CLEAN DEVELOPMENT MECHANISM (CDM)

# investor guide

# South Africa

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

economy environment employment

CLEAN DEVELOPMENT MECHANISM (CDM)

# investor guide

# SOUTH AFRICA

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna, 2003

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# Summary

South Africa has signed the United Nations Framework Convention on Climate Change (UNFCCC). South Africa has also signed the Kyoto Protocol. The Clean Development Mechanism (CDM) has been widely discussed amongst all sectors in South Africa. Government is making final preparations to create readiness for CDM investment in the country. A number of support and capacity building agencies are active in South Africa. The private sector has commenced with project preparation on a limited scale. Extensive potential exists for CDM activity development in South Africa, but capacity needs across all spectrums are still great.

This "CDM Investment Guide and Project Developers' Portfolio for South Africa" aims at providing CDM project proponents in the country, and CDM investors interested in CDM opportunities in the country, with reliable, updated sources of information regarding CDM opportunities in the energy and industrial sectors of South Africa.

The structure of the report is:

- South Africa as a stable investment destination generally;
- The South African government's role in the CDM;
- Emissions in South Africa: a brief profile;
- Sectors and CDM opportunities;
- Industry: associations:
  annex A (on CD-ROM);
- CDM projects, a list produced through a voluntary survey:
  annex B (on CD-ROM);
- Support organizations:
  annex C (on CD-ROM);

The main findings of the report are that:

- Global climate change and greenhouse gas emissions rank as fairly important in South Africa; however the country has pressing problems such as poverty, unemployment, AIDS and education/health as main priorities. The CDM has great potential in South Africa as the country ranks as a foremost emitter of greenhouse gases. The CDM may also play an important role in bolstering the development path which South Africa has set for itself. South Africa has been setting up the institutional infrastructure for climate change and for appraising CDM projects in the country. These efforts are not complete but are underway. A large potential for CDM projects does exist in the energy sector in the country in the areas of fuel substitution and energy efficiency, as South Africa is heavily dependent on coal-based energy. A large potential for CDM projects does exist in the industrial sector in the country.
- Various CDM project development activities and types are currently underway in the country at different stages (under consideration, in preparation, or ready to be

submitted as a CDM project). Some of these have chosen to present details of projects and progress. This is done in the form of a standard template, which is attached without editing.

- Capacity development in the field is a priority, but expertise is available or in development at all levels. Further intensive capacity building will no doubt unlock the extensive potential for CDM development in South Africa.

- In summary, South Africa is fully aware of the many technical and political issues that surround CDM formulation and implementation. A high potential for CDM does exist in various sectors of the South African economy. This is yet to mature, as capacity needs are high. As a consequence, and effort should be made, both domestically and internationally, for further capacity development for CDM in South Africa.

# Abbreviations

| | |
|---|---|
| AA | Assigned amounts; GHG emissions assigned to annex I countries under the Kyoto Protocol |
| AIJ | Activities Implemented Jointly; projects conducted with the objective of establishing protocols and experiences, but without allowing carbon credit transfers between developed and developing countries |
| CDM | Clean Development Mechanism |
| CER | Certified Emissions Reduction; the carbon dioxide credit unit generated from CDM project activities |
| COP | Conference of the Parties; Conference of the Parties oversees global negotiations on climate change until the Kyoto Protocol is ratified |
| DEAT | Department of Environment and Tourism, South Africa |
| DTI | Department of Trade and Industry, South Africa (also referred to as "the dti") |
| DME | Department of Minerals and Energy, South Africa |
| ERU | Emissions reduction unit; the output of CDM or JI projects |
| ET | Emissions trading |
| GDP | Gross Domestic Product |
| GHG | Greenhouse Gas |
| IPCC | Intergovernmental Panel on Climate Change; body established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to provide scientific, technical and socio-economic advice on climate change issues to the world community and in particular to the 170-plus Parties to the United Nations Framework Convention on Climate Change (UNFCCC) |
| JI | Joint Implementation |
| kgC | Kilograms of carbon |
| kgoe | Kilograms of oil equivalent; the amount of energy equivalent to 45,200 joules |
| MtC | Million tons of carbon |
| ODA | Official Development Assistance; funding provided by various multilateral development banks and development agencies to developing countries |
| OE | Operational Entity; certification body that is eligible to validate a CDM project activity |
| PDD | Project Design Document; document that is the output of the Project Design phase of the CDM |
| SSN | South-South North Project |
| UNCTAD | United Nations Conference on Trade and Development |
| UNDP | United Nations Development Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UNOPS | United Nations Office for Project Services |
| WBCSD | World Business Council for Sustainable Development |
| 1MWh = 0,086 Mtoe | One million watt-hour of electricity is equivalent to one million metric tons of oil equivalent |
| toe | Ton of oil equivalent; the amount of energy equivalent to 45,200 thousand joules |

# Abstract

This "CDM Guide and Project Developers' Portfolio for South Africa" aims at providing Clean Development Mechanism (CDM) project proponents and CDM investors interested in CDM opportunities with a reliable, updated source of information concerning CDM opportunities in various sectors of South Africa. The report was prepared from February to May 2003 and provides:

- An overview of South Africa as an investment destination for CDM investors and purchasers of CER's resulting from CDM projects developed in South Africa; this section includes the institutional infrastructure for climate change/Kyoto Protocol activities and the current views of South Africa on climate change issues;
- An analysis of priority sectors for CDM projects in various sectors in the country;
- Conclusions; and
- A CD-ROM containing three annexes:

  Annex A: A contact list of the most important industry associations in South Africa;
  Annex B: A self-generated list by Project Developers within South Africa of CDM activities in development;
  Annex C: A list of support organizations.

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# Introduction

This "CDM Guide and Project Developers' portfolio for South Africa" aims at potential CDM investors interested in CDM opportunities in South Africa, with reliable, updated sources of information regarding CDM opportunities in various sectors within South Africa and the national approach to CDM investments.

## Special acknowledgements

The report was written in a collaborative approach under the lead of Stefan Raubenheimer and Steve Thorne of the SouthSouthNorth Project, together with assistance from Laurraine Lotter of the Chemical and Allied Industries Association, Geoff Stiles of the Capacity Building Leadership Action Project (CBLA) and Harald Winkler of the Energy Development Research Centre of the University of Cape Town (in his individual capacity).

The annexes devoted to the CDM development and support activities in South Africa are presented by the developers themselves, in the form of a series of standard templates which were completed after a comprehensive respondent's survey. These can be viewed on the accompanying CD-ROM to this publication. This information is unedited and unverified.

Finally this Guide was made possible by the support of UNIDO: the implementation of the UNIDO component is managed by Ms. M. Ploutakhina, Industrial Development Officer at the UNIDO Industrial Energy Efficiency Branch.

The report was initiated in February 2003 and is structured in a main section and annexes, so as to cover its following original objectives:

- To provide an overview of South Africa as an investment destination for foreign CDM investors or CER purchasers, including the institutional infrastructure for climate change/Kyoto Protocol activities and the current views and position of South Africa with respect to climate change issues;
- To analyse various sectors in South Africa, discussing the potential, and priorities for CDM projects in both the supply and demand sides;
- To review the current state of CDM project development in South Africa, types of projects, location, status of development, etc
- To provide a list of institutions/organizations that are involved with climate change and CDM activities in South Africa and that could be a useful source of information and contacts for CDM project proponents and investors in South Africa.

## Background: Kyoto and the CDM

At the third Conference of the Parties, held in Kyoto, Japan, in 1997, the Kyoto Protocol was adopted. The Protocol provided inter alia that developed countries accept differentiated emission limitation or reduction commitments between 2008 and 2012 (representing, for the developed countries as a whole, a reduction of at

least 5% in relation to the combined emissions of greenhouse gases in 1990). The economic effort needed to comply with the goals established in the Protocol will result in significant costs to the economies of each industrialized country. As a result, three mechanisms were established to help the developed countries comply with their greenhouse gas emission reductions or limitation targets. One of these mechanisms, defined as the Clean Development Mechanism (CDM), involves both developed and developing countries. Its implementation is of particular interest to southern countries, because it will allow the transfer of resources and technologies for the reduction of the country's greenhouse gas emissions.

The purpose of the Clean Development Mechanism is to assist Parties not included in annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.

Under the Clean Development Mechanism, parties not included in annex I will benefit from project activities resulting in certified emission reductions; and parties included in annex I may use the certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emission limitation and reduction commitments under Article 3, as determined by the Conference of the Parties serving as the meeting of the Parties to this Protocol.

# 1 South Africa as an investment destination[1]

## History and current context

South Africa has emerged from its long history of Apartheid to forge a new and vibrant society and economy. South Africa is still undergoing profound economic changes after the democratic elections of 1994, which saw the change of government from an apartheid system to democratic governance. This change gave new directions to almost all aspects of government.

South Africa is a developing country located in the southern end of Africa. It has a population of about 43 million people, living on a land area of 1.2 million square kilometres. South Africa is endowed with a spectrum of natural resources including minerals, ranging from precious metals to precious stones and coal.

Economically, South Africa is the largest producer of gold and platinum group metals in the world, the fifth producer of diamonds, and fourth producer of hard coal. Its economy is highly hinged on energy production and use, with fossil fuels coal dominating more than 90% of the primary energy demand and mining (DME, 2002). Coal provides 75% of the fossil fuel demand and accounts for 91% of electricity generation (NER, 2000).

## South Africa as an investment location[2]

South Africa is well placed within a developing country (non-Annex I) context as far as its physical infrastructure (Goldblatt et al., 2001). These strengths are highlighted in the KPMG Investment in South Africa 2000 Report (KPMG, 2000) and mainly relate to a well developed transportation, energy and communication infrastructure. Examples of those areas which have relevance to CDM include:

- South Africa is the most advanced country both technologically and economically in Africa;
- It has an extensive network of well maintained railway lines (34,000 km) and roads (over 6,000 km of tarred freeways and main roads);
- It possesses seven good deep water ports.
- South Africa generates approximately 200,000 GWh of electric power, chiefly coal-derived;
- Communications are efficient and improved technologies are continually being introduced into the system;
- The country is well endowed with natural mineral resources.

[1] This section draws on previous work by Davidson et al., (2002).

[2] This section and the following one are drawn from the National Strategy Study (Goldblatt et al., 2001).

## Key economic and political indicators

Investment takes place within the context of macroeconomic and political conditions and is often determined or influenced by these factors. The Economic Intelligence Unit (EIU, 2000) summarizes key political and economic developments over the next five years in South Africa as being characterized by a new emphasis on macroeconomic policy formation and implementation, with an overall objective of fostering and promoting an environment conducive to employment creation.

Values and forecasts of key economic indicators are summarized in the table below.

Alongside these private agencies the International Monetary Fund (IMF) pronounced positively on South Africa's economic policies in March 2000. From the point of view of country political stability Political Risk Services (PRS), on 1 January 2000, produced the following forecasts of South Africa's risk profile to international business, showing a generally positive outlook:

More recently followed an upgrade, on 7 May, of Standard & Poor's long-term foreign currency ratings on the Republic of South Africa to 'BBB' from 'BBB-', and of its local currency ratings to 'A/A-1' from 'A-/A-2'. The outlook on South Africa is stable.

## Socio-economic context

South Africa is the most industrialized country in Africa. Table 3 below shows some key South Africa's development indicators in comparison to some other regions and the world.

**Table 1. Key South African economic indicators (1999-2004)**

| Indicators | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|
| Real GDP growth (%) | 1.0 | 4.2 | 3.2 | 3.2 | 2.5 | 2.0 |
| Consumer price inflation (ave.; %) | 5.3 | 4.0 | 5.0 | 5.0 | 4.5 | 4.0 |
| Budget balance (% of GDP) | –2.5 | –2.5 | –2.4 | –2.5 | –2.4 | –2.5 |
| Current-account balance (% of GDP) | –0.4 | –1.3 | –1.7 | –1.4 | –1.2 | –0.6 |
| Commercial bank's prime rate (ave.; %) | 18.0 | 14.0 | 13.0 | 16.0 | 18.0 | 17.0 |
| Exchange rate R:$ (ave.) | 6.11 | 6.23 | 6.50 | 7.20 | 7.40 | 7.50 |

*Source:* Economic Intelligence Unit, 1 March 2000.

**Table 2. Political risk profile of South Africa**

| Forecast period | Turmoil | Financial transfer | Direct investment | Export market |
|---|---|---|---|---|
| 18-month | High | B+ | B+ | B+ |
| Five-year | Moderate | B+ | B+ | B+ |

*Note:*
(A+ indicates lowest risk; D indicates highest risk; ( ) indicates change in rating.

*Source:* Political Risk Services, 1 January 2000.

While GDP per capita lies below the world average ($3,160 per capita compared to the global average of $5,040 per capita) this figure does not tell much about the gaps between different races and income levels which is substantial.

## Institutions for investment promotion

In South Africa, there are a limited number of institutions which have the specific mandate of attracting and supporting FDI, each of which will be briefly discussed

**Table 3. Key development indicators for South Africa and the world, 1999**

| Indicator | South Africa | Sub-Sahara Africa | World |
|---|---|---|---|
| Population | 42.1mil. | 643.3 | 6.0 bil. |
| Urban Population (% of total) | 54.7 | 33.8 | 46.6 |
| Paved roads (% of total) | 20.3 | 12.3 | 45.1 |
| Illiteracy—males, (% of males age 15+) | 14.4 | 31.1 | – |
| Illiteracy—females (% of females age 15+) | 15.8 | 48.0 | – |
| Energy use per capita (kg of oil equivalent) | 2,596.6 | 671.2 | 1,671.1 |
| GDP (US $ billions) | 130.2 | 319.6 | 30,700 |
| GDP per capita (US $) | 3,160.0 | 490.0 | 5,040.0 |
| GDP Growth (annual %) | 1.9 | 2.4 | 2.9 |
| Agriculture share of GDP (%) | 3.4 | 17.8 | 5.0 |
| Industry share of GDP (%) | 30.8 | 28.5 | 31.2 |
| Manufacturing share of GDP (%) | 18.8 | – | – |
| Services share of GDP (%) | 65.8 | 53.7 | 63.8 |
| Total exports (fob, US $ millions) | 28,625 | – | – |
| Total imports (cif, US $ millions) | 24,477 | – | – |

*Source:* World Bank.

below and evaluated for their relevance to facilitating CDM investments.

### *Investment South Africa*

Investment South Africa,[3] in "The Investment Brief on South Africa", describes itself as "the national investment promotion agency of the Republic of South Africa, established by the Department of Trade and Industry in 1996. Investment South Africa plays a vital role in implementing the Government's vision of a competitive, outward-orientated economy".

Investment South Africa offers the following free services to foreign investors:

- Information on sectors and industries;
- Consultation on the regulatory environment;
- Facilitation of inward investment missions;
- Links to joint venture partners;
- Introductions to the relevant stakeholders in the private and public sector;
- Information on incentive packages for qualifying sectors and industries;
- Assistance with work permit applications;
- Logistical support for relocation; and
- Dedicated aftercare services.

Trade and Investment South Africa (TISA) is a useful source of material for the potential investor in South Africa. http://www.tradeandinvestmentsa.org.za

TISA describes the opportunity in South Africa in these terms:

*"South Africa is one of the most sophisticated and promising emerging markets in the world. The unique combination of a highly developed first-world economic infrastructure and a huge emergent market economy has given rise to a strong entrepreneurial and dynamic investment environment with many global competitive advantages and opportunities.*

*"Fundamental to the broad objectives of solid and sustainable economic growth and development in South Africa are increased long-term foreign direct investment (FDI) inflows. A wide array of economic and social policies has been adopted by the South African Government since 1994 to ensure the international reintegration of the country's economy, and the creation of an environment for sustained export growth, healthy net capital inflows and improved investor confidence.*

*"The South African Government's macroeconomic policy, as outlined in the Growth Employment and Redistribution (GEAR) strategy, sets out to achieve increased growth and employment, while strengthening the long-term competitive performance of the economy. Key tenets of this strategy, aimed at presenting an attractive and viable investment destination to foreign investors, include fiscal deficit reduction, trade and foreign exchange liberalization, restructuring state assets and promoting skills development.*

*"Achieving a balance between greater openness and improved competitiveness while pursuing a process of industrial restructuring aimed at expanding employment opportunities and productive capacity, is a major challenge. Despite the nature of these challenges, South Africa has made courageous strides in opening the domestic economy to international competition, and can claim significant achievements in this regard, including the following:*

- *Significant reduction in tariff barriers, ahead of the WTO timetable, resulting in the lowest trade weighted average rate of protection in the SADC region;*
- *A market related and competitive exchange rate;*
- *No restrictions on the type or extent of investments available to foreigners, and no governmental approval is required;*
- *The strengthening of competition and the development of industrial cluster support programmes;*
- *The abolition of exchange control on non-residents and the substantial reduction of controls on residents;*

[3] Subsequent to the interviews and literature referenced here, ISA has changed its name to Trade and Investment South Africa but retains the functions referred to here.

- *A proactive strategy to attract foreign strategic equity partners into the process of restructuring state assets and infrastructure;*

- *The introduction of greater labour market flexibility; and*

- *The availability of attractive investment incentives to enhance international competitiveness, technology transfer and foreign direct investment.*

*"South Africa has enormous potential as an investment destination. There is a vast array of opportunities available to the foreign investor and healthy capital flows into South Africa reflect the increased interest and confidence in the country. Furthermore, South Africa's positioning at the southernmost tip of the African continent is strategic for accessing world markets.*

*"Given the high level of competition for foreign direct investment among emerging markets, South Africa has placed greater importance on forming strong economic trading blocs to gain access to key markets. and as a result has entered into a number of bilateral trade agreements. South Africa has also turned its attention to pursuing agreements for greater South-South cooperation. The move to establish trade relations with Mercosur via a free trade agreement with Brazil, and also with India, is top of the Government's export-oriented trade agenda. This will facilitate greater trade with South America and the East. Furthermore, South Africa's participation in the Southern African Development Community (SADC), comprising 14 sub-Saharan African countries, allows access to a market of approximately 140 million, which is expected to grow at an annual rate of around 3%.*

*"Indeed these developments further enhance Trade and Investment South Africa's efforts in promoting foreign investments into the country. As the national trade and investment promotion agency, the investment promotion division at TISA are to promote South Africa as an attractive destination for foreign direct investment and to provide investor facilitation services to incoming investors. As part of the Department of Trade and Industry, TISA plays a critical role in implementing the Government's vision of a competitive, outward-oriented growth platform as described in GEAR.*

*"Together with the nine trade and investment promotion agencies, TISA has identified key investment opportunities available to the foreign investor. These investment opportunities are located within sectors and industries where South Africa offers global competitive and comparative advantages.*

*"Foreign direct investment is welcomed. Whilst investment opportunities are available in virtually all sectors of the economy, Trade and Investment South Africa (TISA) believe there is great value in pro-active and highly targeted investment marketing in its promotional activities. The investment promotion division at Trade and Investment South Africa, concentrates on those sectors where national and provincial research initiatives have indicated a high South African competitive and comparative advantage. It targets its marketing and promotion at countries—and the companies within these countries—that would have a high interest in capitalizing on the advantage these sector opportunities present."*

(http://www.tradeandinvestmentsa.org.za)

### *Provincial investment promotion agencies*

Each of South Africa's nine provinces as its own regional investment promotion institution.

PROVINCIAL INVESTMENT AGENCIES

**Gauteng Economic Development Agency**
P.O. Box 782084
Sandton
2146 South Africa
Tel: +27-11-884-2206
Fax: +27-11-884-3236
http://www.geda.co.za

**Western Cape Investment & Trade Promotion Agency**
P.O. Box 1678
Cape Town
8000 South Africa
Tel: +27-21-418-6464
Fax: +27-21-418-2323
http://www.wesgro.org.za

**Centre for Investment & Marketing in the Eastern Cape**
P.O. Box 19253
Tecoma
5214 South Africa
Tel: +27-43-721-1003
Fax: +27-43-721-1006
http://www.cimec.co.za

**Mpumalanga Investment Initiative**
P.O. Box 1330
Nelspruit
1200 South Africa
Tel: +27-13-752-5384
Fax: +27-13-752-5385
http://www.mii.co.za

**Kwazulu Natal Marketing Initiative**
P.O. Box 1105 Durban
4000 South Africa
Tel: +27-31-907-8700
Fax: +27-31-907-5685
http://www.kmi.co.za

**Northern Province Investment Initiative**
P.O. Box 3490
Pietersburg
0700 South Africa
Tel: +27-15-297-4414
Fax: +27-15-297-4415

**North West Development Corporation**
P.O. Box 3976
Rivonia
2128 South Africa
Tel: +27-11-803-5510
Fax: +27-11-803-1754

**Department of Economic Affairs Free State**
P.O. Box 264
Bloemfontein
9300 South Africa
Tel: +27-51-403-3604
Fax: +27-51-403-3437
http://mangaung.ofs.gov.za

**Department of Economic Affairs Northern Cape**
Private Bag X5016
Kimberley
8300 South Africa
Tel: +27-53-831-4227
Fax: +27-53-831-3668

### *Industrial Development Corporation (IDC)*

The IDC's mission states that "the IDC is a self-financing State-owned development finance institution whose primary objectives are to contribute to the generation of balanced, sustainable economic growth in South Africa and to the economic empowerment of the South African population, thereby promoting the economic prosperity of all citizens. The IDC achieves this by promoting entrepreneurship through the building of competitive industries and enterprises based on sound business principles." The IDC has a number of specific sectoral strategies.

#### Industrial Development Corporation

The Industrial Development Corporation of South Africa (IDC) is a State-owned development finance institution whose primary objectives are to contribute to:

- The generation of balanced and sustainable growth in South Africa;
- The economic empowerment of the South African population;
- The economic prosperity of all citizens by promoting enterpreneurship through the building of competitive industries and enterprises amongst small, medium and large manufacturing firms; agri-businesses; tourism; and small-scale mining enterprises.

For details contact:

**Industrial Development Corporation of South Africa Ltd.**
P.O. Box 784055
Sandton
2146 South Africa
Tel: +27-11-269-3000
Fax: +27-11-269-3116
http://www.ide.co.za

### *The Development Bank of South Africa*

The organization focuses on investment opportunities and joint ventures/partnerships in public and private sector financing, mainly for infrastructural development, through loans, equity and guarantees.

The DBSA's mandate is to:

- Invest in infrastructure and facilitate the provision of infrastructural development finance;
- Finance sustainable development in partnership with the public and private sectors;
- Respond to development demands and act as a catalyst for investment.

## Development Bank of Southern Africa

The Development Bank of Southern Africa (DBSA) provides policy advice, planning, programming and financing for infrastructure provision. It cooperates with the private financial sector in support of local authority infrastructure needs, also promoting public-private partnerships.

For details contact:

**Development Bank of Southern Africa**
P.O. Box 1234
HALFWAY HOUSE
1685 South Africa
Tel: +27-11-313-3711
Fax: +27-11-313-3409
http://www.dbsa.org

# 2 South African government's role in climate change issues

## Approach to climate change policy

The South African Government ratified the UNFCCC in August 1997 and acceded to the Kyoto Protocol in March 2002.

In order to fulfil the requirements of the UNFCCC, South Africa has prepared an Initial National Communication to the UNFCCC, and will submit this to the next Conference of the Parties.

South Africa sees addressing climate change issues as an integral part of achieving sustainable development. Increasingly climate change issues are being incorporated into sectoral policies. As a relatively high GHS emitter, South Africa recognizes the necessity to delink industrial development and GHG emissions. One of the mechanisms to achieve this is investment in CDM projects.

## Host country approval of CDM projects

The focal point for climate change in South Africa is the Department of Environmental Affairs and Tourism (DEAT). Within the department, a directorate has been established to deal with climate change, the Directorate of Global Climate Change and Ozone Layer Protection. The CDM office (or "Designated National Authority" (DNA)) for CDM is located in the Department of Trade and Industry (the dti). The website of this department contains valuable information for investors in South Africa. The reference is: www.thedti.gov.za

The Fund for Research into Development, Growth and Equity of the dti is about to award a tender for the development of a comprehensive CDM Investment Strategy.

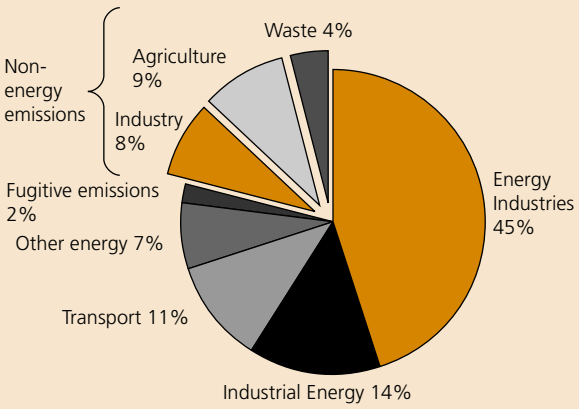
The process of considering approval will include consideration of sustainable development criteria, which are in the process of being finalized. Projects that promote benefits for local communities and create local manufacturing capacity are likely to be favourably received. Project developers will be required to present Project Design Documents for CDM activities before registration by the CDM Executive Board, whereupon they will be considered for approval by the DNA.

## Emissions in South Africa

### *Major sources of GHG emissions in South Africa*

Compared to other major developing countries, South Africa's emissions intensity is relatively high, in that it emitted 0.96 kg $CO_2$ per dollar of GDP in 1999 compared to a non-OECD average of 0.66. South Africa ranks in the top 20 countries in the world in emissions of greenhouse gases, notwithstanding its relatively small population. Reliance on coal resources for electricity production is the main reason behind this emission profile, and other reasons include the production of synthetic liquid fuels from coal, a high proportion of energy intensive industry and mining, and the inefficient use of energy.

**Figure I. South Africa's greenhouse gas inventory by sector, 1994**




*Source:* Van der Merwe & Scholes, 1998.

*Data source:* SSA, 1998, 1999; IEA, 2001.

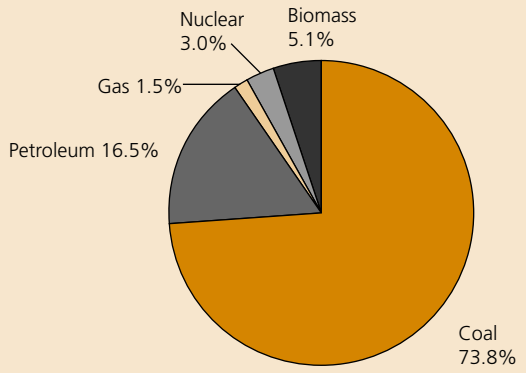
A summary of South Africa's total emissions in 1990 for major greenhouse gases indicates that South Africa contributed 1.02% to the total global emissions. The 1999 figures cited by IPCCC, which are admittedly estimates, show 1.6%, or 99 MT C-E/a vs a world total of 6,143 MT, with constant growth being predicted.

The energy sector, including energy production and use, contributed 78% of GHG emissions (297,564 tons $CO_2$ equivalent), agriculture 9.3%, industrial processes 8.0% and waste 4.3%. Comparing the three greenhouse gases in the inventory, carbon dioxide contributed by far the most, 83.2% in 1994. Methane contributed 11.4% and nitrous oxide 5.4% respectively. Given the predominance of carbon dioxide, this analysis focuses on $CO_2$ emissions.

The energy sector is a key source of emissions (see figure I), which include a number of critical energy related activities such as: energy industries (45% of total gross emissions), energy used in manufacturing and industry (14%), energy used in transport (11%), fugitive emissions from fuels (2%), and other energy related activities (6.6%), which include commercial (0.2%), residential (2.0%) and agricultural (4.4%) use of energy (calculated from (Van der Merwe & Scholes, 1998)).

# 3 Priority sectors and CDM project opportunities in South Africa*

**Figure II. Share of total primary energy supply, 1999**




## Energy supply and demand

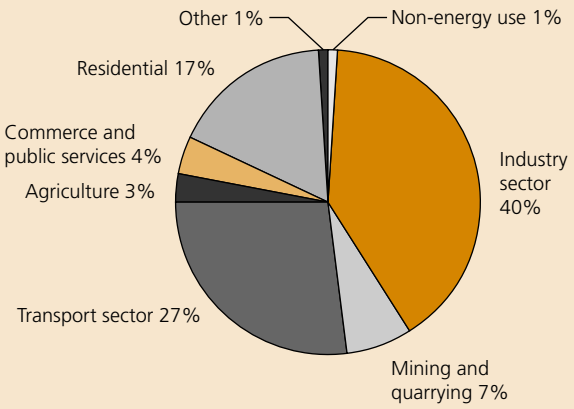
### *Profile of the South African energy sector*

The greenhouse gas profile of South Africa is strongly related to its energy sector, as discussed above. Figures II and III show the distribution of energy consumption in different sectors and the share of different energy supply sources. It can be seen that industry, mining, and transportation consume a large share of final energy. Energy consumption levels in South Africa are significantly higher than many other developing countries, particularly consumption of electricity. Statistics show that South Africa consumes half of Africa's electricity with only 5% of its population. Since the production of electricity is mostly coal based, it results in South Africa being the largest emitter of greenhouse gases in Africa. The primary source of GHG emissions is production of $CO_2$ from energy use.

### *Mitigation options and potential for CDM*

Given that the energy sector contributes most to GHG emissions, the potential for CDM projects is large. This includes both supply-side and demand-side projects. Many projects might focus on the electricity sector, but

**Figure III. Share of final consumption, 1999**




*Source:* DME, 2001.

* Very useful sector profiles can be downloaded from: http://www.thedti.gov.za/newsandevents/sectorbrochures.htm

there are also opportunities to replace other fuels with lower-emitting ones.

Concerning technology eligibility, nuclear projects are the only energy technologies that are clearly excluded from the CDM. Some projects are given fast-track prioritization, and subject to less vigorous screening. Fast-track approval applies to smaller-scale renewable energy and energy-efficiency projects, where transaction costs might negatively affect project viability. Small-scale is defined by the UNFCCC as "renewable electricity projects less than 15 megawatts, energy efficiency projects less than 15 gigawatt hours/year, or other projects displacing less than 15 kilotons of carbon per year".

### *Reducing emissions from electricity generation*

Two possible scenarios to mitigate GHG emissions from electricity generation were evaluated, namely demand side management and a second scenario that uses a mix of more efficient supply technologies. It is estimated that demand side management (DSM) could reduce GHG emissions by a total of 265 $MtCO_2$ (10.6 $MtCO_2$/year) during the period 2001 to 2025 (Howells, 1999; Goldblatt et al., 2001).

The second mitigation scenario considered the use of a cost-effective mix of options of electricity generating processes, in order to reduce $CO_2$ emissions effectively. By the year 2025, the energy-generating plant mix was assumed to be 10% nuclear, 9% combined cycle gas turbine, 12% imported hydropower, 1% generated by renewable sources and the balance by coal-fired power stations. It was estimated that during the period 2001 to 2025, a total reduction of 1,055 $MtCO_2$ (42.2 $MtCO_2$) could be achieved with this mitigating option.

### *Renewable energy technologies*

There is some experience with RETs in South Africa, but the potential for renewable energy is still largely untapped. Jointly, such projects could help make the fuel mix in South Africa significantly cleaner. Some existing and planned RE interventions include:

- To evaluate whether utility scale, renewable electricity generation could extend the renewable electricity capacity, Eskom is conducting research. In 1998, Eskom initiated a South African Bulk Renewable Energy Generation (SABRE-Gen) programme (www.sabregen.co.za)
- Plans are to demonstrate wind, solar thermal, biomass and wave power for electricity generation. In 2001, Eskom announced plans to develop 100-200 MW renewable electricity demonstration projects using wind (Lombard, 2001). These would have been the largest such investments ever in South Africa; however, recent reports indicate that these plans have been scaled back to 10 MW. The first turbine was installed in August 2002 with a capacity of 660 kW, and two more demonstration turbines are intended to be constructed at Klipheuwel (near Durbanville, Cape Town) during 2002 (Smetherham, 2002).
- SABRE-Gen also is conducting research on parabolic trough technology (Darroll, 2001) which has been commercialized in California in 30-80 MW units. No actual demonstration units have been constructed by Eskom. A 25 kW solar dish, however, was erected at the DBSA, combined with a Stirling engine, as a demonstration of the potential of renewable energy for WSSD.
- The proposed Darling Wind Farm, a 5 MW wind facility on the West Coast, was named a National Demonstration Project by the energy minister (Otto, 2000). The wind farm would be a grid-connected wind power facility, with a capacity factor of 36% and an annual output of 31,500 MWh. The potential exists to expand the facility to 10 MW. The first turbines were planned for completion by August 2002, but this goal was not reached. However, the developers have secured a contract to supply the Cape Town municipality. To be viable, the developers (the Oelsner Group) say they require tariffs of 38c/kWh. Eskom currently charges the Swartberg-Malmesbury municipality approximately 20 c/kWh, while Cape Town pays 11-12 c/kWh for bulk electricity.
- A solar chimney with a flue height of 1,500 m has been proposed for the Northern Cape (Stinnes, 2001).
- The World Bank's Prototype Carbon Fund (PCF) is considering a project in Durban using landfill gas for 20 MW electricity generation. The electricity would be sold to Durban municipality, displacing coal-fired energy purchased from the grid. The PCF envisages this leading to similar projects in other municipalities, up to 50 MW. Concerns have been raised by local communities that the project might extend the life of the landfill, and that sound waste management practices—waste minimization, separation and measures to reduce local impacts—need to be guaranteed. see: http://cdm.unfccc.int/EB/Panels/meth/CallForInputs/NM0010

Investors interested in renewable energy technologies in South Africa could pursue:

#### Wind power

While both Eskom and the Darling Wind farm are installing the first turbines, these do not begin to reach the estimated potential. There are various estimates of the potential, ranging between 2 and 24 TWh/year, which means that current facilities exploit less than1% of the potential.

#### Biomass and biodiesel

Existing use of renewable energy in South Africa primarily means biomass. Except for a few small hydroelectric facilities and a small number of other renewable energy demonstration projects, biomass use has been the only significant source of renewable energy until very recently. Quantitative research on national biomass consumption, however, has been very limited, with the Department of Minerals and Energy Biomass Initiative being the most authoritative report (Williams et al., 1996). Potential projects might use biomass for production of liquid fuels, or for electricity generation. Bio-diesel has been commercially produced in several European countries for close on 15 years, and in the United States for the past 5 years. Considerable expansion in the production of bio-diesel is anticipated in these countries. Since it has already been accepted in developed countries, bio-diesel technology can quickly and easily be implemented in South Africa. The production potential of bio-diesel without impacting negatively on food production is large, while impressive numbers of jobs can be created in the process. Using some 2.3 million hectares of land, it has been estimated that 1.4 billion litres of bio-diesel could be produced. Assuming that half of this production could be achieved in the next 10 years, this results in 700 million litres. Assuming 40 MJ/litre, this would be an additional 7,778 GWh (0.78 Mtoe; 28 PJ), which is 17% of current diesel use for road and rail transport. We suggest a target of 10% of annual diesel consumption from renewable sources to be reached within 10 years.

#### Solar thermal electricity

There is no doubt that the theoretical potential of solar energy is by far the largest source in South Africa (Eberhard and Williams, 1988), larger than wind or coal. Howells estimates the potential at 2.36 million TWh/ year (Howells, 1999). However, solar thermal technologies for electricity generation are little explored. Apart from RD&D by SABRE-Gen into solar thermal technologies, a solar chimney has been proposed for the Northern Cape. Enormous opportunities exist for CDM projects to take these technologies to commercialization.

#### Photovoltaic solar power

PV systems have been used primarily for off-grid solar home systems in South Africa:

- The Schools and Clinics Electrification Programme (SCEP) provided off-grid energy services with solar home systems (SHS) to community facilities. 1,852 schools had been connected by 2000, and an unspecified number of schools (DME, 2001: 97).
- A Shell/Eskom joint venture for SHS electrification built 6,000 systems for residential use by 2000 (DME, 2001; Spalding-Fecher, 2002c).[4] Based on recent reports (EC et al., 2000; Stassen, 2001), the size of the solar home system market, outside of the major government programmes, has been estimated at 28 million Rands in 2000 (Spalding-Fecher, 2002b).
- Roll out of the off-grid electrification programme began in 2002. The programme will target 350,000 homes for solar home systems, but had been slowed down by negotiations among government, Eskom, and the concessionaires. In 2002, DME agreed to the subsidy level (Kotze, 2001) and Eskom's role in the programme was clarified. Concessionaires have signed interim contracts, with NuonRAPS, EdF and Solar Vision each installing some 200 systems.

### *Reducing emissions from fossil fuels*

Lower emission from fuel switching on the supply side can be achieved in several existing technologies.

## Chemical and Mining Industries

### *Chemical*

The South African chemical industry is dominated by local companies which developed from the industry's historical base in explosives for the mining industry, followed by development of the nitrogen-based fertilizers

[4] In 2002, indications were that 4,700 of these systems were operational (Afrane-Okese, pers. comm.).

and sulphuric acid. The strategic decision to adopt the Fischer-Tropsch process to derive oil from coal on a large scale resulted in the foundation of a significant polymer industry in South Africa.

The potential shortage in the availability of petroleum products and of primate feedstocks such as olefins and basic aromatics are becoming critical issues for sustainable growth in the industry. The possibility of a number of feedstock projects such as a Naptha Cracker as well as a new worldscale refinery with an aromatics unit are being proposed. This is expected to lead to further downstream investment potential in major imported chemicals such as ethylene, glycol, styrene, and terephthalic acid.

The petroleum and petrochemical industry is dominated by four oil refineries (3 coastal, 1 inland) plus the Sasol and Mossgass Fischer-Tropsch based operations. The rest of the chemical manufacturing sector consists mainly of AECI, Sentrachem and fertilizer plants such as Indian Ocean Fertilizers and Omnia.

During 1996 the chemical industry experienced relatively good growth primarily due to an exceptional rainfall season which saw fertilizer and other agrochemicals grow in excess of 50%. Good growth in the plastics industry resulted in good demand for feedstocks such as olefins and other polymer resin feedstocks. Other domestic markets experienced growth mainly in line with the GDP growth of 3.5%. The growth rate of the plastics industry has been averaging between 6-7% for the past few years.

Estimated size of the basic chemical manufacturing industry for 1996 is 10.3 million tons of inorganic and organic basic chemicals. The total production volume of fuels and lubricants is estimated at 30 million tons. In addition the production volume of formulated products such as paints, detergents, etc. was 1.2 million tons.

The export volume of basic chemicals during 1996 was estimated at 1.9 million tons, or 18% of the total production volume. Roughly an equal quantity (1.8 million tons) of basic chemicals was imported during the same period. However, these imports are mostly higher value-added fine chemicals, compared to exports which are more basic products such as phosphoric acid, alcohols and solvents.

While chemical production contributed 15% of South African manufacturing output in 1996, chemical products accounted directly for 12% of total manufacturing exports. This would exclude the significant volumes of chemicals going into the exports of other industries as intermediate products.

Exports from the industry have increased by over 20% in the past four years in real terms, as opposed to the 3% growth seen in exports as a whole. Clearly, the chemical industry is a major force in reshaping the economy's orientation to trade.

South Africa is committed to new international practice standards for research and development, manufacturing, transportation, distribution and disposal, right through to customer end-use.

### *Mining*

In 1997 South Africa's mining industry contributed about R7.8 billion, or 8.9% to gross domestic fixed investment (GDFI). Sales of primary mineral products accounted for 37.3% of total export revenue. South Africa is one of the world's richest countries in terms of minerals, with the world's biggest reserves of gold, manganese, platinum metals, chromium, vanadium, andalusite and alumino-silicates, as well as sizeable reserves of iron ore, coal, diamonds, uranium, titanium and nickel. Its mining industry is one of the most advanced in the world, especially in deep level mining.

The recent trend toward monopoly capitalist industries is also evident in the mining sector. The emergence of more focused mining companies has resulted in the establishment of large mining houses such as Anglogold, Gold Fields, Amplats and Implats. These large mining corporations account for most of the gold, uranium, zinc, platinum-group metals, lead, diamonds and silver produced, as well as other minerals. Iscor produces the country's iron and steel requirements from minerals derived from its own mines. Sasol operates a number of collieries which provide raw materials for its synfuel plants. Beneficiation of minerals before export is a major growth area. De Beers mining is also one of the big mining groups in South Africa.

Specific opportunities for potential CDM projects in these two sectors are explored in the examples below:

SWITCH FROM COAL TO GAS

In the electricity generation sector, there is a move towards greater use of natural gas instead of coal as the

sole fuel. Natural gas is likely to form a larger percentage of South Africa's fuel mix in the medium term.

Two South African gas networks are expected to import gas from neighbouring countries. The gas network from Mozambique could supply natural gas to replace some of the coal feedstock used to manufacture chemicals at Sasolburg and synthetic liquid fuels at Secunda. It is unclear to what extent both of these projects could happen due to debates surrounding reserve sizes. An amount of 10% substitution was chosen as a "middle of the road" estimate. This, it is assumed, takes place from 2002 and over three years (Howells, 1999). Similar issues apply to perhaps the largest mitigation project in a single facility, namely switching the feedstock for SASOL synfuel from coal to gas. SASOL has already identified the Sasol Natural Gas Conversion Project (SNGCP) as a potential future CDM project. The SNGCP entails building a pipeline from the Temane gas field in Mozambique to Secunda. This natural gas will supplement coal as a feedstock at Sasol Synthetic Fuels at Secunda and replace coal as a feedstock at Sasol Chemical Industries at Sasolburg, with the effect of reducing GHG emissions from these plants. The 26-inch diameter pipeline will be approximately 895 km in length with a pressure rating of 125.7 bars for the full line. The pipeline is designed to deliver 122 MGJ/annum without transmission compression, which could be doubled with quarter point compression. substitution of gas for goal in synfuel production and in chemicals production. My understanding is that SASOL wants to bring gas to Sasolburg first to substitute for coal in the chemicals process, and then (if reserves allow) to Secunda for substitution in synfuel production. This is two projects, not one, and both may not occur because of limits on the reserve size. It is worth mentioning, too, that a third use—sending gas through the regional network to Joburg, Witbank, and even Durban for industry use—is also a serious possibility.

### New coal technologies

New coal technologies, such as advanced pulverized coal combustion and atmospheric and pressurized fluidized bed combustion, are more efficient, but also generally more expensive than Eskom's current coal plants. They are not in current short-term forecasts, so they may also be able to pass the additionality screens and be attractive as potential CDM projects.

### Liquid fuels and synfuels

Mitigating options were considered for both the refining of crude oil and the production of synthetic fuel. One mitigating option would be to import refined petroleum products and not to build additional refinery capacity. It is estimated that during the period 2000-2030, a total reduction of 103 $MtCO_2$ equivalent could be achieved with this mitigating option. In the synthetic fuel production industry, the substitution of 10% coal consumption with natural gas would result in a total reduction of 168 $MtCO_2$ equivalent (Howells, 1999).

### Coal mining

Some options exist for reducing emissions in coal mining, including improved washing, catalytic combustion, ash filling with extraction/or with pillar support, methane drainage and combustion of discards. A project is proposed for Fluidized Bed Combustion using discard coal in Richards Bay.

Further elaboration of the options (Goldblatt et al., 2001):

- Adopting higher extraction ratios underground: Pillar methods of mining leave considerable quantities of coal not mined in the form of support pillars from which methane diffuses into the atmosphere. However, there are significant limitations on the widespread use of total extraction underground. The disadvantages of total extraction would be reduced if other means of roof support, such as ash filling, could be employed.

- Extraction of remnant pillars: The extraction of remnant pillars that are readily accessible by opencasting would stabilize the under-mined ground permanently and would prevent spontaneous combustion. It is assumed that there are 15 billion tons of coal immobilized in pillars, of which one third is close enough to the surface to be mined by opencast methods. It is therefore assumed that 5 million tons of the coal immobilized in pillars will be recovered, which will replace coal currently produced from deeper and more methane-rich areas.

- Improved coal utilization resulting from improved coal washing: Improving the efficiency of the washing plants will result in a reduced discard coal fraction. Efficiency improvements of 0.15% per annum have been achieved and are assumed for the mitigating options study.

- Improved combustion technology to burn discards: At present there are difficulties in burning discard coal because of the high ash content that leads to excessive erosion of boiler internals. Eskom is undertaking a pilot study of fluidized bed combustion that would allow coal discards to be used, and thus reduce the amount of coal that would need to be mined.

- Removal of emitted methane prior to mining: Methane drainage prior to mining through holes drilled from the surface has been widely practised. Widespread investigations into the possibility of establishing an industry to recover the methane for local heating duties have been undertaken.

- Catalytic combustion of methane: An investigation is being undertaken in Canada to evaluate the catalytic flow reversal process, which catalyses the exothermic conversion of methane to carbon dioxide and water. The heat generated by the combustion can also be recovered.

- Coal-bed methane: Previously unemitted methane in coal-beds may also show big potential as CDM projects.

## Housing

Providing housing is a major development objective of the South African Government. The aim is to remove a backlog of between 2 to 3 million houses, with the aim of building 300,000 new units per year (ANC, 1994). There is an existing housing subsidy of R17,500 per household. There is experience in several projects focusing on small-scale energy efficiency interventions in low-cost housing, but potential for replication is large. Interventions in middle and upper-income housing are a relatively unexplored opportunity, even though the energy consumption (and therefore savings) are larger per household.

These interventions particularly strongly link the two objectives of the CDM, namely reducing emissions and promoting sustainable development.

### *Energy efficiency*

This opportunity includes efficiency through improved thermal performance of houses, efficient appliances and passive solar design (see table 4).

There is great potential to install a range of energy efficiency measures in new houses. These include efficient lighting (CFLs), insulation of ceilings as well as optimizing design (e.g. orienting houses north). Efficient appliances for cooking, water heating (solar water heaters) and space heating can save both energy and GHG emissions.

Passive solar design is a way of directly harnessing heat from the sun to replace fuel and electricity use for space heating. There is already extensive South African research in this area that shows potential electricity savings (and therefore use of solar energy) of 60-75% of space heating energy in low cost housing and 30% in middle income housing, with relatively short economic payback times, using proper orientation and materials, appropriate roof overhangs and window sizing, and adequate insulation (Irurah, 2000; SEED, 2002; Winkler et al., 2002). Space heating is roughly 8% of electricity use in typical suburban households. For households using coal and paraffin, however, space heating can be up to 40% and 25% of household energy use, respectively (Simmonds and Mammon, 1996). If all new homes were required to implement passive solar design and thermal efficiency measures, and existing homes were retrofit, we could expect potential savings of at least 40% of current consumption, or 11,500 GWh (0.99 Mtoe; 41.5 PJ).

### *Solar water heaters*

Few SWHs have been installed in low-income households, exceptions being in rental stock, such as private or publicly owned workers' hostels. The only significant project has been in Lwandle township (Thorne et al., 2000; Ward, 2002). This is despite the fact that the DME announced support from the Global Environmental Facility for a National Solar Water Heating Programme (DME, 2001a). There is significant potential for CDM projects to remove barriers to the further diffusion of this technology in South Africa.

Current residential consumption of electricity amounts to about 28,700 GWh (2.47 Mtoe; 103 PJ). Assuming that some 30% of total domestic electricity consumption is used for water heating, based on Eskom load estimates, market penetration of one third, and that 60% of this electricity can replaced by solar energy by using a hybrid solar-electric water heating system (Spalding-Fecher et al., forthcoming), then the potential savings for urban residential households come to 5,200 GWh.

### *Fuel switching*

Further research is needed on quantification of the potential of delivering renewable liquid and other fuels for household consumption. Examples of these are ethanol gelfuel, plant oils for stoves and biogas. It is clear that the production and use of these in rural areas could have significant rural development multiplier effects in terms of both employment and wealth creation, as well as forex savings implication for the nation, making them attractive CDM projects for South Africa.

### *Aggregate potential*

A range of technical interventions and their potential reductions (aggregated to national level, not per project) are reported in the table below, comparing the total potential for emission reductions.

Some interventions focus on lighting (replacing incandescent bulbs with CFLs; more efficient practices). More energy is used in the residential sector for cooking, making efficient wood or coal stoves more attractive than inefficient models. Fuel switching for cooking might involve moving from electric hot plates to gas or paraffin cooking. Water is heated with electricity in most middle and upper-income homes, but with multiple fuels in typical low-income households. In both cases, emissions may be reduced by introducing solar water heaters (simple or hybrid). Energy can be saved by insulating hot water geyers, and by efficient use (e.g. by changing time of use). To improve space heating, a range of passive solar methods are possible (e.g. insulation, better ceilings, orientation, etc) or switching for active heating from electricity to gas. Lower-emissions sources of electricity overall could come from solar homes systems or distributed wind generation.

**Table 4. Energy efficiency in residential housing**

| Residential | Emission reduction cumulative $MtCO_2$ over 30 years |
|---|---|
| Replace incandescents | 11 |
| Efficient lighting practices | 18 |
| Efficient wood/coal stove | 5 |
| Hot plate to gas cooking | 5 |
| Hybrid solar water heaters | 88 |
| Solar water heaters | 2 |
| Heat pumps for hot water | 19 |
| Insulation of geysers | 25 |
| Efficient use of hot water | 22 |
| Thermally efficient housing | 9 |
| Electric to gas space heating | 25 |
| Appliance labelling & standards | 25 |
| Solar home system | 2 |
| Distributed wind generation | – |
| Paraffin to gas cooking | 2 |

*Source:* De Villiers & Matibe, 2000.

## Industry generally

### *Industrial boilers*

Converting industrial boilers from heavy fuel oils, diesel or coal to biomass from forestry waste and biogas are attractive options.

### *Industrial energy efficiency*

Several concepts promoting energy-efficiency have been tested in South Africa and shown to deliver significant GHG emissions reductions with relatively quick economic payback periods. Industrial demand-side management can focus on energy savings through more efficient processes (ERI, 2000).

For CDM projects, there are a number of opportunities which have been identified by previous studies as having good potential for emissions reduction:

- Fuel switching for thermal energy supply
  - From coal and oil to natural gas
  - From electricity to natural gas
- Energy efficiency improvements in steam and thermal energy supply systems
  - Gas-fired boilers and steam systems
  - Coal fired boilers and steam systems
  - Oil fired boilers and steam systems
  - Electrode boilers and steam systems
- Energy management (energy efficiency) in the following areas:
  - Variable speed drives;
  - Electrical motors;
  - Lighting; and
  - Compressed air systems (Trikam, 2002a).

## Landfill gas

Historically, there has been little or no attention paid to the draining of gases from landfill sites in South African

municipalities. CDM projects can encourage the collection and productive use of methane and other landfill gases. Existing and future landfill sites can be designed to maximize this resource in a sustainable and environmentally beneficial way. Secondary benefits include the sedimentation of the material in the landfill and hence the prolonged life of the landfill before municipal waste is disposed of further and further afield, with the associated increases in costs and emissions. Currently a number of landfill CDM projects are being pursued.

## Commercial buildings/building industry

### *Efficiency in buildings*

The construction industry contributes approximately 6% of total GDP. Confidence levels in the industry are improving, as the residential sector improved strongly during the fourth quarter of 1999 (up 13% on the same period for 1998) and 23% higher than the third quarter of 1999. Confidence levels in the non-residential sector have also improved, although not as dramatically as in the residential sector.

Forecasts for the year 2000 are expected to be high for the building industry. All indicators are being monitored closely to identify any significant turning points which will signal the starting point of a recovery process, which is hoped to last for at least three to four years.

A number of energy-efficiency projects have been identified by the International Institute of Energy Conservation, the Energy Research Institute, the Energy and Development Research Centre, Green Buildings for Africa, and others (see table 5). Commercial buildings can improve lighting, heating and cooling operations (HVAC), both saving energy and reducing emissions. There are also opportunities for CDM projects in variable speed drives for fans, as well as solar water heating at the commercial level.

**Table 5. Energy efficiency in commercial buildings**

| Commercial | Cumulative $MtCO_2$ over 30 years |
|---|---|
| New building thermal design | 80 |
| HVAC retrofit | 41 |
| Efficient new HVAC systems | 50 |
| Lighting retrofit | 21 |
| New lighting systems | 16 |
| VSDs for fans | 16 |
| Heat pumps | 20 |
| Energy star equipment | 9 |
| Solar water heating | 22 |
| Fuel to natural gas | 13 |
| Electric to natural gas | 18 |

*Source:* De Villiers, 2000.

#### New building thermal design

The largest single influence on building energy consumption is the design of the building. New building envelope design will reduce energy consumption through:

- optimization of thermal mass for local climate;
- optimal insulation;
- glazing;
- correct orientation;
- building shape.

Potential savings depend very much on the payback of the initial investment. Using the discussion on the potential for energy efficiency in buildings as a basis, it is estimated that optimal thermal design of a new building up to 2030 can reduce heating, ventilation and cooling energy requirements by 40% relative to the baseline with an average payback of five years. The reader should note that these estimates are very uncertain.

Barriers to improved thermal design are increased initial cost, split incentives (the developer often does not have to pay for the energy bill), and lack of training of architects and consulting engineers in efficient building practices.

Improved thermal design of buildings will reduce non-greenhouse gas emissions by reducing fuel requirements. Commercial sector emissions are important from a health perspective because they are emitted in high density population areas. South Africa lags behind the developed world in efficient building design and potential measures are all technologically proven.

#### HVAC retrofit

Options for a heating, ventilation and cooling (HVAC) retrofit include:

- switching off air-conditioning when there are no occupants;
- eliminating reheat, in which pre-conditioned air is reheated in a heating coil in the duct system;
- prevent mixing of cold and hot air;
- new air-conditioning temperature set-points;
- ventilation with outside air and night cooling;
- use of evaporative cooling;
- use of computerized energy management systems.

The University of Pretoria library retrofitted a HVAC system and reduced energy consumption by 37% with a 2.5 year payback (Grobler et al., 1993). It is assumed that similar energy savings could be realized in 50% of existing buildings over a ten-year period, with an average payback of three years.

Barriers include a lack of awareness by building owners of the benefits of a HVAC retrofit and the mindset that energy services are merely a support service for commercial activity and therefore little attention is given to cost efficiency.

An HVAC retrofit will reduce non-greenhouse gas emissions by reducing fuel and electricity requirements. A small increase in employment would result in the HVAC industry.

### Efficient HVAC systems for new buildings

The same measures as in HVAC retrofits apply. In addition, HVAC systems should not be overdesigned, leading to poor efficiencies. HVAC systems designed for new buildings will be more energy-efficient than those in existing buildings under the baseline scenario. It is estimated that efficiencies for new systems up to 2030 could be reduced by a further 25% with a payback of five years. Once again the reader should note that these estimated are highly uncertain.

The same barriers that apply to the two previous mitigation options apply to new HVAC systems as well.

Efficient new HVAC systems will reduce non-greenhouse gas emissions by reducing fuel requirements. A small increase in employment would result in the HVAC industry.

### Lighting retrofit

Efficient lighting includes the following:

- Replace low wattage incandescent lighting with fluorescent lighting.
- Replace high wattage incandescent lighting with high-pressure metal halide or sodium lamps.
- Replace standard fluorescent tubes and magnetic ballasts with more efficient fluorescent tubes and electronic ballasts.
- Replace incandescent lighting with high-pressure metal halide or sodium lighting.
- Replacing existing reflectors with more efficient reflectors.
- Introducing lighting controls including more switches, photo-electric sensors and occupancy sensors.
- Reduce lighting levels where illumination is too high.

Two large lighting retrofits were carried out at Megawatt Park (Grobler, 1999). In 1996 automation and integration of the lighting system with the building management system realized energy savings of about 5,543,000 kWh annually (26% of lighting energy). In 1997 standard fluorescent tubes and magnetic ballasts were replaced with more efficient fluorescent tubes and electronic ballasts. The total cost was R2,313,559 and total savings were 3,216,000 kWh annually (21% of lighting energy). This gives a ratio of R0.72 per annual kWh saved.

Numerous case studies of lighting retrofits in the United States (US DOE, 1999) indicate that financially viable building lighting retrofits save between 20% and 40% of lighting energy. It is assumed that 30% of lighting energy can be saved in 70% of South African buildings within the next ten years. It is assumed that the average cost of lighting retrofits is the same as for Megawatt Park (R0.72 per annual kWh saved), and that this represents a once-off incremental cost.

Barriers to a lighting retrofit include lack of awareness by building owners and the mindset that lighting is a

service that is used on demand without any thought about cost-effectiveness.

Efficient lighting will reduce non-greenhouse gas emissions by reducing the amount of electricity required. Efficient lighting technologies have existed for some time and technological support is available in South Africa.

### Efficient lighting systems for new buildings

There is greater potential for efficient lighting systems in new buildings compared with existing buildings, but the baseline scenario will capture some of these. It is estimated that lighting energy use in new buildings could be reduced by 20% on average with an average payback of three years. As with the lighting retrofit, it is assumed that the cost of replacing lamps does not change significantly in the mitigation scenario.

Barriers to efficient lighting systems for new buildings are increased initial cost, split incentives (the developer often does not have to pay for the energy bill), and lack of training of architects and consulting engineers in efficient building practices.

Efficient lighting will reduce non-greenhouse gas emissions by reducing the amount of electricity required. There are no technological barriers to new efficient lighting systems.

### Variable speed drives for fans

Electric motors normally operate at a constant speed (and electricity consumption) no matter what flow is required, and valves or dampers used to control the flow. Variable speed drives allow electric motors to use less electricity by automatically changing the speed (and electricity consumption) of the motor in proportion to the flow required. Variable speed drives were installed at Megawatt Park in 1997 at a cost of R900,000, saving 1,599,000 kWh annually (Grobler, 1999) which is 15% of HVAC energy consumption (30% of fan energy consumption). This gives a cost of R0.56/kWh saved. The total amount of electricity used on fans is estimated to be 53% of HVAC electricity consumption (Piani, 1997). Only variable volume air handling units can operate with variable speed drives. It is estimated that 25% of air handling fans are eligible for variable speed drives and that these fans could have variable speed drives installed by 2015. The average life of a variable speed drive is 15 years.

Barriers to the installation of variable speed drives for fans are lack of awareness of their benefits, the risk that promised savings will not materialize, and the high investment cost.

Variable speed drives will reduce non-greenhouse gas emissions by reducing the amount of electricity required. Variable speed drives are currently imported, but if sufficient demand was created, local production would be possible. Variable speed drives have been successfully operated for over a decade.

### Heat pumps for water heating

Replacing electrical resistance water heaters with heat pumps will reduce energy consumption by 67%. The cost of a 50 kW heat pump is R50,000 and its annual maintenance is R2,500 (Graham, 1999). Assuming a 0.2 load factor, annual electricity consumption is 29,200 kWh. The equivalent electrical resistance heater would cost R12,500, have negligible maintenance costs and consume 87,600 kWh per year.

It is estimated that by 2015 an additional 30% more than the baseline of hot water heating installations could be heat pumps. The average life of a heat pump is assumed to be 15 years.

Barriers to the installation of heat pumps are the high investment cost and possibility of operational problems.

Heat pumps will reduce non-greenhouse gas emissions by reducing the amount of electricity required. Heat pumps systems have imported components so they would a negative effect on balance of payments. They are a technologically proven technology with technical support available in South Africa.

### Energy star equipment

Most computers and other office equipment are shipped to South Africa with the energy saving capability de-activated. Targeting the suppliers will capture most of the savings potential. Suppliers can either be persuaded to activate the energy savings capability through procurement requirements. Bulk computer customers will need to be educated about the potential savings. Costs are administrative and relate to the education of bulk computer customers. Average electricity savings per computer are estimated at 213 kWh per year (40% of consumption), and in 1998 700,000 computers entered South Africa (Price, 1999). Due to

uncertainties regarding future computer technologies, it is assumed that savings will only be implemented and realized from 2000 to 2015. It is estimated that computer sales will increase at 5% per year between 1998 and 2015, and it is estimated that 50% of computers bought could benefit from the programme. In addition savings can also be made on other office equipment such as printers, fax machines and photo-copiers and it is estimated that these savings will amount to 10% of computer savings. Finally it is assumed that the energy saving capability of office equipment will be activated in the future, but that an energy star programme can speed this process by five years.

Barriers to activated energy star equipment are lack of awareness and the perceived risk that activating energy star capabilities could create computer problems.

Energy star enabled equipment will reduce non-greenhouse gas emissions by reducing the amount of electricity required.

### Solar water heating

Solar hot water heating in the commercial sector will usually be considered with a back-up source of heating when solar irradiation is insufficient. In South Africa, on average, about 90% of hot water would be generated by solar energy, and 10% by electricity. Solar collectors are installed on roofs of buildings and connected to a storage tank. At present solar water heating in South Africa's commercial sector is negligible. Solar water heaters have a life of about 20 years and costs including installation are about R35,000 for a 1,000 litre system (Venter, 1999) or about R462/GJ of annual water heating. Annual maintenance costs are assumed to be 3% of the investment cost. It is assumed that, by 2015, 25% of commercial hot water heating could be converted to solar water heating. It is estimated that a public programme to promote solar water heaters would cost R2 million per year.

Barriers to solar water heating are the risk of the technology not performing as promised, the risk of operational problems and the high investment cost.

Solar water heating will reduce non-greenhouse gas emissions by reducing fuel and electricity requirements.

### Switching from coal and oil boilers to natural gas boilers

Coal- and oil-fired boilers can be modified to use natural gas. Natural gas is much more convenient to use and maintenance costs will be reduced, and efficiencies of fuel use will improve (assumed by 15%). In the baseline scenario natural gas becomes available in 2010 and, by 2030, 20% of boilers are converted to natural gas. In the mitigation option it is assumed that natural gas becomes available in 2005 and that, by 2030, 50% of boilers are converted to natural gas. Conversion to gas will require an upfront cost, but new gas boilers are cheaper than coal or oil boilers. Maintenance costs on a gas boiler will be lower than those for coal and oil boilers. Since the annualized cost of a boiler investment is considerably less than fuel cost and only incremental costs are of interest, incremental costs are assumed to be zero. Only fuel costs are considered.

The main barrier to the use of natural gas is its availability.

Use of natural gas instead of coal and oil will reduce non-greenhouse gas emissions. Natural gas is likely to be imported and therefore the trade balance would be adversely affected.

### Switching from electricity to natural gas for heating

The mitigation option considers replacing centralized electrical heating systems with centralized gas boiler systems. In the baseline scenario it is assumed that natural gas becomes available in 2010 and, by 2030, 10% of electrical heating systems are replaced by natural gas. In the mitigation option it is assumed that natural gas becomes available in 2005 and that, by 2030, 30% of electrical heating systems are converted to natural gas. It is assumed that the efficiency of use of gas is 90% (Wiese, 1999). The costs of retrofitting a gas hot water system is R20,000 per 1,000 kg/hour system (Wiese, 1999), and it is assumed that water heating is carried out 12 hours/day, 6 days per week, and 11 months per year.

The main barrier to the use of natural gas is its availability.

Use of natural gas instead of electricity will reduce non-greenhouse gas emissions. Natural gas is likely to be imported and therefore the trade balance would be adversely affected.

## Transport and automotive sectors

In the transport sector, emissions could be reduced by switching to buses using alternative fuel (compressed natural gas), promoting better transport infrastructure including commuter vehicle sharing, and techniques to improve emission control and fuel economies. Relatively few government policies are in place to promote these activities, and current transport infrastructure is not conducive to more energy-efficient transport (Naude et al., 2000). Projects promoting behavioural changes (e.g. using bicycles rather than cars [Shova Kalula], multi-occupancy lanes) sometimes find it difficult to attribute emissions reductions to the project activity.

CDM projects focusing on the transport and automotive sectors might consider:

- Efficiency in transport—more efficient vehicles;
- Fuel switching to lower-emission fuels;
- Bio-fuels (bio-diesel and ethanol);
- Infrastructure changes, e.g. from private to public transport.

The South African automotive and components industry is set for high growth. Exports have grown by 3,000% from 1988 to 1998, and indications are that growth is likely to continue.

The automotive industry is largely located in the Eastern Cape and Gauteng, with other centres in KwaZulu-Natal and the Western Cape. Multinational assemblers such as BMW, Daimler-Chrysler, Volkswagen, Toyota and Ford have established production bases in South Africa, with plants being expanded for increased exports into world markets. Global trends in the automotive industry have also been mirrored at the level of component manufacturers. International companies like Bloxwitch, Arvin Exhaust, Senior Flexonics, Corning and AP Faurecia have established production bases in South Africa.

The Motor Industry Development Programme (MIDP) enhances the international competitiveness of the industry, allowing car assemblers and component manufacturers to offset Completely Built Up (CBU) units or component exports against Completely Knocked Down (CKD) units or component imports.

In line with global sourcing trends, companies that have manufacturing facilities in South Africa will be well positioned to take advantage of low production costs as well as access to new markets as a result of the comprehensive trade agreement with the EU and the SADC free trade area.

## LULUCF

CDM projects in this sector are limited to afforestation and reforestation. South Africa does not have significant forest cover and the potential for mitigation is relatively small. It is small both compared to other countries, for example Latin American countries; and compared to other options within other sectors in South Africa.

Plantations for production of paper pulp are of interest to paper manufacturers.

The mitigating options that were considered for the agricultural sector included the following (Scholes et al., 2000):

- Optimizing herd composition and feed intake: Optimization of the herd sex, age and breed would allow the national herd to be reduced while maintaining the same level of production. Supplementing the feed with high protein forage would reduce the methane production and increase productivity. A 30% reduction in the free-range herd and a 15% increase in feedlot were assumed. It is estimated that total emissions can be reduced by 207.8 $MtCO_2$ equivalent with these initiatives over the period 2000 to 2030.
- Manure management: It was assumed that 40% of the manure from feedlots is digested anaerobically and that the methane gas is collected for re-use, 10% in lagoons and the remaining 50% by dry spreading. It is estimated that total emissions can be reduced by 49.8 $MtCO_2$ equivalents with these initiatives.
- Burning of agricultural residues: It was assumed that the fraction of area planted with sugar cane that is burned prior to harvest declines to 60% by the year 2005 and remains at that level until 2030. It is estimated that total emissions can be reduced by 9.1 $MtCO_2$ equivalents with these initiatives.

- Fire frequency reduction: The frequency of fires is assumed to be halved over the period 1990 to 2030. It is estimated that total emissions can be reduced by 22.2 $MtCO_2$ with these initiatives.

- Savanna thickening: It is assumed that savanna thickening is promoted over 40% of the total savanna area. It is estimated that total emissions can be reduced by 237 $MtCO_2$ equivalents with these initiatives.

- Afforestation: An additional 330,000 ha planted as a mitigation option would reduce the total emissions by 116 $MtCO_2$ equivalents.

Of the seven activities considered in the land use mitigation study two relate to sequestration projects. However, CDM projects are limited to reforestation and new forestation. The study estimates the potential emission reduction opportunities for non-sequestration subsectors to be approximately 10 $MtCO_2$ per year with 80% of these reductions being achieved at negative or low cost.

However, for all of these five sub-sectors—animal management, manure management, fire frequency control, reduced tillage and burning of agricultural residues—there are many sources of emission spread over a wide area which creates difficulties for maintaining a consistent and acceptable level of emission verification and subsequent certification of CERs. This will significantly increase transaction costs per ton of $CO_2$ reduced (Goldblatt et al., 2001).

This will make CDM projects in this sector less attractive to foreign investors than projects in other sectors. However, this sector may attract interest from institutional investors.

## Conclusion

This document illustrates the extensive potential opportunities for CDM development and investment in South Africa. It further illustrates that South Africa is in the early stages of readiness for CDM administration and promotion. The primary need in South Africa is extensive capacity development. Current steps are in place to develop capacity at government level; in addition various capacity drives are in place through support organizations listed to develop capacity in certain sectors. Experience has shown that the development of viable CDM projects ready for market will require individual support work with project developers. A concerted effort in this regard will release viable projects into the market. South African project developers are also interested in the views and approaches of the wider investment community, and it is hoped that this document, which is in some way a forerunner of the further work about to be embarked upon in developing an investment strategy for the CDM in South Africa, will unlock debate and interest from both developers and investor/purchasers.

The following annexes can be seen on the CD-ROM that accompany this publication:

### *Annex A: industry associations holding information on projects*

This annex contains the self-generated details of the various industry associations which can act as information and referral agencies for CDM investors interested in that sector. This list is constantly being updated and the agencies are listed under the numbers A1, A2, etc.

### *Annex B: CDM projects in development*

This annex contains the self-generated list of project details granted on a voluntary basis by some project developers in South Africa. This list is constantly being updated and the individual projects are listed under the numbers B1, B2, etc.

### *Annex C: support organizations*

This annex contains lists of project details granted on a voluntary basis by support organizations in South Africa. This list is constantly being updated and the individual projects are listed under the numbers C1, C2, etc.

# Annex. Final Report: CDM Delegate Programme from South Africa at UNIDO ITPO Tokyo

## Introduction

The CDM Delegate Programme was launched at UNIDO in the context of the activities of the United Nations inter-agency project "Engaging the Private Sector in Clean Development Mechanism Project Activities", which aims to enhance national capacity in the participating countries (Brazil and South Africa) to implement the Clean Development Mechanism (CDM). The project has been a joint effort of UNDP, UNIDO and UNCTAD. Each of the participating agencies has been implementing a component in line with its core expertise and the United Nations mandate. The CDM Delegate Programme has been implemented as an activity of the UNIDO component of this project.

The objective of the Programme was to establish bilateral ties between the Japanese business and industrial community interested in CDM opportunities in South Africa and South African project developers and other stakeholders actively engaged in designing CDM projects. To that end, a portfolio of 23 CDM projects was compiled by the South African CDM Delegate, Mr. Stefan Raubenheimer, for presentation to potential investors in Japan. The delegate had some 30 meetings with Japanese corporations and institutions representing the industrial and energy sectors. The South African Embassy, learning of the Programme, also became involved and offered strong support and appreciation. The Programme has been successfully completed and has received positive evaluations from UNIDO, ITPO/Tokyo and participating companies in Japan and South Africa. More information about the Programme can be obtained at http://www.unido.org/file-storage/download?file_id=11671

The following is a brief description of the Programme and some information on the meetings held by the South African delegate. Details of the meetings have been deliberately omitted at the request of participants, owing to the confidential nature of the information discussed. Some specific information can, however, be obtained from ITPO/Tokyo. (Please contact Mr. F. Gelegen at fgelegen@unido.or.jp)

The programme was held at the United Nations Industrial Development Organization Investment and Technology Promotion Office in Tokyo, Japan during the period 21 to 31 May 2003. Mr. Stefan Raubenheimer, National Consultant to UNIDO and Chief Executive Officer of SouthSouthNorth participated as the South African Delegate.

## Acknowledgements

Special acknowledgement is due to Mr. Stefan Raubenheimer, who served as South African delegate for the CDM Delegate Programme. He also led the research and drafting work for the CDM Investor Guide and Project Portfolio, which he and the UNIDO ITPO office in Tokyo presented in Japan. Acknowledgements are also due to Ms. Laurraine Lotter of the Chemical and Allied Industries Association, Geoff Stiles of the Capacity Building Leadership Action Project (CBLA) and Harald Winkler of the Energy Development Research Centre of the University of Cape Town (in his individual capacity) for their support of the UNIDO project and assistance in the preparation of the South African project portfolio.

## Background

In 1999, UNIDO became one of the partners in a United Nations inter-agency project entitled "Engaging the Private Sector in Clean Development Mechanism Project Activities". UNIDO's component of the project was to facilitate and execute capacity building programmes in targeted countries and to design a programme to promote the projects developed in each country in an annex I country through Investment and Technology Promotion Offices (ITPOs). This was the first time such promotion had been attempted by UNIDO.

South Africa, a large emitter of greenhouse gases and the most industrialized country in Africa, was chosen to participate in the project and the CDM Delegate Programme in Japan for a number of reasons. These include a high GHG mitigation potential in terms of scale and scope and cost competitiveness. South Africa is also perceived as a country that can assist other countries in the region in building national capacities for CDM activities. UNIDO hopes to expand the number of countries participating in the Programme in the next phase of the United Nations interagency project on capacity-building for CDM.

Japan is a strong proponent of the Kyoto Protocol. The Japanese government and Japanese industry are intensely working on finding opportunities to be involved in CDM and JI projects, to help Japan to meet its target of 6% reduction by 2012. This target in based on 1990 emission levels and has now ballooned to 16% in real terms due to increasing emissions registered since 1990. As it is virtually impossible for Japan to achieve this target internally, the option of carbon

mitigation through CDM and JI is of crucial importance to the country.

Another reason for choosing Japan is the existence of UNIDO ITPO Tokyo (ITPO Tokyo), which is a part of the network of Investment and Technology Promotion offices of UNIDO. Since 2002, ITPO Tokyo has prioritized environment and technology transfer projects as part of its activities. Among these, CDM related programmes have been of particular interest to ITPO Tokyo, especially since UNIDO's co-hosting of an international forum on the CDM in Tokyo, in June 2002.

## Programme outline

The CDM Delegate Programme for South Africa was undertaken in Tokyo between 21 and 31 May 2003. The programme was designed and implemented by Industrial Energy and Climate Change (IEE) Branch of UNIDO HQ and the UNIDO ITPO office in Tokyo. Mr. Stefan Raubenheimer participated in the programme as UNIDO National Expert for CDM Investment Promotion.

The CDM Guide and Project Developer's Portfolio was used as the basis of interaction with potential investors in Japan. The delegate held 16 meetings with public and private sector organizations of Japan, conducted two press interviews (Japan Industrial Journal and UNIworld), participating in one seminar organized by NEDO and UNIDO as keynote speaker, and one roundtable meeting organized by Mitsubishi Research Institute (MRI). Throughout the programme, the delegate had the opportunity to hold discussions and make presentations with 64 businesspersons, government officials and media. A detailed copy of the agenda is included in this report (see below).

The delegate presented the CDM Investor Guide for South Africa and background information for Japanese investors and potential buyers of CERs. The delegate presented the projects listed in the CDM Portfolio for South Africa (see annexes of the CDM Guide on CD-ROM).

## Findings and results from the programme

The Programme has successfully initiated "bridge-building" between Japanese investors and the South African CDM project developers and other stakeholders.

### *South African Government*

The South African Embassy in Tokyo is fully aware of the opportunity contained in the CDM and its implications for South Africa. The embassy will pursue this opportunity based on the connections built through this programme. The Embassy will seek to assist South African officials and politicians in promoting the development of the CDM capacity in South Africa, in particular the Designated National Authority.

### *Japanese Government*

The Japanese Government needs to make tremendous efforts to attain the Kyoto Protocol emission target of –6% to 1990 level. Japan will take advantage of the flexibility built into the Protocol including the CDM. With regard to the location of CDM projects, the priority will be the Asia Pacific region. However, the Japanese Government and their affiliated agencies do not exclude opportunities in other regions.

The major responsible ministries are Ministry of Economy, Trade and Industry (METI) and MOE. Affiliated agencies of the two ministries are dealing with practical assistance to project host countries or Japanese CDM/JI investors.

Meetings with high-ranking government officials suggested that the efforts made by the Japanese private sector and foreign governments to pursue Kyoto protocol targets are in the interests of the Japanese government for GHG policy development. The Japanese Government presented its polity in respect of the CDM in general and South Africa in particular.

Other international schemes, e.g. CTI may be applicable to promote CDM project's development by Japanese investors, technology transfer and capacity building in South Africa.

### *Private sector*

The private sector participants showed interest in the opportunities in South Africa and set out their particular interests. The private sector reactions to the presentations are contained in the contact reports listed below. (In accordance with a request from the participants in the meeting, these contact reports have been edited in order to exclude those details of the discussions deemed to be confidential. For more information on these reports, please contact Mr. F Gelegen at fgelegen@unido.or.jp).

## Contact Reports

### *Contact Reports: South African Embassy, Tokyo*

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

Dr Krish Mackerdhiy, Ambassador

Angus September, Counsellor, South African Embassy

Kunio Katsunuma, Marketing Officer, Economic Division

Shinji Yamamoto, Marketing Officer, Economic Division

Pinkie Moleko, First Secretary, South African Embassy

ITPO Tokyo: F Gelegen, S Raubenheimer, H Negishi

Contact date: 22 May 2003

Place: Tokyo

### *Contact Reports: Japan Bank for International Cooperation (JBIC)*

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

Akihiko Koenuma, Director, Divisions Corporate Finance Department

Kuniaki Ito, Director General, Divisions Corporate Finance Department

Go Denda, Senior Financial Officer, Corporate Finance Department

ITPO Tokyo: F Gelegen, S Raubenheimer

Contact date: 23 May 2003

Place: Tokyo

### *Contact Reports: Seminar at NEDO Roundtable*

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

**NEDO**
Hiroyuki Ochiai, Director General

Manabu Inoue, Deputy Director

Seto Kohta, Project coordinator

Yoshiko Yurugi, Chief Officer

**Idemitsu Kosan Co.**
Yugo Nakamura, Global Environment Project

**Mitsui & Co.**
Kentaro Yabe, Manager

**CO2e.com**
Ken Yabe, Representative

**Mitsubishi Research Institute**
Kenichiro Yamaguchi, Senior Consultant

**JFE Engineering Corporation**
Yuzo Fujii, Deputy Manager

**Kawasaki Steel Corporation**
Yuzo Fujii, Assistant Manager

**NATSOURCE**
Norio Suzuki, Senior Manager

**Oil Paper Co., Ltd**
Naoto Haragichi, Manager, Overseas Forestation Department

**Sumitomo Metals**
Takumi Yamano, Manager, Steel Engineering & Consulting Co.

**Sumitono Corporation**
Hidefumi Noda, Assistant Manager, Global Environment Department

**Mitsui & Co., Ltd**
Kentaro Yabe, Manager, Business Promotion Department

**Mitsui Global Strategic Studies Institute**
Masato Ichimiya, Senior Strategist, Environment Project Centre

**Development Bank**
Haruhisa Kawashita, Deputy Director General, Energy & Energy Department

**TEPCO—Tokyo Electric Power Company**
Tsuyoshi Otani, General Manager

### *Contact Reports: South African Embassy*

Angus September, Counsellor, South African Embassy

ITPO Tokyo: F Gelegen, S Raubenheimer, H Negishi

Contact date: 26 May 2003

Place: Tokyo

### *Contact Reports: Marubeni Corporation*

More on Marubeni Corporation at www.marubeni.com

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

Toichi Kudo, General Manager

Yutaka Shinagawa, Assistant Manager

Hideto Yamaji, Assistant General Manager, Corporate Strategies Department

Shigeru Yamaguchi, Area Manager

Masahiro Kimura, Domestic & Business Generation

ITPO Tokyo: F Gelegen, S Raubenheimer, H Negishi

Sumitomo at www.sumitonocorp.co.jp

Contact date: 26 May 2003

Place: Tokyo

### *Contact Reports: Sumitomo Corporation*

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

R Yamamoto, General Manager, Global Environment Department

Hidefumi Noda, Assistant Manager, Global Environment Department

Masanori Takada, Manager, Global Environment Department

Sam Fukumoto, Manager, Global Warming Prevention Project Team

ITPO Tokyo: F Gelegen, S Raubenheimer, H Negishi

Sumitomo at www.sumitonocorp.co.jp

Contact date: 27 May 2003

Place: Tokyo

### *Contact Reports: Mitsubishi Research Institute (MRI) Roundtable with Utility Companies*

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

**Mitsubishi Research Institute**
Kuniyuki Nishimura, Research Director, Sustainable Development

Shuta Mano, Sustainable Development Research Department

Nobuyuki Kobayashi, Sustainable Development Research Department

Kenichiro Yamaguchi, Senior Consultant, Sustainable Development Department

**TEPCO—Tokyo Electric Power Company,**
Yoshitaka Hagiwara, Deputy Manager, International Environmental Business Group

**Mizuho Corporate Bank**
Hideaki Kuraishi, Senior Vice President

**Electric Power Development Corporation**
Tatsuya Nitta

ITPO Tokyo: F Gelegen, S Raubenheimer

Contact date: 27 May 2003

Place: Tokyo

### *Contact Reports: NEDO*

More on NEDO at www.nedo.go.jp

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

Hiroyuki Ochiai, Director General

Manabu Inoue, Deputy Director

Seto Kohta, Project coordinator

Yoshiko Yurugi, Chief Officer

ITPO Tokyo: F Gelegen, S Raubenheimer, H Negishi

Contact date: 28 May 2003

Place: Tokyo

### *Contact Reports: Chubu Electric Power Co., Inc.*

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

**TCC—Techno Chubu Company**
More about Chubu at www.chuden.co.jp/english

Takashi Nagao, General Manager, Energy & Environment

Takashi Fujiwara, Manager, Global Environment Group

Kazanori Kuze, Senior General Manager, Corporate Planning & Strategy Division

Tomoaki Sakurai, Assistant Manager, International Consulting Group

Minoru Yasui, Assistant Manager, Plant Engineering & Construction Group

Tsuyoshi Nakajima, Assistant Manager, Plant Engineering & Construction Group

Katsuhiro Suzuki, Assistant Manager, Environmental Affairs Department

Yuji Nobusawa, Assistant Manager, Environmental Affairs Department

ITPO Tokyo: F Gelegen, S Raubenheimer

Contact date: 28 May 2003

Place: Nagoya

### *Contact Reports: Toyota Tsusho Corporation*

More on Toyota Tsusho at www.toyotsu.co.jp

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

Takashi Hattorri, Managing Director

Sienosuke Sasaki, Project General Manager, GHG Mitigation Project Team, Environmental Business Development Group, Energy Department

Koji (Ken) Kawade, Project General Manager, Energy Department

Tatsunori (Tom) Kaiden, GHG Mitigation Project Team, Environmental Business Development Group, Energy Department

Atsushi Kubo, GHG Mitigation Project Team, Environmental Business Development Group, Energy Department

ITPO Tokyo: F Gelegen, S Raubenheimer

Contact date: 28 May 2003

Place: Nagoya

### *Contact Reports: METI*

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

**METI, Ministry of Economy, Trade and Industry, Global Environmental Affairs Office**

More on METI at www.meti.go.jp/english/

More on CTI at www.climatetech.net/

Shigetaka Seki, Director for Environmental Affairs

Tetsuta Shimokawa, Section Chief

ITPO Tokyo: F Gelegen, S Raubenheimer, H Negishi

Contact date: 29 May 2003

Place: Tokyo

### *Contact Reports: METI Middle East/Africa Division*

More on JICA at www.jica.go.jp

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

Ryuichi Kataoka, Deputy Director, Middle East & Africa Office, Trade Policy Bureau

Yukifumi Yamaguchi, Deputy Director

Yoshikazu Hasunuma, Middle East & Africa Office, Trade Policy bureau

ITPO Tokyo: F Gelegen, S Raubenheimer, H Negishi

Contact date: 29 May 2003

Place: Tokyo

### *Contact Reports: Tokyo Mitsubishi Securities*

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

Junji Hatano, Chairman, Clean Energy Finance Committee

Mari Yoshitaka, Project Manager/Senior Analyst

ITPO Tokyo: F Gelegen, S Raubenheimer, H Negishi

Contact date: 29 May 2003

Place: Tokyo

### *Contact Reports: Mitsubishi Natsource*

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

Makoto Katagiri, Executive Vice President

Norio Suzuki, Senior Manager

Eiji Takizawa, Manager

Hiroshi Ross Aoyama, Project Manager

Ayiko Yoshizawa, Intern

ITPO Tokyo: F Gelegen, S Raubenheimer, H Negishi

Contact date: 29 May 2003

Place: Tokyo

### *Contact Reports: MITSUI Engineering and Shipbuilding Co.*

Country: Japan

Subject: South Africa CDM Guide and Project Developers' Portfolio

Persons present:

Tadashi Katsuyama, Manager, Technology Management Department

Hideaki Yura, Manager, Sales Department

Masahide Yamakawa, General Manager, Overseas projects

Toshiaki Murata, Technical Consulting Adviser

ITPO Tokyo: S Raubenheimer, H Negishi

Contact date: 29 May 2003

Place: Tokyo

## Conclusions and recommendations

Some 23 projects were introduced by the South African participant of the CDM Delegate Programme to potential Japanese investors in the course of the duration of the Programme, which entailed approximately 30 meetings including a seminar and a roundtable discussion. The activities were attended by some 64 businessmen, government officials and other stakeholders. Some of the projects of the South African portfolio were already quite advanced in terms of their development, while others were in the initial phase of design and formulation. The Ministry of Economy and Trade (METI) and the New Energy and Technology Development Organization (NEDO) generously supported the Programme. The Embassy of South Africa showed keen interest and also provided support to the Programme.

The outcome of the meetings showed that the Japanese Government and private sector companies are keen to find opportunities to be involved in CDM or JI projects. As mentioned earlier, this is reflected in a proactive policy of the Government. At the moment, however, the policy gives priority to the Asia Pacific region. Japanese companies, on the other hand, are clearly interested in markets such as South Africa, where large numbers of carbon emissions can be mitigated through joint venture projects or through outright purchase of CERs. Given the considerable interest in CDM investment in South Africa by the Japanese business and industry community, it was suggested that Japan could consider South Africa and Brazil (the other country participating in the UNIDO CDM Delegate Programme) as partners for CDM project activities and encourage and support capacity building work in these countries in a way similar to that of some EU governments, such as Denmark, Finland, Netherlands, etc.

The Japanese participants at the meetings raised questions about the institutional infrastructure necessary to launching CDM programmes in each of the participating countries. They were particularly interested in the Designated National Authority and its status and activities, as well as the rules and regulations governing the CDM transactions.

As CDM and the Kyoto Protocol represent new fields of global business activity, there is a clear gap between various capacity building activities undertaken in countries that would become potential hosts of CDM projects and also in those that would act as CDM project investors. In both cases there is an information gap about the current status and trends of the carbon market, rules and procedures elaborated by the CDM Executive Board and relevant COP meetings to guide project developers throughout the stages of the CDM project cycle as well as a clear understanding and knowledge of GHG mitigation opportunities in the industrial sector. In particular, the share of energy efficiency projects in the portfolio of both participating countries is rather low, indicating that more capacity building work in this area is necessary.

Judging by the enthusiasm of the participants, it is evident that the UNIDO ITPO CDM Delegate Programme in Japan has filled an important capacity gap faced by both potential hosts and potential investors of CDM projects. The Programme also resulted in upgrading and extension of the existing institutional capacity of UNIDO to enable the promotion of investment into CDM projects, using promotion expertise, techniques and methodologies that have been tested through many years of promoting industrial investment projects around the world. UNIDO plans to expand its newly developed CDM Delegate Programme to other countries and establish a parallel programme that would cover Joint Implementation (JI) projects.

The South African programmes and projects will be actively followed up with the help of the UNIDO ITPO office in Tokyo, which is already working on several requests for cooperation from Japanese companies. As UNIDO is discussing with the project partners the continuation of activities of the United Nations Interagency project on capacity building for CDM, the expansion of the CDM Delegate programme to include other ITPO offices is envisaged.

## South Africa—CDM Investment Promotion Programme

JBIC (Japan Bank for International Cooperation).

NEDO Seminar.

NEDO, with Messrs. Ochiai, Nakanishi and September (Embassy).

Marubeni Corporation.

Marubeni Corporation.

Sumitomo Corporation.

## South Africa—CDM Investment Promotion Programme

Roundtable: Mitsubishi Research Institute (MRI).

Interview: Nikkan Kogyo Shimbun.

Chubu Electric Power Co., Inc.

Toyota Tsusho Corporation.

METI, Global Environment Affairs Section.

METI, Middle East-Africa Office.

## South Africa—CDM Investment Promotion Programme

Mitsubishi Securities Co., Ltd.

Natsource Japan Co., Ltd.

Embassy of South Africa.

UNIDO ITPO Tokyo farewell.

# Bibliography


ANC (African National Congress) 1994. The Reconstruction and Development Programme: A policy framework. Johannesburg, Umanyano.

Darroll, L., 2001. Can solar energy serve South Africa's electricity needs? *African Energy Journal* 3 (4): pp. 14-16.

Davidson, O., Mwakasonda, S., Spalding-Fecher, R., and Winkler, H., 2002. Developing country actions report: South Africa. Energy & Development Research Centre, University of Cape Town.

De Villiers, M., 2000. Greenhouse gas baseline and mitigation options for the commercial sector. Cape Town, Energy & Development Research Centre.

De Villiers, M & Matibe, K., 2000. Greenhouse gas baseline and mitigation options for the residential sector. Cape Town, Energy & Development Research Centre.

DME (Department of Minerals and Energy) 2001. Annual Report 2000-2001. Pretoria.

DME (Department of Minerals and Energy) 2002. South Africa National Energy Balance 2000. Pretoria, DME. Received 6 June.

Eberhard, A. A., and Williams, A., 1988. *Renewable energy resources and technology development in South Africa*. Cape Town, Elan Press.

EC, DBSA and ISES (European Commission DG XVII, Development Bank of Southern Africa, International Solar Energy Society) 2000. Renewable energy technologies in SADC—a guide for investors. Midrand, Development Bank of Southern Africa. January.

ERI 2000. The 3E strategy: energy efficiency earnings. *Energy Management News* 6 (3): 1-2. Energy Research Institute. September.

Goldblatt, M., Kagi, W,, Leuchinger, A., and Visser, W., 2001. South African national strategy study on the Clean Development Mechanism. Draft final report. Johannesburg, National Climate Change Committee.

Howells, M., 1999. Baseline and greenhouse gas mitigation options for bulk energy supply, South African Country Study on Climate Change. Draft. Energy Research Institute, University of Cape Town.

Howells, M, I., 2000. Baseline and greenhouse gas mitigation options for bulk energy supply. Energy Research Institute, University of Cape Town.

IEA (International Energy Agency) 2001. $CO_2$ emissions from fossil fuels 1971-1999. Paris, IEA.

Irurah, D. K. (ed), 2000. *Environmentally sound energy efficient low-cost housing for healthier, brighter and wealthier households, municipalities and nation. Final report*. Pretoria, Environmentally Sound Low-cost Housing Task Team and USAID.

Kotze, I. A., 2001. Letter from DME to off-grid concessionaires on evaluation of business plans. Pretoria, Department of Minerals and Energy. 11 July.

Lombard, E., 2001. Eskom to harness wind: multi-million rand project in Western Cape will investigate environmentally friendly, alternative energy source. *Sunday Times*. 25 February Johannesburg.

Naude, C. M., Coovadia, T. and Pretorius, J., 2000. Mitigation options: Transport sector. South African Country Studies on Climate Change. Pretoria.

NER (National Electricity Regulator) 2000. Electricity supply statistics for South Africa 2000. Pretoria, NER.

Otto, A., 2000. Darling wind farm declared national demonstration project. *Energy Management News* 6 (3): 19.

Scholes, R. J., Van der Merwe, M. R., Kruger, A. J., & Crookes, D 2000. Mitigation of climate change through land use practices. *South African Country Studies on Climate Change*. Pretoria, Council for Scientific and Industrial Research.

SEED 2002. Typical electricity use and savings opportunities in households identified by audits. Urban SEED Update 1 (1): pp. 2-3.

Simmonds, G., and Mammon, N., 1996. Energy services in low-income urban South Africa: A quantitative assessment. Cape Town, Energy & Development Research Centre, University of Cape Town.

Smetherham, J-A., 2002. Eskom's latest study is blowing in the wind. *Cape Times*. 22 August: 4.

Spalding-Fecher, R., 2001. Energy and sustainability in South Africa: the 2001 Sustainable Energy Watch Report. Cape Town, Energy & Development Research Centre, University of Cape Town.

Spalding-Fecher, R., (ed) 2002a. *The CDM Guidebook: the Clean Development Mechanism of the Kyoto Protocol—a guide for project developers in Southern Africa*. Contributors: R. Berold, G. S. Hodes, W. R. Makundi, S. Raubenheimer, H. Rukato, R. Spalding-Fecher, S. Thorne and L. Tyani. Cape Town, Energy & Development Research Centre, University of Cape Town.

Spalding-Fecher, R., 2002b. Energy sustainability indicators for South Africa. Cape Town, Energy & Development Research Centre, University of Cape Town.

Spalding-Fecher, R., 2002c. Solar home systems as a potential Clean Development Mechanism project: a financial analysis. Proceedings of the tenth conference on Domestic Use of Energy, Cape Town, 2 April. Cape Technikon. pp. 117-122.

Spalding-Fecher, R., 2003. Indicators of sustainability for the energy sector: a South African case study. *Energy for Sustainable Development* 7 (1): 32-46. March.

Spalding-Fecher, R., Afrane-Okese, Y., Davis, M., and Matibe, K., 2000. Electricity & the environment. Paper No. 5: World Wildlife Fund Macroeconomic Reforms and Sustainable Development in Southern Africa Project. Cape Town, Energy & Development Research Centre, University of Cape Town.

Spalding-Fecher, R., Thorne, S., and Wamukonya, N., forthcoming. Residential solar water heating as a potential Clean Development Mechanism project: a South African case study. *Mitigation and adaptation strategies for global change.*

SSA (Statistics South Africa) 1998. Statistical release P0302. Pretoria, Statistics South Africa. 17 December.

SSA (Statistics South Africa) 1999. Statistical release P0302. Pretoria, Statistics South Africa. 12 July.

Stassen, D., 2001. Personal communication. 1 March.

Stinnes, W-W., 2001. Extension of the feasibility study for the greenhouse operation: the 200MW solar power-station in the Northern Cape province. *Energy Management News* 6 (4): 4-12.

Thorne, S., Spalding-Fecher, R., and Wamukonya, N., 2000. Residential solar water heating as a potential CDM project: A South African case study. Paper presented at workshop on Forging New Links and Reinforcing National Capacities on Climate Change: Challenges and Opportunities for CDM in Africa, 8-10 May 2000, Cape Town.

Trikam, A., 2002a. Greenhouse gas mitigation options in the industrial sector. Forum for Economics and Environment Annual Conference, Cape Town, 11-12 February.

Trikam, A., 2002b. Greenhouse gas mitigation options in the industrial sector. *South African Journal of Economic and Management Sciences* 5 (2): 473-498. June.

Van der Merwe, M. R., and Scholes, R. J., 1998. South African Greenhouse Gas Emissions Inventory for the years 1990 and 1994. Pretoria, National Committee on Climate Change.

Ward, S., 2002. *The Energy Book for urban development in South Africa*. Cape Town, Sustainable Energy Africa.

Williams, A., Eberhard, A., and Dickson, B., 1996. Synthesis report of the Biomass Initiative. Pretoria, Chief Directorate of Energy. Department of Mineral and Energy Affairs.

Winkler, H., Spalding-Fecher, R, Tyani., L., and Matibe, K., 2002. Cost-benefit analysis of energy efficiency in urban low-cost housing. *Development Southern Africa* 19 (5): 593-614. December.

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**UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION**
Vienna International Centre, P.O. Box 300, A-1400 Vienna, Austria
Telephone: (+43 1) 26026-0, Fax: (+43 1) 2692669
E-mail: unido@unido.org  Internet: http://www.unido.org