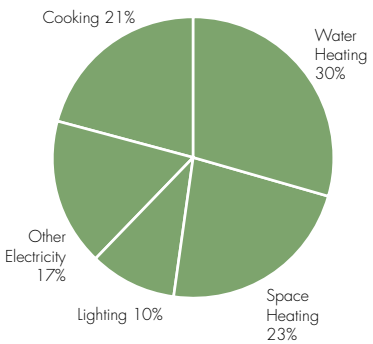
Detailed information on energy use per building type, use, climatic zone and, importantly, age of building is very difficult to obtain in South Africa (as is the case in much of the rest of the world) but some information is available as to the overall energy use.

Energy use in residential buildings is strongly influenced by affordability and access to energy and overall household energy consumption patterns in the residential sector is given below (after Winkler, 2006[27]). The urban and high- and medium-income households account for about 50% of the total number of households but account for about 75% of energy consumption and about 90% of electrical energy. Low-income households account for about 50% of households but only about 25% of total energy consumption and 10% of electricity. Although the low-income electricity use will increase due to South Africa's electrification programme and the free basic energy policy, the pattern is not likely to change significantly because of affordability conditions.

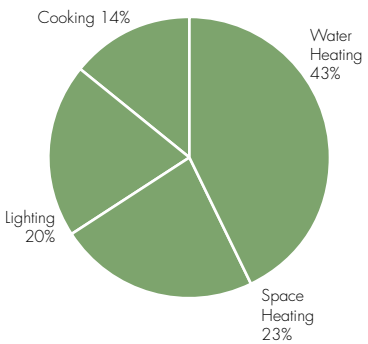
Household Energy Consumption Patterns (2001)

	Urban High-Med Income; Electrified	Urban Low Income; Electrified	Urban Low Income; non-Electrified	Rural High-Med Income; Electrified	Rural Low Income; Electrified	Rural Low Income; non-Electrified
	UHE	ULE	ULN	RHE	RLE	RLN
Energy Consumption GJ/HH p.a.	18.6	8.2	3.4	11.2	2.9	5.2
Electricity Consumption GJ/HH p.a.	18.7	7.1		9.9	1.9	
In KWh	433	164		229	43	
Number of HH %	36%	11%	12%	11%	10%	20%
Energy Consumption % of Total	64%	9%	4%	11%	3%	10%
Electricity Consumption % of Total	77%	9%		12%	2%	
Energy Consumption Ratio	1.00	0.44	0.18	0.60	0.16	0.28
Electricity Consumption Ratio	1.00	0.38		0.53	0.10	

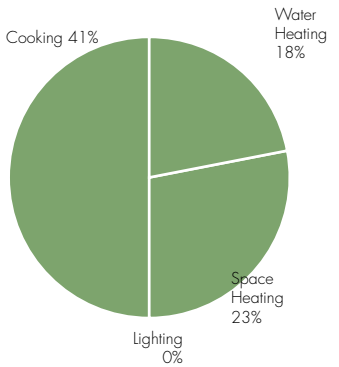
Urban High-Medium Income; Electrified



Urban Low Income; Electrified

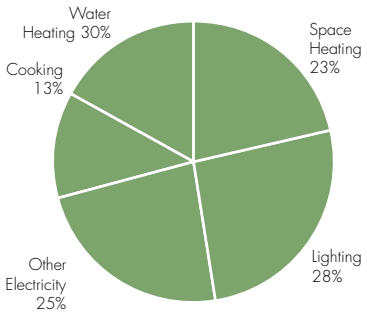


Urban Low Income; non-Electrified

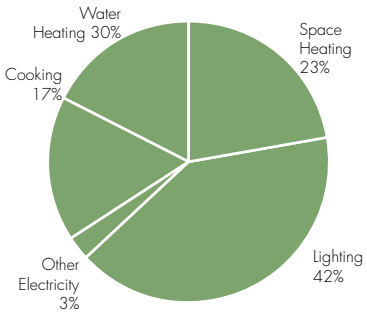


27 Winkler (2006). Energy Policies for Sustainable Development in South Africa's Residential and Electricity Sectors; Implications for Mitigating Climate Change. Thesis presented for the Degree of Doctor of Philosophy in the in the Energy Research Centre, University of Cape Town, June 2006. http://www.erc.uct.ac.za/Research/publications/06Winkler PhD.pdf

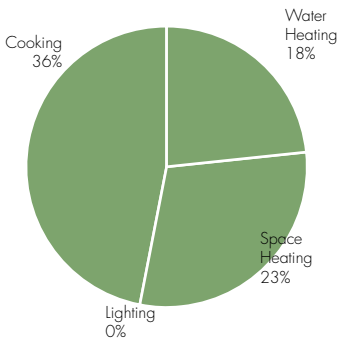
Rural High-Medium Income; Electrified



Rural Low Income; Electrified



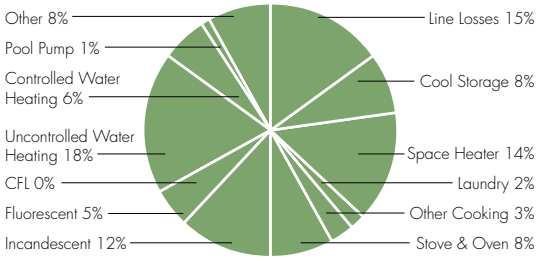
Rural Low Income; non-Electrified



Source: Winkler (2006)

A more detailed breakdown in electricity energy consumption in high- and middle-income residential buildings is given below, together with "target strategies" to reduce consumption.

Electricity Usage (%); Residential Sector (High/Middle Income)	
Line Losses	15%
Cool Storage	8%
Space Heater	14%
Laundry	2%
Other Cooking	3%
Stove and Oven	8%
Incandescent	12%
Fluorescent	5%
CFL	0%
Uncontrolled Water Heating	18%
Controlled Water Heating	6%
Pool Pump	1%
Other	8%



Source: Eskom

Energy consumption in non-residential buildings is strongly influenced by use, design factors and climate. The summary results for total energy use for 20 commercial buildings in Cape Town are shown below. Typically, in commercial buildings, HVAC equipment accounts for around 30% of electricity use and lighting around 35%.

Energy Consumption of 20 Commercial Buildings (Cape Town) (kWh/m² p.a.)	
Upper Quartile	321
Average	289
Lower Quartile	256

Source: After PJCarew Consulting and the Cape Town Partnership

4.3 ENERGY USE AT THE CITY LEVEL

The previous sections have looked at the breakdown in energy use in the residential and commercial sectors. It must, however, also be recognised that the energy use (and hence emissions) also varies from city to city, depending largely on the level of development, industrialisation, spatial layout, etc.

The energy use within cities is reported on in the *State of Energy in South African Cities 2006; Setting a Baseline*[28], in which the energy use in fifteen cities and towns was investigated, including the six big metros, industrial towns, inland, coastal and more rural towns. Collectively, these cities account for about 37% of South Africa's energy consumption and 41% of electricity consumption. The six large metros alone account for about 25% of South Africa's energy consumption as shown below.

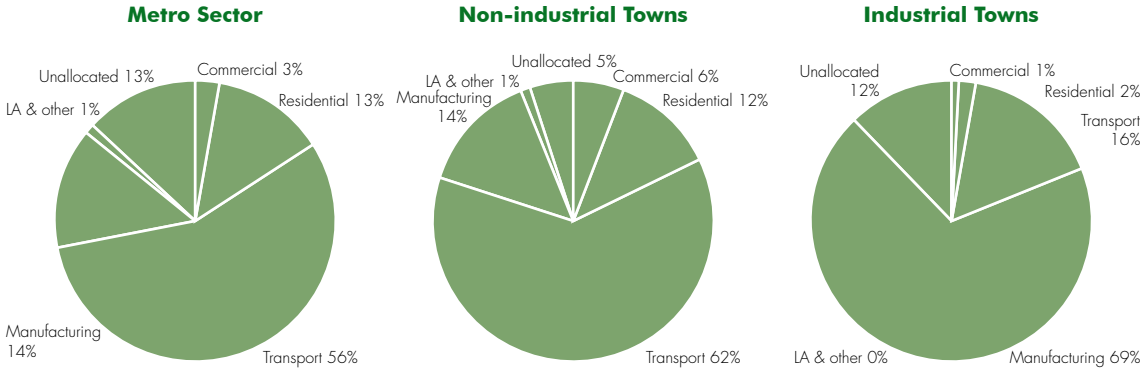
Energy Consumption of Industrial and Other Towns, 2004					
	Population %SA	Energy Consumption		Electricity Consumption	
		Per Capita (GJ)	%SA	Per Capita (kWh)	%SA
Metros	33%	44	25%	3 821	26%
Non-industrial Towns	5%	25	2%	1 888	2%
Industrial Towns	4%	153	11%	16 150	13%

Source: State of Energy in South African Cities 2006

A breakdown of energy use per sector in these cities and towns is given below and of interest is that the report suggests that the commercial sector in the metros and non-industrial towns accounts for only around 3% of the total energy use and residential sector around 20% (including unallocated). This low contribution of the commercial sector to total energy use, however, is not in alignment with that reported on in Section 4.1 of this report.

28 SEA (2006). State of Energy in South African Cities 2006; Setting a Baseline. Published by Sustainable Energy Africa, 2006. http://www.sustainable.org.za

Energy Consumption of Industrial and Other Towns, 2004			
	Metro Sector	Non-industrial Towns	Industrial Towns
Commercial	3%	6%	1%
Residential	13%	12%	2%
Transport	56%	62%	16%
Manufacturing	14%	14%	69%
LA and other	1%	1%	0%
Unallocated (predominately residential)	13%	5%	12%



Source: State of Energy in South African Cities 2006

4.4 CO2 EMISSIONS IN THE BUILDING SECTOR; OPERATIONS

The following emission conversion factors have been used for estimating greenhouse gas emissions per energy source, all of which are derived from the US Energy Information Administration (EIA) Voluntary Reporting of Greenhouse Gases Programme's Emission Coefficients[29] except for electricity which has been derived from Eskom's official statistics[30].

Emission Coefficients; tCO_2/TJ				
Electricity [1]	Renewable and Waste [2]	Coal [2]	Petroleum Products [2]	Gas [2]
278	93	102	74	59

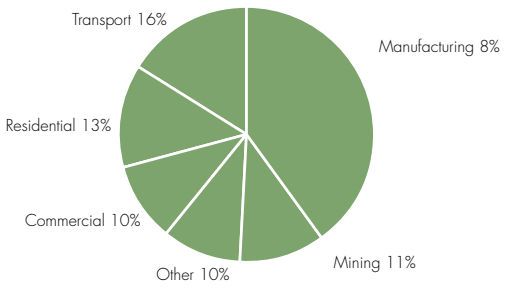
Estimates of the CO_2 emissions per sector are given below based on the final 2006 consumption summarised in Section 4.1, together with summarised information for the building sector. It is seen that operation of the building sector accounts for around 23% of greenhouse gas emissions.

29 EIA. Voluntary Reporting of Greenhouse Gases Programme (Fuel and Energy Source Codes and Emission Coefficients). http://www.eia.doe.gov/oiaf/1605/coefficients.html

30 Eskom (2008). Environmental Implications of Using or Saving One Kilowatthour of Electricity. Eskom Annual Report 2008. http://financialresults.co.za/eskom_ar2008/ar_2008/table_one_kilowatt.htm

CO_2 Emissions per Sector ($mtCO_2$ p.a.; 2006)						
	Elec-tricity	Renewable & Waste	Coal	Petroleum Products	Gas	Total
Commercial	29		4	2	0	35
Residential	40	2	0	3		45
Sub-Total	69	2	4	5	0	80
Transport	3			53		56
Industry	85		46	1	6	138
Mining	32		5	2	0	40
Other	27		0	6		33
Total	216	2	55	68	6	347

CO_2 Emissions per Sector (%; 2006)						
	Elec-tricity	Renewable & Waste	Coal	Petroleum Products	Gas	Total
Commercial	13%		6%	3%	1%	10%
Residential	18%	100%	1%	4%		13%
Sub-Total	32%	100%	7%	8%		23%
Transport	2%			78%		16%
Industry	39%		83%	2%	96%	40%
Mining	15%		10%	4%	3%	11%
Other	13%		0%	9%		10%
Total	100%	100%	100%	100%	100%	100%

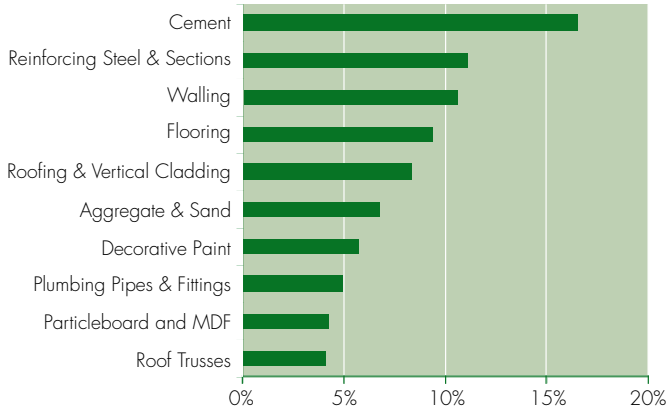


4.5 CO2 EMISSIONS IN THE BUILDING SECTOR; MANUFACTURING OF BUILDING MATERIALS

In addition to the CO_2 emissions involved in the operation of buildings, additional emissions are generated during the manufacture of materials and the construction process.

Estimates of the total market (by value) for major product groups in the building and civil engineering sectors in 2006 are given below. Only the top building products contributing to 80% of the total market is shown.

Major Building Products



Source: BMI-BRSCU

A more detailed breakdown of estimates in the building sector for the main product groups is given below, together with emission factors and estimates of CO_2 emissions per year. It is seen that emissions from the manufacture of the major materials for the building sector amounts to around 18 $mtCO_2$ per year or around 4% of total CO_2 emissions.

CO_2 Emissions for Major Building Products ($mtCO_2$ p.a.)					
	Volume: Building and Civil Engineering	Volume: Building	Unit	Emission Factor tCO_2/t [1]	$mtCO_2$
Cement	14 193 911	9 226 525	Tonnes	1.1	10.1
Reinforcing Steel and Sections	700 000	70 000	Tonnes	1.2	0.1
Roofing and Vertical Cladding					
Roofing	57 451	54 579	m^2*1000	1.2	0.1
Vertical Cladding	32 005	30 405	m^2*1000	1.2	0.0
Walling					
Facebricks	1 157 193	1 099 333	BE*1000	0.9	1.0
Faceblocks	202 073	191 969	BE*1000	0.9	0.2
Stockbricks	2 464 479	2 341 255	BE*1000	0.9	2.1
Stockblocks	4 589 969	4 360 471	BE*1000	0.9	3.9
Total (major building products)					18

Notes: 1) Source: European Commission. 1999. A Green Vitruvius. London: James & James. http://www.sustainablesettlement.co.za/issues/climate.html

Chapter 5

Progress Toward Zero: Strategies and Scenarios

Progress Toward Zero: Strategies and Scenarios

5.1 OVERVIEW

South Africa has a well-developed policy and legislative environment and the impact of these on reducing greenhouse gas emissions in the building sector is examined in the sections to follow.

In assessing the policy and legislative environment on reducing greenhouse gas emissions it must, however, be recognised that there are several interrelated key drivers, namely:

- an overarching climate change strategy, aligned with global concerns about the environmental impact of greenhouse gas emissions arising primarily from fossil fuels;
- a national energy-efficiency strategy which compliments the climate change strategy; and
- a short-term energy shortage, with strong demand-side manage interventions.

An assessment of the impact of the policy and legislative environment on the building sector is discussed in the following sections[31].

International climate change related protocols affecting South Africa	
Kyoto Protocol to the UNFCCC 1997	The Protocol does not commit developing countries like South Africa to any quantified emissions targets in the first commitment period (2008-2012). South Africa ratified in 2002.
United Nations Framework Convention on Climate Change (UNFCCC) 1992	This is an intergovernmental treaty developed to address the problem of climate change and which sets out an agreed framework for dealing with the issue.
Johannesburg Plan of Implementation: World Summit on Sustainable Development 2002	The plan highlights areas of key importance in terms of meeting sustainable development in terms of economic development, social development and environmental protection. The key focus areas put poverty, sustainable development and Africa high on the global agenda.
South African climate change and energy related policies and legislation	
Overarching	
Central Energy Fund Amendment Act 1994	Focuses on management of crude oil and locally produces hydrocarbons. Role is being extended to renewable energy programmes.

31 This section draws on the draft report Review of Climate Change and Resource Consumption Initiatives in the Built Environment within South Africa, undertaken by KPMG for the cidb.

White Paper on Energy Policy for Republic of S.A. 1998	The White Paper sets out the following: • Meeting the basic needs of all people: providing energy for community services such as schools and clinics; increasing electrification of households; improving fuelwood management; making gas and paraffin more affordable; encouraging energy-efficient housing design; reducing health and safety problems related to fuel use. • Promoting economic growth: promoting the availability of low-cost, high-quality energy; implementing energy efficiency. • Promoting a sustainable environment: monitoring and reducing coal power station emissions; increasing the use of renewable energy; actively promoting energy efficiency.
Integrated Energy Plan 2003	Published by the DME, this plan is a framework for taking decisions on energy policy and for the development of different energy sources and energy technologies in the country.
National Energy Regulator Act of 40 of 2004	To establish a single regulator for electricity, piped-gas and petroleum pipeline industries. The National Energy Regulator of South Africa (NERSA) is funded from a levy on all electricity sales. The role of NERSA includes: licensing generators, transmitters and distributors (and facilitating competition in the industry); approving pricing and tariffs; setting minimum standards for quality of supply and service.
National Energy Bill 2004	This Bill aims to provide for the establishment of the National Energy Advisory Committee, National Energy Data Base and Information System; integrated energy planning; renewable energy and energy- efficiency matters; energy safety, health and environmental matters; energy access by households; and international energy obligations.
National Climate Change Response Strategy 2004	This policy document outlines the global and national implications of climate change and clearly indicates the steps or actions to be taken by the government and other players to respond at a national level to the challenges posed by climate change.
Draft national Strategy on Cleaner Production and Sustainable Consumption 2005	The strategy is being prepared by DEAT through the implementation of the Johannesburg Plan of Implementation of recommendations as contained in Chapter 3 on sustainable consumption and production.

National Framework for Sustainable Development 2008	Presents a framework for sustainable development in South Africa that includes a national vision, principles, trends, strategic priority areas and implementation measures. It identifies priority areas for strategic intervention including efficient use of natural resources and creating sustainable human settlements. It identifies key energy related risks and trends and lists appropriate energy and climate change related responses.
Energy Efficiency	
NERSA's Regulatory Policy for Energy-efficiency and Demand side Management 2004	This policy identifies problems of peak generation capacity requirement in the near future and the inefficient end-use of electricity. It also examines the current regulatory mechanisms of implementing energy efficiency and demand-side management (EEDSM) programmes through Eskom.
DME Energy Efficiency Strategy 2005	This strategy provides specific targets for reduction in energy demand by 2014 within given demand sectors, with an overall target of a 12% national reduction in consumption by 2015. The strategy's eight goals include health improvement; job creation; alleviation of energy poverty reductions in pollution and CO_2 emissions; improvement of industrial competitiveness; enhancement of energy security; and the reduction of the need for additional power generation capacity.
Electricity	
Electricity Distribution Industry Restructuring Bill April 2003	Provides for the establishment of a national framework for the restructuring of the distribution industry, the creation of regional electricity distributors (REDs) and the management of the restructured electricity distribution industry.
Electricity Regulation Act 2006	Established a national regulatory framework for the electricity supply industry and makes the National Energy Regulator (NERSA) the custodian and enforcer of the national electricity framework. Regulations for Compulsory Norms and Standards for Reticulation Services have been issued in terms of the Act, with the purpose of maintaining good quality of supply, ensuring stability of the electricity network, minimising electricity load shedding and avoiding blackouts.

Renewable Energy	
White Paper on the Promotion of Renewable Energy 2006	The White Paper addresses four key areas namely, financial instruments; legal instruments; technology development; awareness-raising; capacity building and education. It sets a medium (ten-year) target of 10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels.
Draft Bio-fuels Industrial Strategy 2006	Outlines government's approach to policy, regulation and incentives.
Nuclear Energy	
Nuclear Energy Act 12 of 1999	Provides for the establishment of the South African Nuclear Energy Corporation, a state owned public company.
National Nuclear Regulator Act 47 of 1999	Provides for a National Nuclear Regulator.
Built Environment Related	
Construction Industry development Board Act 38 of 2000	Provides for the establishment of the Construction Industry Development Board, whose objects are, amongst others, to determine and establish best practice that promotes positive safety, health and environmental outcomes. The Act also provides for the establishment of a Best Practice Project Assessment Scheme based on the best practices identified by the Board. All construction contracts above a prescribed tender value will then be subject to an assessment of compliance with best practice standards and guidelines published by the Board.

Source: Adapted from The New Energy Book for Urban Development in South Africa by Sarah Ward, Published by Sustainable Energy Africa, 2008

5.2 CLIMATE CHANGE FRAMEWORK

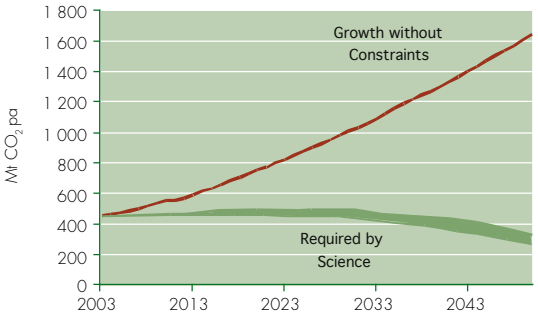
South Africa has ratified the United Nations Framework Convention on Climate Change and its Kyoto Protocol and plays a proactive role in the climate negotiations. Thus far, South Africa has been exempt from taking mandatory action to reduce our high level of relative emissions. In the *United Nations Framework Convention on Climate Change* (UNFCCC) the principle of equity and "common but differentiated responsibility" was agreed, by which the developed nations would take the lead in mitigating greenhouse gases. South Africa has a loose commitment to mitigate under the Convention but no legally binding, quantified target.

In March 2006, the South African Cabinet commissioned a process to examine the potential for mitigation of South Africa's greenhouse gas emissions. The aim was to produce *Long Term Mitigation Scenarios* (LTMS)[32] that would provide a sound scientific analysis from which Cabinet could draw up a long-term climate policy. Such a policy would give South African negotiators under the UNFCCC clear and mandated positions for their negotiations. It would also ensure that South African stakeholders understood and committed to a range of realistic strategies for future climate action.

Two base-line scenarios were developed, namely "Growth without Constraints" and "Required by Science":

i) Growth without Constraints: This scenario models South Africa's economy and greenhouse gas emissions to 2050 (and beyond) if South Africa were to develop without any consideration of greenhouse gas emission. Assumptions about economic growth that underpin this scenario ranged between 3% and 6% GDP growth per year. Current trends in land use, agriculture and waste sectors were assumed to continue. Under this scenario, the overall emissions were projected to rise from 440 mega tonnes of CO_2-eq in 2003 to around 1 600 mt per year by 2050, nearly a four-fold increase!

Long Term Mitigation Scenarios



Source: LTMS

ii) Required by Science: This scenario modelled the ideal case assuming that South Africa had all the resources and technology at its disposal to contribute to the global mitigation effort that is required to stabilise the climate – requiring global reductions of 60% to 80% from the 1990 levels to be achieved by 2100. In the *Required by Science* scenario, the burden taken up by South Africa is not exact but is seen rather as a target band of 30% to 40% from 2003 levels by 2050.

The LTMS then considered various strategic options for moving towards the *Required by Science* scenario consisting of various emission reduction potential "wedges", consisting primarily of:

- energy-efficiency options in the industrial, commercial, residential and transport sectors;
- electricity-generation options including cleaner fuels; and
- economic instruments including CO_2 tax and subsidies for solar water heaters and renewable electricity.

The major emission reduction potentials identified in the LTMS are highlighted below:

32 Scenario Building Team 2007. Long Term Mitigation Scenarios: Technical Summary, Department of Environment Affairs and Tourism, Pretoria, October 2007. http://www.erc.uct.ac.za/Research/LTMS/LTMS-intro.htm

- Energy efficiency: The potential emission reductions in 2050 obtained through energy efficiency in the industrial, commercial, residential and transport sectors is shown in the following table, from which it is seen that the LTMS projects the largest efficiencies in the industrial and transport sectors with only small reductions in the commercial and residential sectors. Total reductions of around 400 $mtCO_2$ p.a. are projected from energy-efficiency solutions.

LTMS Energy-efficiency Potential per Sector		
	$mtCO_2$-eq p.a.	
Sector	2006 emissions [1]	2050 reductions
Industrial	178	240
Commercial	39	15
Residential [2]	76	14
Transport	56	128
• Improved vehicle efficiency		55
• Electric vehicles		24
• Hybrids vehicles		19
• Passenger modal shift		30

Notes:
1. Based on current investigation – Section 4.4
2. Including solar water heaters

The key assumptions adopted in the LTMS in modelling energy efficiency in commercial buildings are summarised below[33]:

LTMS Energy-efficiency Potential in the Commercial Sector	
Existing Buildings	New Buildings
HVAC: Variable speed drives	
• 35% efficiencies on retrofits to one third of existing buildings.	• 42.5% efficiencies on one third of new buildings in 2015.
HVAC: Heat pumps and central air conditioners	
	• Demand is increased 5% between 2008 and 2015 and a further 6% by 2030.
Thermal Design	
	• 40% efficiencies in 50% of new buildings each year and a further 30% savings in 40% of buildings from 2008 onwards.
Efficient Lighting	

33 Hughes A, Haw M, Winkler H, Marquard A and Merven B, (2007). Energy Modelling: A modelling input into the Long Term Mitigation Scenarios process, LTMS Input Report 1, Energy Research Centre, Cape Town, October 2007. http://www.erc.uct.ac.za/Research/LTMS/LTMS-intro.htm

- 40% efficiencies through replacing of magnetic with electronic ballasts in the complete retrofit in 20% of buildings by 2015.
- CFLs replace 3.3% of demand for incandescent lighting in 2015 and 6% of demand for incandescent lighting by 2030.

- 20% efficiencies through replacing of magnetic with electronic ballasts in 50% of new buildings.
- CFLs replace 3.3% of demand for incandescent lighting in 2015 and 6% of demand for incandescent lighting by 2030.
- Improved design reduces demand by 60% in 40% of buildings and 30% in a further 40% of new buildings.

Water Heating

- Solar water heaters and heat pumps meet up to 10% of demand in new buildings in 2015 and 20% of demand in 2030.

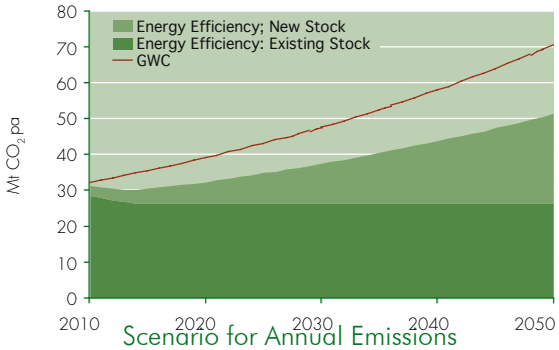
Other Appliances

- 25% of appliance demand can increase 15% in efficiency and a further 25% can achieve a 30% increase in efficiency.

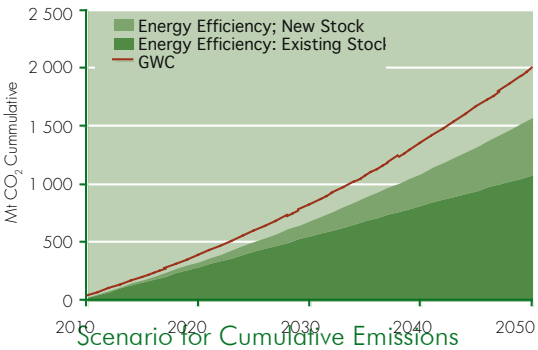
Source: ERC

The importance of retrofitting existing buildings is illustrated in the figure below, in which a scenario is used based on the estimated CO_2 emissions from electricity use for *commercial buildings* obtained in the present study based on a 2% growth rate p.a. (Section 3.2.iv) together with the following simplified assumptions derived from the LTMS study:

- 30% efficiencies in 30% of existing buildings by retrofitting between 2010 and 2015 (i.e. overall efficiencies of 30%•30% = 9%); and
- 40% efficiencies in 100% of new buildings building up to 2020.



Scenario for Annual Emissions



Scenario for Cumulative Emissions

Overall, reductions in emissions of around 27% are obtained by 2050 of which the reductions achieved through retrofitting are not insignificant but which could be noticeable increased if further efficiencies of greater scale of retrofitting could be obtained.

Importantly, however, is that emissions from the commercial sector still increase over time which is not

in alignment with the *Required by Science* scenario and the most likely option for moving towards the *Required by Science* scenario is therefore a combination of energy efficiency and fuel switching.

Of concern, however, are the cumulative emissions obtained from the above scenario shown in the above figure and again the importance of emissions from the existing building stock can be clearly seen.

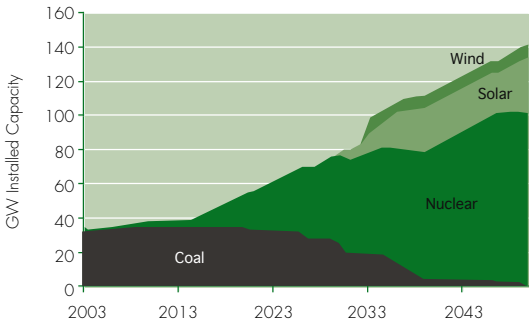
For completeness, the key assumptions adopted in the LTMS in modelling energy efficiency in residential buildings are summarised below[34]

LTMS Energy-efficiency Potential in the Residential Sector	
Existing Buildings	New Buildings
Solar Water Heating	
• Adoption rates of 15% to 20% for rural and urban middle- and upper-income electrified housing.	• Adoption rates of 65% to 80% for rural and urban middle- and upper-income electrified housing.
Geyser Blankets	
• 65% penetration rates, achieving efficiencies of 14.3% by 2015.	
Insulation/Space Heating	
	• 30% efficiencies in space heating in 50% of new houses.
Efficient Lighting	
• 60% penetration of CFLs in urban areas and 40% penetration in rural areas by 2050.	

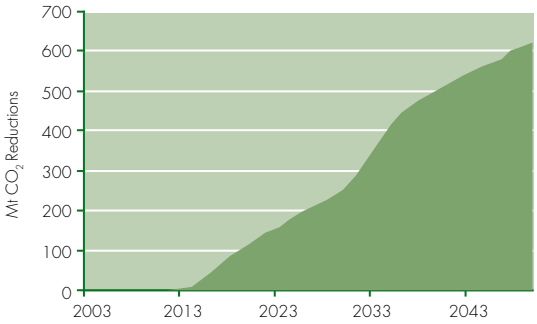
Source: ERC

- Economic instruments: The LTMS also models the impact of an escalating CO_2 tax starting at R100/t CO_2-eq in 2008, rising to R250 by 2020 and rising sharply after 2030 after which it is capped at R750 between 2040 and 2050. The main impact of the tax is to reduce coal use by making alternative forms of electricity generation more affordable and as a result the projected electricity grid is dominated by nuclear and renewables. The projected electricity generation and resulting emission reductions are illustrated schematically below, in which it is seen that GHG reductions of around 600 mtCO_2 p.a. are projected to be achieved.

34 Hughes A, Haw M, Winkler H, Marquard A and Merven B, (2007). Energy Modelling: A modelling input into the Long Term Mitigation Scenarios process, LTMS Input Report 1, Energy Research Centre, Cape Town, October 2007. http://www.erc.uct.ac.za/Research/LTMS/LTMS-intro.htm



Electricity Generation Scenario



Emission Reductions

Source: After LTMS

Building on the LTMS, a summary of the plan of action which will determine South Africa's position on emission reduction targets is given below:

- *National Climate Change Response Policy Development Summit* (2 to 6 March 2009) in which it is anticipated that South Africa's Climate Change Framework will be adopted. The Summit will be informed by:
  - *Vulnerability Atlas:* An atlas of the climate change vulnerability across Southern Africa including, among others, vulnerability to negative impacts on health; agriculture and forestry; water supply and quality; biodiversity; industry; tourism; infrastructure; land-use; fisheries; etc. is being developed for presentation to the Summit.
  - *Renewable Energy Feed-in Tariff Report* (due February 2009, DME and NERSA): An initial report on the implementation of the Cabinet directed renewables feed-in tariff for presentation to the Summit.
  - *2nd National Communication* (due February 2009, DEAT through SANB): The compilation of South Africa's country report to the UNFCCC. Initial research findings to be presented at the Summit.
- *Carbon Tax Study:* As per Cabinet decision, Treasury will study a carbon tax in the range modelled by the LTMS, starting at low levels soon and escalating to higher levels by 2018/2020, with sensitivity to higher and lower tax levels, and/or alternative market mechanisms, and report to Cabinet on its findings.
- Sectoral policy development work (June 2009).
- Post-2012 negotiation positions (up to July 2009).
- UNFCCC post-2012 negotiations concluded (Copenhagen, December 2009).
- National policy updated for implementation of international commitments (March 2010).
- Green Paper published for public comment (April 2010).
- Final National Climate Change Response Policy published (end 2010).
- Policy translated into legislative, regulatory and fiscal package (from now up to 2012).

As noted above, South Africa's climate change framework is being driven by DEAT, supported by DME. Of particular importance is that the building sector should be adequately involved in the process and in particular in the sectoral policy development work.

5.3 ENERGY-EFFICIENCY FRAMEWORK

An overview of key energy-efficiency and demand-side management initiatives and strategies that are currently in place or are being developed, is given below.

i) White Paper on the Energy Policy of the Republic of South Africa

The *White Paper on Energy Policy*[35] (1998) set the following policy objectives:

- increasing access to affordable energy services;
- improving energy governance;
- stimulating economic development (including encouraging competition within energy markets);
- managing energy-related environmental and health impacts; and
- securing supply through diversity.

ii) Energy Efficiency Strategy of the Republic of South Africa

The Energy Efficiency Strategy[36] (2005) was mandated by the White Paper on Energy Policy and links energy sector development with national socio-economic development plans as well as being in line with other Government departmental initiatives. The strategy falls under the ambit of the Department of Minerals and Energy (DME) and aims to bring about the development and implementation of energy-efficiency practices in South Africa. In addition, it provides guidelines for the implementation of efficient practices and sets governance structures for activity development and coordination. The strategy sets an overall national Target Final Energy Demand Reduction of 12% by 2015 (expressed in relation to the forecast national energy demand in 2015) and targets of 10% in the residential sector and 15% in the commercial sector.

Energy-efficiency improvements will be achieved largely via enabling instruments and interventions. These will include economic and legislative means, efficiency labels and performance standards, energy management activities and energy audits, as well as the promotion of efficient practices.

The policy is currently in the process of being revised and one of the purposes of this revision is to align the targets of this strategy with that of the LTMS (Section 5.2). A workshop was held in October 2008 to engage with stakeholders and gather their input for the strategy updates and the DME will update the strategy in time for presentation to the Cabinet in February 2009.

Some probable updates, relevant to the built environment could include:

- The establishment of an energy-efficiency standard for existing buildings. Such a standard is currently lacking in South Africa as the recently published energy-efficient standard SANS 204 is only relevant for new buildings (see Item iii below).

35 South Africa. Department of Minerals and Energy (DME) (1998). White Paper on the Energy Policy of the Republic of South Africa. Pretoria. December 1998. http://www.dme.gov.za/pdfs/energy/planning/wp_energy_policy_1998.pdf

36 South Africa. Department of Minerals and Energy (DME) (2005). Energy Efficiency Strategy of the Republic of South Africa. Pretoria. March 2005. http://www.dme.gov.za/pdfs/energy/efficiency/ee_strategy_05.pdf

- In addition, at the National Energy Efficiency Strategy Workshop of October 2008, an updated target of a 15% reduction in energy usage in both the commercial and public buildings sector by 2015 was decided which will require addressing both new and existing buildings (see Section 5.2).

iii) South African National Standard SANS 204; Energy Efficiency in Buildings

The establishment of this standard came as a directive from the Department of Minerals and Energy (DME) as well as the Department of Housing. The South African Bureau of Standards (SABS) has developed the SANS 204 series of standards to provide a framework for energy-efficient buildings:

- SANS 204-1 – General Requirements;
- SANS 204-2 – Energy Efficiency in Naturally Ventilated Buildings; and
- SANS 204-3 – Energy Efficiency in Artificially Controlled Buildings

In terms of SANS 204, commercial buildings will typically be required to be designed to meet a specified maximum energy demand and the maximum annual consumption, typically:

- a maximum energy demand of 75 to 90 VA/m^2; and
- a maximum consumption of 185 to 210 kWh/m^2 p.a. for offices and 240 to 260 kWh/m^2 p.a. for retail buildings.

In the absence of a rational design, the requirements of SANS 204 would be met by complying with the requirements of SANS 204-2 or SANS 204-3 as appropriate.

Residential houses need to comply with SANS 204-2 which specifies requirements for, amongst others, the following:

- orientation requirements;
- slab-edge insulation;
- minimum R-value for walls;
- minimum levels of insulation for roof and ceiling construction; and
- requirements on roof lights.

It is not yet clear whether these requirements for residential housing will be made mandatory for low-income housing (see Item vi to follow).

The standard will result in minimum requirements for buildings as opposed to best practice. It is, however, believed that SANS 204 would result in energy efficiencies of around 40% in commercial buildings.

SANS 204 is aligned with the objective of performance standards for buildings in the national *Energy Efficiency Strategy*. SANS 204 was published in October 2008 but is presently only a voluntary standard and will only be mandatory once SANS 204 has been incorporated into the National Building regulations

(NBRs) which could take up to two to three years. The process for incorporating SANS 204 into the NBRs has been initiated by DME.

Once incorporated into the NBRs, the impact of SANS 204 could also be constrained due to a lack of administrative and technical capacity at the local authority level.

iv) The cidb Best Practice Project Assessment Scheme

The Construction Industry Development Board (cidb) Act (Act 38 of 2000) requires that the Board must establish a *Best Practice Project Assessment Scheme* based on the best practices identified by the Board. All construction contracts above a prescribed tender value will then be subject to an assessment of compliance with best practice standards and guidelines published by the Board.

The cidb *Best Practice Project Assessment Scheme* is currently being developed but in line with government policy consideration is being given to developing best practices that will support energy efficiency and emission reductions. Specifically, consideration is being given to encouraging that all new commercial and public buildings (or buildings that are to undergo major renovations) are to be designed, constructed, and certified to meet, at a minimum, a four star Green Star SA standard.

v) Green Star SA

The Green Building Council of South Africa (GBCSA) was established in 2007 and has to date launched the Green Star SA Office rating tool for new office construction projects and base-building refurbishments.

The rating system is an adaptation of the Australian Green Star system and includes an assessment of the environmental performance of the building on a range of issues including energy, water, materials and emissions. Six levels of performance are provided for, namely:

- 1 Star – Minimum Practise
- 2 Star – Average Practise
- 3 Star – Good Practise
- 4 Star – Best Practise
- 5 Star – Local Excellence
- 6 Star – World Leadership

The system is at present a market-driven voluntary system but consideration is being given by the cidb and the Department of Public Works (DPW) to follow the lead of several other countries requiring all new public buildings to be designed to achieve a 4-Star rating as a minimum. This could be incorporated as a requirement into the cidb *Best Practice Project Assessment Scheme* as early as 2009 (see Item iv).

The cidb and DPW are also encouraging the development of a rating tool for existing buildings along the lines of the Australian Green Star Office Existing Building pilot rating tool which could then be used as a performance standard for existing buildings.

Green Star SA-rating tools for new and existing buildings would then complement the objective of efficiency labels and performance standards for buildings in the national *Energy Efficiency Strategy*.

vi) Retrofitting of Government Buildings

This initiative for retrofitting of government buildings is being driven by the DME in conjunction with the Department of Public Works (DPW), in line with the DME's energy-efficiency strategy in which government will lead by example through raising energy-efficiency awareness and by implementing specific measures within its own estate. An overall target for energy-demand reduction of 12% of the projected energy consumption has been set, which is to be met by 2015.

Retrofitting of government buildings was initiated in 1997 in which the DPW became active in the conservation of water and electricity in public buildings. The DPW is split up into 11 regional offices of which the Cape Town and Johannesburg offices entered into contracts with private companies in 1997 to perform energy audits and then to retrofit the buildings based on the findings of the energy audit. In 1999, Bloemfontein entered into a similar contract with a private company followed by the Pretoria office in 2003.

The contracts between the private companies and the DPW were based on a shared split of the profits from the energy savings resulting from the retrofitting. As such, a tariff rebate would be calculated by the municipality and then split between the DPW and the private company. The tariff rebate would be the difference between the monthly electricity usage bill before the retrofitting and the bill after the retrofitting. This shared rebate would continue for the duration of the contract. The contract would be reviewed if the building function were to change, resulting in a higher energy usage.

The method of retrofitting contracts is, however, due to change due to some irregularities in the "shared contracts". As such, these contracts will not be continued when they expire and DPW will enter into direct contracts with private companies to perform energy audits and retrofitting. This initiative is, however, likely to be severely constrained due to a lack of funds.

vii) Energy-efficient RDP Housing

In response to the large housing backlog in South Africa, the government initiated a low-cost housing scheme (including housing subsidy for low-income families) soon after the democratic elections in 1994 (see Section 3.3.i). The houses constructed under this scheme are often referred to as "RDP housing" (which originates from the ANC's Reconstruction and Development Programme).

Currently, a maximum of R43 506 is allocated to subsidise the construction of each house and the houses which are currently being constructed are typically two bedroom, 40 m^2 units, mostly without ceilings. Because of cost constraints, these units are very energy inefficient. Since April 2007, the subsidy amount is sufficient to include a small prepaid electricity unit to each house, including two plug points and one light unit. Nevertheless, many households still rely on sources other than electricity, as the monthly electricity bill is not within their budget.

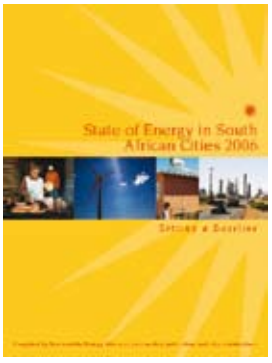
As noted in Item iii above, it is not yet clear whether the requirements for residential housing in SANS 204 will be made mandatory for low-income housing. In line with this, Cabinet decided that emergency measures needed to be taken to make the RDP houses more energy efficient and *Draft National Norms and Standards for Energy Efficiency for the National Housing Programme* were commissioned as an interim measure.

The Department of Housing (DOH) and the National Home Builders Registration Council (NHBRC) are currently working together to establish a number of energy saving measures which could be incorporated in RDP houses and an analysis of these measures is included in the *Draft National Norms and Standards*. The measures include:

- ceilings with insulation;
- internal and external plastering;
- plastic membrane under floor;
- sealing the house at ground level; and
- north-facing roof overhang.

The *Draft National Norms and Standards* will be presented to the Minister of Housing early in 2009, once the analysis of the best compromise between the highest impact changes verses the lowest cost changes to the construction of the RDP houses has been completed. After consultation, the new policy could be in place by April 2009. However, the ability to introduce energy-efficient requirements into government subsidised housing will be constrained by affordability criteria.

viii) Local Initiatives



In addition to the national initiatives outlined in the previous sections, there are many local public and private sector initiatives in place in South Africa that are targeting energy efficiency in buildings. This is reflected in, amongst others, the publication of the *State of Energy in South African Cities 2006; Setting a Baseline*, which was developed through a growing network of city officials and related stakeholders[37]. Fifteen cities and towns were involved in the study, including the six big metros, industrial towns, inland, coastal and more rural towns. These cities include 13 of the 17 cities that form the "backbone" of the South African economy. Data drawn from this study has been included in Section 4 of the present report.

Some of the local initiatives taking place are summarised below:

- Cape Town Solar Water By-Laws[38]: The City of Cape Town has adopted an Energy and Climate Change Strategy in which one of the goals is to have 10% of all households and 10% of all city-owned housing equipped with solar-water heaters (SWHs) by the year 2010. To achieve this target the city is engaging in a number of initiatives:

37 SEA (2006). State of Energy in South African Cities 2006; Setting a Baseline. Published by Sustainable Energy Africa, 2006. http://www.sustainable.org.za

38 City of Cape Town (2008). Solar Water heater Advancement Programme. http://www.capetown.gov.za

- a Solar-water Heater Bylaw: A subsidisation scheme, using funding obtained from a number of sources to assist staff members with an income below a certain level to afford the fitting of a SWH in their home; and
- a project to fit SWHs to the city's nature reserve facilities.

To date, a draft bylaw has been prepared and will be introduced to the public for comment and input before finalisation and submission to the council. The information and volunteer processes for the SWH subsidy schemes is being finalised and retrofitting of SWHs at the city's nature reserve facilities has begun.

- Cape Town Partnership Energy-efficient Initiative[39]: This initiative is a collaboration between the City of Cape Town and the Sustainability Institute. Seed funding for the project has been obtained from CORDAID, a large Dutch foundation.

The aim of the energy-efficient project is to "consolidate and fast-track the delivery of energy-efficiency projects in buildings in the Cape Town CBD in a way that reduces operating costs for building owners, the consumption of grid electricity, and the total environmental impact of the CBD. A longer term aim is to redirect a proportion of the savings into pro-poor infrastructure development and the establishment of a self-financed agency to manage energy-efficiency projects within the CBD. The project will also investigate the possibility of implementing energy-efficient equipment on new buildings or buildings undergoing complete refurbishment."

Some highlights of the work undertaken to date include:

- A basic study comparing the electricity consumption of 20 commercial buildings in the central city has been conducted.
- The pilot first seven commercial buildings have been audited and some are now ready to start with their energy-efficiency retrofits which will reduce electricity consumption and save money on electricity bills which are set to at least double within the next three years.
- A second set of buildings are now being approached for audits.
- The partnership has selected a local firm of energy-management experts with a strong track record as a technical and financial partner.
- An active network of stakeholders was established with ongoing promotional activity and updates during the recent "energy crisis".
- Exploring the barriers to implementing energy efficiency and ways to address these.
- A detailed business model has been developed to investigate the viability of a self-financing mechanism.
- An investigation into retrofitting the city-owned buildings.

- Gauteng Integrated Energy Strategy: The Gauteng Local government has initiated the development of an Integrated Energy Strategy which is scheduled to be ready early in 2009.

39 Cape Town Partnership. http://www.capetownpartnership.co.za

- Johannesburg City Council: The City Council[40] is encouraging energy-efficient designs for new buildings and specifically encouraging natural heating provided in winter through north-facing buildings and eave overhangs of at least 700mm on north, east and west facades, facilitating shade in summer and sun penetration in winter. Other measures that will be strongly encouraged include solar water heating systems; roof insulation; energy-efficient light fittings; and motion or timer sensors on lights, air conditioners and geysers.

  Initially these new requirements will rely on voluntary compliance but could be regulated in the future.
  The city will also strongly encourage the retrofitting of existing buildings with energy saving devices, and incentives are being considered for this.

- EnerKey Programme: Over the next seven to nine years a number of energy-efficiency projects are being planned to be undertaken in Johannesburg, Ekurhuleni and Tshwane through a joint collaboration between South Africa and Germany. Pilot projects have been running since 2006 and will now be rolled out on a larger scale to develop energy savings strategies across these cities.

- Business Unity South Africa (BUSA): The members of BUSA (which was created through the merger of the Black Business Council and Business South Africa) have pledged to increase energy efficiency through, amongst others, to:

- appoint an accountable member of staff ("Energy Manager") for each of the buildings that they occupy to take responsibility for energy efficiency; and
- perform a basic energy audit for each of the buildings that they occupy to identify quick hits to improve energy efficiency and reduce actual consumption.

ix) The Electricity Regulation Act

The *Electricity Regulations for Compulsory Norms and Standards for Reticulation Services*[41] (Regulation No. 773 of 8 August 2008) have been issued in terms of *The Energy Regulation Act*[42] (Act No. 4 of 2006) introduced by The Presidency. The purpose of these regulations is to maintain good quality of supply to ensure stability of the electricity network, to minimise electricity load shedding and avoid blackouts but it will also impact the energy efficiency of buildings.

Amongst others, in terms of these Regulations:

- energy-efficient fittings must be used in all buildings except where a specific fitting is required for some purpose and the nature of that purpose does not allow an energy-efficient fitting; and
- street and highway lighting must be energy efficient and the licensee[43] must ensure that it is switched off during the day.

40 Johannesburg City Council. New Buildings to Become Energy Wise. http://www.joburg.org.za/content/view/2176/168/

41 South Africa. Department of Minerals and Energy (DME) (2008). Electricity Regulations for Compulsory Norms and Standards for Reticulation Services. Pretoria. 16 July 2008. http://www.dme.gov.za/pdfs/energy/electricity/1-31250 18-7 Minerals.pdf

42 Presidency (2006). The Energy Regulation Act. The Presidency, Cape Town. http://www.info.gov.za/gazette/acts/2006/a4-06.pdf

43 Note: In terms of the regulations, a licensee is an entity that distributes electricity to end-users – such as a local authority.

It should be noted, however, that the Regulations of August 2008 are in fact significantly watered down from earlier drafts (Regulation No. 148 of 8 February 2008), in which the following would have been prohibited (and which would have had a greater impact on energy efficiency):

- In respect of lighting:
  - proliferation of incandescent lights;
  - lighting of unoccupied buildings especially after working hours; and
  - street and highway lighting during broad day light.

- In respect of water heating in commercial and residential buildings:
  - installation of an electric geyser that does not incorporate a solar water heating facility to a new dwelling with a value exceeding R750 000; and
  - any new geyser without an insulation blanket.

- In respect of water heating in commercial and residential buildings to be in place not later than the year 2010:
  - Installation of an electric geyser that does not incorporate a solar water heating facility to office blocks, hospitals, hotels and resorts, and shopping complexes) feeding from centralised water heating systems.

x) The National Electricity Efficiency Agency

The National Energy Efficiency Agency (NEEA) was officially established in March 2006 through a directive issued by the Minister of Minerals and Energy. As such it is lead by the Department of Minerals and Energy.

The objectives of NEEA are:

- the prioritisation and recommendation of energy efficiency and Demand Side Management (DSM) projects to be undertaken in the country;
- identification and development of key strategies to address the growing demand for energy in the country, including gas, electricity, liquid petroleum, etc.;
- stimulate areas neglected in terms of energy efficiency in the past such as the transport sector;
- develop and implement comprehensive annual "Energy Efficiency and DSM" awareness campaigns to assist the general public in making wise choices when purchasing energy-consuming equipment and appliances;
- oversee the integration and coordination of training in energy efficiency currently undertaken by various stakeholders in the country and facilitate skills transfer, capacity building and the creation of additional jobs in the field of energy conservation;
- oversee the Measurement and Verification (M&V) of all energy-efficiency and DSM projects undertaken by registered Energy Service Companies, (ESCos), through Eskom; and
- cooperate with persons, associations and institutions undertaking energy- efficiency programmes in other countries to ensure that international "best practices" are adopted and applied in South Africa.

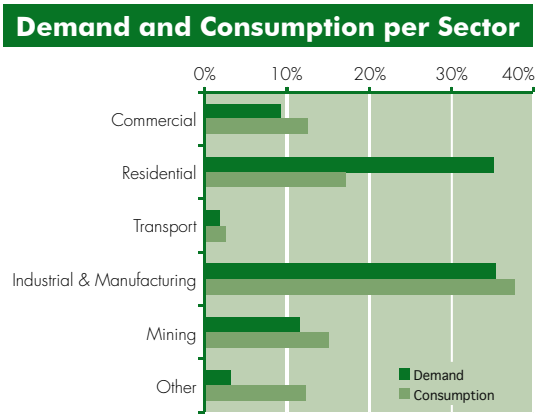
Many of these objectives could therefore impact on energy efficiency and emissions in the building sector. However, these objectives are currently being severely constrained due to insufficient funding for NEEA. Currently, NEEA is unable to assist Eskom with the Demand Side Management due to the lack of funds, and NEEA's primary role is with training and qualifying engineers according to the NQF framework which is aligned with the need for qualified persons to undertake energy-efficiency work including, for example, retrofitting of existing buildings.

xi) Energy Efficiency Demand Side Management

The aim of the Energy Efficiency Demand Side Management (EEDSM) initiative is to roll out energy efficiency and load reduction technologies which are able to reduce the national demand profile on a sustainable basis. The EEDSM initiative was initiated through NEEA for the following reasons:

- it has a lower economic cost than supply-side options (Eskom estimates that for every R1 spent on DSM, a saving of R4 to R5 is made on avoided generation costs);
- it is quickly executable and scalable;
- it can act as an accelerator for economic growth through process efficiencies and job creation; and
- it reduces air pollution, resulting in less damage to human health and the environment.

The current focus of the EEDSM strategy is to focus firstly on high-load factor energy-efficiency savings in the industrial and commercial sectors. The second priority is for other sector energy-efficiency savings, including the residential sector. Specifically, the residential sector offers the greatest potential for EEDSM savings as there is a significant variance between Energy Demand and Energy Consumption. Additionally, the residential sector offers the best opportunities to quickly roll out low-cost/high-impact technologies (e.g. CFLs). The industrial and commercial sectors also offer significant opportunities for EEDSM but these opportunities will initially come at a higher cost per MWh due to the technologies involved (e.g. motor efficiency).



Some of the current DSM initiatives include:

- the mass replacement of incandescent light bulbs with energy-efficient CFL light bulbs (in which, for example, Eskom reach an agreement with a municipality to conduct a door to door light bulb swap in the municipal area);
- Smart metering, in which Eskom applies differing rates depending on the electricity usage of the smart meter;
- partnerships with retailers to trade in energy-inefficient lights for new efficient ones; and
- Corporate roll out of energy-efficient technologies.

Notwithstanding this, Eskom's DSM activities are currently constrained due to a lack of funding.

The greatest challenges currently being faced, and which will need to be rectified in order for DSM to have the required impacts, are:

- Currently Eskom receives 100% funding for load shifting initiatives and 50% funding for energy-efficiency initiatives. As it is energy-efficiency initiatives that will bring about an actual lowering of energy usages, these should, however, be 100% funded. Energy-efficiency initiatives are in general far cheaper than load shifting and have a greater long-term impact. The compromise would be that load shifting initiatives are only 50% funded.

- Defined funding regulations for Eskom initiatives need to be established. These would need to express the source of the funding and the amount of funding to be provided. New electricity tariffs need to be defined and these need to be sufficient to provide the amount of funding required by these initiatives.

Eskom has met with the regulator in order to set up a new policy for DSM. In order for this new policy to be actioned, however, a number of steps still need to take place. These include: A public hearing and consultation. Eskom estimate that the new policy could be in place by March 2009.

This new policy will focus on the following elements:

- energy and capacity shortage, with an increased focus on energy efficiency rather than load management;
- acceleration of large-scale residential-key programmes and industrial and commercial sector-key programmes; and
- driven by avoided costs as these will hard-wire energy savings in a sustainable manner.

Amongst others, Eskom recommends the following to maximise the future potential of Energy Efficiency DSM:

- tax incentive for energy-efficient technologies;
- wavering of import tariff on key energy-efficient appliances (currently the costs of many solar geysers are simply too high and the payback period too long to justify its purchase to companies or households);
- energy-efficient appliance labelling and restrictions on the sale of energy inefficient appliances; and
- compulsory energy-efficient building standards.

xii) Power Conservation Programme

In response to the electricity shortages currently being experienced in South Africa, NERSA has recently announced draft criteria for a national Power Conservation Programme (PCP) for public comment[44]. Core to the PCP strategy is:

- a mandatory Energy Conservation Scheme (ECS); and
- an Energy Growth Management (EGM) strategy for managing new electricity connections and growth in consumption to align with available capacity.

The ECS will apply to customers or licensees (with a licence to trade and distribute electricity, such as a local authority) with a consumption or anticipated consumption of 25 GWh or more during 12 consecutive Billing Periods, and users will be allocated an annual limit for their electricity use and will have to pay a charge in addition to regular tariffs if they exceed that baseline. Reductions in energy consumption in line with energy-efficiency targets published by government would need to be included in the baselines.

The objective of the EGM rules is to prioritise new electricity connections and the following criteria are proposed:

Energy Growth Management (EGM) Tiered System – MVA thresholds	
Application size	Criteria to be applied
≤ 100 kVA	• Energy-efficiency commitments as published by government.
> 100 kVA to ≤ 1 MVA	• Customers to adopt energy-efficiency commitments.
> 1 MVA to < 20 MVA	• Energy-efficiency commitments. • Commit to energy savings in terms of the Energy Conservation Scheme at all existing supply points they may have.
≥ 20 MVA	• As per 1 to 20 MVA plus appropriate criteria defined by government (DTI).

Several priority projects will be excluded from these criteria, including:

- health facilities;
- education facilities;
- mass housing projects;
- bulk water and sanitation systems; and
- public transport projects (but not industrial freight projects).

44 NERSA (2008). Power Conservation Programme (PCP) Rules; Consultation Paper. National Energy Regulator of South Africa. http://www.nersa.org.za/

The impact of the ECS and EGM criteria on the commercial and residential building sector is not yet fully clear but these criteria will clearly support energy efficiency in the short term, in particular amongst the larger commercial developments. Rating systems, such as the Green Star SA rating tool would clearly be supportive of identifying opportunities for energy reduction.

xiii) Economic Instruments

As noted in Section 3.3, the Department of Environmental Affairs and Tourism has initiated a joint process with National Treasury which will lead to National Budget interventions which support sustainable development, with a long-term view of making an economic case for the environment. "Green procurement" policies have been adopted and implemented across various institutions in both the public and private sectors.

A first step towards a CO_2 tax was introduced by Minister Trevor Manuel in his 2008 budget speech[45], in which a levy of a 2c a kilowatt-hour was introduced on non-renewable sources of electricity. The levy was introduced as "a first step towards appropriately targeted fiscal environmental measures, and in support of the required demand-side response to power supply shortages".

5.4 POLICY ASSESSMENT

From the previous sections, it can be seen that South Africa has a relatively well-developed climate-change, energy-efficiency policy and legislative framework in place. However, the extent to which this framework is applicable to the building sector is examined here, and the South African policies are evaluated against a policy framework developed by the UNEP Sustainable Building and Construction Initiative (UNEP SBCI)[46]. Based on a study of policy tools in over 50 countries on all continents, the SBCI framework assesses the likely emission reduction effectiveness and cost-effectiveness of various policy instruments. The SBCI study notes, however, that in general a combination of policy instruments (or policy packages) is most effective.

The assessment is given in the following table from which it can be noted that:

- Firstly, while several policy instruments are being put in place in South Africa, overall the progress with these to date is very limited largely due to:

    - financial and capacity constraints; and
    - the time scales required to implement and give effect to policies (e.g. making SANS 204 mandatory, energy-efficiency obligations and quotas.)

45 Minister of Finance (2008). Budget Speech 2008, Minister of Finance, Trevor A Manual. Pretoria. www.info.gov.za/speeches/budget/budget2008.pdf

46 UNEP SBCI (2007). Assessment of Policy Instruments for Reducing Greenhouse Gas Emissions from Buildings; Summary and Recommendations. http://www.unepsbci.org

- Secondly, policy instruments that are known to be effective within the building sector and which have been identified in the National Energy Strategy of South Africa and other draft policies and strategies, have not yet been developed further or begun to be implemented, such as:

  - appliance standards;
  - mandatory audit requirement; and
  - labelling and certification programmes.
- Thirdly, some policies which are known internationally to be effective within the building sector do not appear to be under formal consideration in South Africa at present and in particular tax exemptions/reductions.

Notwithstanding this, most significantly is that the need for action to address climate change and energy efficiency is well recognised in the public and corporate sectors, and there are many examples at national, provincial and local level where the public sector is beginning to demonstrate leadership. The challenge, however, remains translating intent into action.

Assessment of Energy Efficiency/GHG Emission Reduction Policies			
Policy instrument	Emission Reduction Effectiveness	Cost-Effectiveness	South African Status
Appliance standards	High	High	Not readily available in SA, no requirements in place.
Energy-efficiency obligations and quotas	High	High	National draft recommendations in place.
Demand side management programmes (DSM)	High	High	National DSM programme in place but constrained by finance.
Tax exemptions/ reductions	High	High	Under consideration.
Cooperative procurement	High	Medium/High	No requirements
Building codes	High	Medium	SANS 204 currently only voluntary and could take up to three years to be mandatory. Will only specify minimum standards and only applicable to new buildings.
Mandatory audit requirement	High, but variable	Medium	No requirements in place.
Energy performance contracting (EPC)/ESCO support	High	Medium	Limited use for public-sector retrofitting but stopped due to irregularities.
Capital subsidies, grants, subsidised loans	High	Low	Very limited.
Labelling and certification programmes	Medium/High	High	Voluntary certification in place, with mandatory requirements for public buildings under consideration.
Public leadership programmes, incl. procurement regulations	Medium/High	High/Medium	Public leadership growing, often constrained by finance, capacity or regulatory obstacles.
Voluntary and negotiated agreements	Medium/High	Medium	Energy-efficiency agreements in place amongst industry and public sector, progress somewhat limited.
Public benefit charges	Medium	High	Not in place.
Energy-efficiency certificate schemes/white certificates	Medium	High/Medium	Not in place.
Detailed billing and disclosure programmes	Medium	Medium	Not in place.
Education and information programmes	Low/Medium	Medium/High	Limited.
Kyoto Protocol flexible mechanisms	Low	Low	Some progress.
Taxation (on CO_2 or fuels)	Low	Low	Under consideration.

Chapter 6

Conclusions and Recommendations

Conclusions and Recommendations

6.1 SUMMARY AND CONCLUSIONS

The report concludes that the operation of non-residential and residential building sectors account for around 23% of total emissions. Of this, non-residential sector accounts for around 10% of total emissions and the urban and rural high-medium income residential sectors account for around 8%. In addition, it is estimated that the manufacture of building materials accounts for around 5% of total emissions.

CO_2 Emissions from Building Sector (2006)		
Sector	$mtCO_2$-eq p.a.	% SA
Commerce	35	10%
Residential	45	13%
• Urban High-Med Income; Electrified	17	5%
• Urban Low Income; Electrified	7	2%
• Urban Low Income; non-Electrified	3	1%
• Rural High-Med Income; Electrified	10	3%
• Rural Low Income; Electrified	3	1%
• Rural Low Income; non-Electrified	5	1%
Manufacture of building materials	18	5%

The commercial and the high-medium income residential sectors, together with the materials manufacturing sector, are clearly sectors that require specific focus in terms of energy efficiency and reduction of greenhouse gas emissions.

Based on historical trends and anticipated government investment programmes, it is likely that investment in residential and non-residential buildings will grow on average at around 2% per year between 2008 and 2050 which would result in the total building stock doubling by 2050. If CO_2 emissions were unchecked, this would result in a twofold increase in emissions!

However, affecting change in the building sector is complex, due to:

- Fragmentation of the building sector: Buildings normally have a long life cycle with only limited interaction between stakeholders involved in different phases of the buildings lifetime. Furthermore, different aspects of the buildings, such as architecture, engineering, building management, building function, occupant profiles etc. are often poorly or not at all coordinated. There is therefore no natural incentive for a life-cycle approach to managing energy use in buildings.

- Split economic interests: The parties typically making decisions about the building design (designers and investors) are seldom the ones who would benefit from energy-efficiency improvement and its reduced associated costs (owners and users).

- High perceived business risk and underestimation of the life-cycle cost benefits from energy-efficiency investments in buildings: Lack of track record from real projects including risk-benefit analyses.

- Energy costs are often a comparatively small part of the overall costs for a building: The economic incentive provided by reduced energy costs is therefore often weak.

The major opportunities for energy efficiency in the building sector in South Africa have to date tended to focus on the opportunities summarised below.

Energy-efficiency Opportunities	
Commercial Sector	Residential Sector
• HVAC variable speed drives • thermal design • energy-efficient lightning • solar-water heating and heat pumps • energy-efficient appliances • behavioural changes	• solar-water heating • geyser blankets • efficiencies in space heating • energy-efficient lightning • behavioural changes

Collectively, it is estimated that these opportunities could result in energy efficiencies in new buildings of around 40% to 50% in the commercial sector and around 30% to 40% in the residential sector which can be impacted on through a range of policy instruments.

Estimates using current technologies suggest that energy efficiencies of around 40% to 50% could be obtained in new buildings in the commercial sector and around 30% to 40% in the residential sector which can be impacted on through a range of policy instruments. Notwithstanding this, a major hurdle is the ability to effect energy changes in existing buildings and scenarios currently being used in South Africa suggest that overall reductions in energy use that could be achieved from existing buildings would only amount to around 10%. Under this scenario, it is estimated that existing buildings would still account for around 50% of annual emissions from this sector by 2050.

Retrofitting of existing buildings remains a major challenge that needs to be addressed to support emission reductions from the building sector.

It should be noted, however, that even under the most optimistic projections using currently known technologies, although meaningful reductions in greenhouse gas emissions can be achieved from the building sector, these will not be sufficient to bring the emissions from this sector in line with that required by the LTMS *Required by Science* scenario by 2050.

It is therefore clear that a combination of energy-efficient technologies as well as clean energy sources and cogeneration plants is required to bring emissions from the building sector in line with that *Required by Science* which in all likelihood would need to be supported or achieved through a carbon tax.

Several policy instruments and initiatives that focus on the building sector are being developed and implemented in South Africa, most notably:

- demand-side management initiatives;
- guidelines for energy-efficient buildings (SANS 204);
- building rating systems (Green Star SA); and
- retrofitting of government buildings.

However, the progress with these to date is limited, largely due to financial and capacity constraints in the public sector and the time scales required implementing and giving effect to policies (e.g. making SANS 204 mandatory).

Leadership by example is gaining momentum across all levels in the public sector but, as noted above, is being constrained by financial and capacity constraints. In the private sector, energy efficiency and the Green Star SA-rating system is gaining increasing momentum through market-driven factors but is likely to be dampened somewhat by the current global financial crisis.

Notwithstanding these initial moves to address energy-efficiency and emission reductions in the building sector, accelerated and focused attention needs to be given to this sector.

6.2 RECOMMENDATIONS

This report has shown that South Africa has a relatively well-developed climate change and energy-efficiency policy and legislative framework in place that will impact on the building sector, albeit that some of this is being driven by short-term energy management requirements. Importantly, the need for action to address climate change and energy efficiency is well recognised in the public and corporate sectors, and there are many examples at national, provincial and local level where the public sector is beginning to demonstrate leadership.

However, the challenge remains translating intent into action.

The following recommendations arise from this report to support translating intent into action in the building sector:

- Prioritising the building sector: Although the energy reduction potential of the residential and commercial sectors have been recognised in all government policies, the importance of the building sector has in effect not been highlighted as a priority sector in its own right. Furthermore, the estimates of the contribution of the commercial sector to greenhouse gas emissions vary quite significantly from between 3% to 8% of total greenhouse gas emissions, and while the actual differences in these estimates are in themselves not important, this has a significant impact on identifying the importance of the sector and in emphasising the leadership required in the sector. A clear statement on the recognition of the importance of the building sector in terms of opportunities for energy-efficiency and emission-reduction potential is required.

A clear statement on the recognition of the importance of the building sector in terms of opportunities for energy-efficiency and emission-reduction potential is required.

- A national focus on the building sector: It is well recognised that the building sector is a fragmented sector involving many stakeholders in the public and private sectors including clients, owners and users. At present the leadership in the building sector being provided is fragmented, most notably by the Department of Minerals and Energy (DME), the Department of Environment and Tourism (DEAT), the National Energy Regulator of South Africa (NERSA), the national Department of Public Works (DPW), several provincial and local government structures, the Green Building Council of South Africa, the South African Property Owners Association (SAPOA), the Master Builders of South Africa (MBSA) Electricity Task Team, Business Unity South Africa (BUSA), and many others.

  All these initiatives are contributing to energy-efficiency and emission reductions but many of these initiatives are operating in isolation of each other. A need exists for a national public/ private coordinating partnership for climate change in the building sector.

A need exists for a national public/ private co-ordinating partnership for climate change in the building sector.

- Translating intent into action: As noted, accelerated and focused attention needs to be given to translating existing policy into regulation and translating intent into action. Specifically, SANS 204 needs to be made mandatory and several of the initiatives identified in the national Energy Efficiency Strategy need to be developed and implemented (including labelling schemes and energy reporting and auditing) as soon as possible.

SANS 204 needs to be made mandatory and several of the initiatives identified in the national Energy Efficiency Strategy need to be developed and implemented as soon as possible.

- Focusing on retrofitting: The focus on energy-efficiency requirements (which then impact on emission reductions) is to date somewhat biased towards new buildings, whereas an increasing focus is required on the legacy of energy inefficient buildings that exists. Specifically, policy options along the line of those required in the UK, Australia and others requiring selected retrofitting of commercial and residential buildings on the change of ownership should be investigated and developed. Furthermore, the development of a Green Star SA-rating tool for existing buildings that could be used as a basis or performance standard for existing buildings should be encouraged.

An increasing focus on retrofitting of public and private sector buildings is required.

- Leadership by example: Government needs to lead by example by setting best practice standards for new government buildings and (within resource constraints) by enhancing the government programme for retrofitting existing buildings. In addition, government needs to promote those best in class buildings as demonstration projects.

Government needs to lead by example.

- Economic Instruments: Ultimately, energy efficiency within the built environment sector will be transformed through economic instruments and incentives. Noting that the residential and non-residential sectors account, in total, for around 27% of CO_2 emissions and that these sectors account for around 6% of GDP, it is important that the DEAT/NT process which will lead to National Budget interventions which support sustainable development should take cognisance of this sector.

The DEAT/NT process which will lead to National Budget interventions which support sustainable development should take cognisance of the building sector.

About the Sustainable Buildings and Climate Initiative

Launched in 2006 by the United Nations Environment Program (UNEP), the Sustainable Buildings and Climate Initiative (SBCI), formerly the Sustainable Buildings and Construction Initiative, is a partnership between the private sector, government, non-government and research organizations formed to promote sustainable building and construction globally.

SBCI harnesses UNEP's unique capacity to provide a convening and 'harmonizing' role to present a common voice from the building sector on climate change issues. More specifically UNEP-SBCI aims to:

1. Provide a common platform for and with all building and construction stakeholders to collectively address sustainability issues such as climate change;
2. Establish globally consistent climate-related building performance baselines and metrics for monitoring and reportingpractices in particular based on the life cycle approach;
3. Develop tools and strategies for achieving a wide acceptance and adoption of sustainable building practices throughout the world;
4. Implementation - Promote adoption of the above tools & strategies by key stakeholders.

For more information, see www.unepsbci.org

About Sustainable United Nations (SUN)

Sustainable United Nations (SUN), is a UNEP initiative that provides support to UN and other organisations to reduce their greenhouse gas emissions and improve their sustainability overall. SUN was established in response to the call from UN Secretary General Ban Ki-Moon at the World Environment Day 2007 (5 June), to all UN agencies, funds and programmes to reduce their carbon footprints and "go green". This call was echoed in October 2007 in a decision of the UN Chief Executives Board (CEB/2007/2, annex II) to adopt the UN Climate Neutral Strategy, which commits all UN organisations to move towards climate neutrality. SUN is in this context working with the UN Environment Management Group – the UN body coordinating common environmental work within UN – to provide guidance, and develop tools and models for emission reduction within organisations.

SUN is using a "whole-organisation" approach in identification of sources and causes for emissions and opportunities for reduced emissions and improved sustainability. In this way opportunities for improvements are typically found within one of the three major focus areas for SUN:

a. Physical assets: building, equipment, vehicles…
b. Management processes: procurement, travel, management systems…
c. Organisational Culture: day-to-day office behaviour, "corporate" culture, green meetings…

SUN operates in synergy with existing initiatives and networks such as the Sustainable Buildings and Construction Initiative, the High Level Committee on Management Procurement Network, the UN Global compact, or the Marrakech Task Force on Sustainable Public Procurement and many others.

For more information, see www.unep.fr/scp/sun

About the UNEP Division of Technology, Industry and Economics

The UNEP Division of Technology, Industry and Economics (DTIE) helps governments, local authorities and decision-makers in business and industry to develop and implement policies and practices focusing on sustainable development.

The Division works to promote:

> sustainable consumption and production,
> the efficient use of renewable energy,
> adequate management of chemicals,
> the integration of environmental costs in development policies.

The Office of the Director, located in Paris, coordinates activities through:

- **The International Environmental Technology Centre** - IETC (Osaka, Shiga), which implements integrated waste, water and disaster management programmes, focusing in particular on Asia.
- **Sustainable Consumption and Production** (Paris), which promotes sustainable consumption and production patterns as a contribution to human development through global markets.
- **Chemicals** (Geneva), which catalyzes global actions to bring about the sound management of chemicals and the improvement of chemical safety worldwide.
- **Energy** (Paris), which fosters energy and transport policies for sustainable development and encourages investment in renewable energy and energy efficiency.
- **OzonAction** (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition to ensure implementation of the Montreal Protocol.
- **Economics and Trade** (Geneva), which helps countries to integrate environmental considerations into economic and trade policies, and works with the finance sector to incorporate sustainable development policies.

UNEP DTIE activities focus on raising awareness, improving the transfer of knowledge and information, fostering technological cooperation and partnerships, and implementing international conventions and agreements.

For more information, see **www.unep.fr**

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UNEP

UNEP-SBCI has commissioned the compilation of regional reports that quantify the influence of buildings on climate change in selected regions. This South African report has been undertaken in collaboration with the Construction Industry Development Board (cidb).

The report concludes that the operation of non-residential and residential building sectors account for around 23% of total emissions. Based on historical trends and anticipated government investment programmes, it is likely that investment in residential and non-residential buildings will grow on average at around 2% per year between 2008 and 2050 which would result in the total building stock doubling by 2050. If greenhouse gas emissions were unchecked, this would result in a twofold increase in emissions.

Estimates using current technologies suggest that energy efficiencies of around 40% to 50% could be obtained in new buildings in the commercial sector and around 30% to 40% in the residential sector, which can be impacted on through a range of policy instruments.

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