

# HOW TO IMPLEMENT RENEWABLE ENERGY AND ENERGY EFFICIENCY OPTIONS

*Support for South African  
local government*



*solar water heaters • energy efficient lighting*

*energy efficient buildings • public transport*



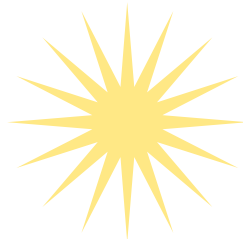
renewable  
energy  
& energy  
efficiency  
partnership



# HOW TO IMPLEMENT RENEWABLE ENERGY AND ENERGY EFFICIENCY OPTIONS

*Support for South African local government*

*solar water heaters • energy efficient lighting  
energy efficient building • public transport*



Produced by

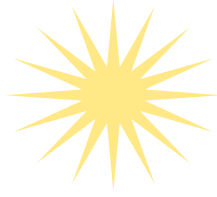
Sustainable Energy Africa in partnership  
with an alliance of cities and North Energy Associates Ltd (United Kingdom)



Funded by

REEEP (Renewable Energy & Energy Efficiency Partnership)





**Published by Sustainable Energy Africa, 2007**

Copies available from Sustainable Energy Africa,

The Green Building

9B Bell Crescent Close

Westlake

7945

tel: 021 702 3622

fax: 021 702 3625

email: [info@sustainable.org.za](mailto:info@sustainable.org.za)

web address: [www.sustainable.org.za](http://www.sustainable.org.za)

This handbook has been developed through the participation of an alliance of cities, North Energy Associates Ltd (United Kingdom), and a wide range of city stakeholders, however Sustainable Energy Africa is responsible for the views expressed and any errors made in this document.

© Sustainable Energy Africa

# Contents

Using this manual.....	3
<b>1. Success through sustainability.....</b>	<b>4</b>
1.1 Better local air quality and human health.....	5
1.2 Arrested global warming.....	5
1.3 Energy security .....	5
1.4 Equity .....	5
1.5 Financial efficiency .....	6
1.6 City development.....	6
<b>2. Cities as energy leaders.....</b>	<b>7</b>
<b>3. City action towards a sustainable energy path.....</b>	<b>10</b>
3.1 A sustainable energy strategy for your city .....	10
3.2 The first steps .....	11
<b>4. Solar water heater implementation.....</b>	<b>12</b>
4.1 The case.....	12
4.2 What is a solar water heater? .....	14
4.3 Potential for rollout.....	16
4.4 Barriers to implementation.....	20
4.5 How to go about implementation.....	20
4.6 Case studies .....	24
4.7 Support organisations .....	27
<b>5. Energy efficient lighting implementation .....</b>	<b>30</b>
5.1 Overview .....	30
5.2 The case.....	30

5.3	Potential for rollout.....	32
5.4	Barriers to implementation.....	33
5.5	How to go about implementation.....	34
5.6	Case studies .....	35
5.7	Support organisations .....	38
<b>6.</b>	<b>Energy efficient building implementation .....</b>	<b>39</b>
6.1	Overview .....	39
6.2	The case.....	40
6.3	Potential for rollout.....	42
6.4	Barriers to implementation.....	43
6.5	How to go about implementation.....	44
6.6	Case study.....	46
6.7	Support organisations .....	48
<b>7.</b>	<b>Public transport .....</b>	<b>50</b>
7.1	Overview .....	50
7.2	The case.....	51
7.3	Potential for rollout.....	52
7.4	Barriers to implementation.....	53
7.5	How to go about implementation.....	54
7.6	Case studies .....	56
<b>8.</b>	<b>Some useful resources.....</b>	<b>58</b>

# Using this manual

This Manual has been designed for use by city officials and planners. It is a practical handbook, which identifies easy to achieve energy interventions that will save money (for cities, businesses and households), promote local economic development and enhance the sustainable profile of a city.

Four key interventions have been identified as important and sensible starting points for cities. These are tackled as separate sections in the manual:

- Solar Water Heaters
- Energy Efficient Lighting
- Energy Efficient Building
- Transport (Modal shift from private to public)

In each section, the manual will:

1. Make the case (broadly) for the intervention.
2. Explore the potential for mass rollout of the intervention, using specific city scenario models as case studies to determine
  - The energy and carbon savings resulting from the intervention
  - The financial impact of the intervention
  - Poverty alleviation through the intervention
3. Identify key barriers to mass rollout of the intervention.
4. Provide practical steps towards implementing mass rollout.

## Developing the intervention scenarios

Scenarios for five cities in South Africa (Cape Town, Ekurhuleni, Tshwane, Potchefstroom and Sol Plaatje) have been modeled using the LEAP modeling software. The input data for the city models was obtained from the cities' respective State of Energy reports and energy strategies. The outputs of this software allows one to see what the energy, environmental and financial benefits will be when considering a mass rollout of an intervention (for example installing solar water heaters) against a 'business-as-usual' (no solar water heater) scenario.

For the demonstration purposes of this manual, just one city's results will be considered for each intervention. However the full results for all 5 cities are available on the Sustainable Energy for Cities website: [www.sustainable.org.za/cities/](http://www.sustainable.org.za/cities/)


Unless otherwise referenced, all data and graphs in this manual are sourced from Sustainable Energy Africa's publications and city models.

### WHAT IS LEAP?

LEAP or Long-range Energy Alternatives Planning System is software which allows one to develop a 'business-as-usual' energy model of a study area, for example a city, by entering current energy data, economic and population growth rates, household sizes etc. Various alternative scenarios can then be modeled, usually over a 20 to 30 year time frame, and their impact measured from an energy, environmental and economic perspective.

# 1. Success through sustainability

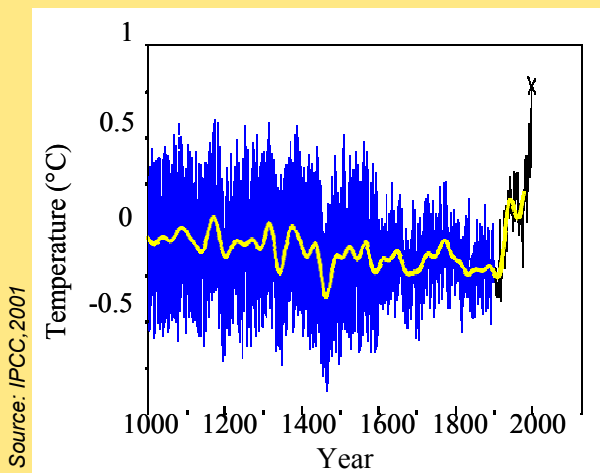
Our current energy use patterns – predominantly our huge dependency on fossil fuels - cannot continue. A move to a more sustainable path is important for the following reasons:



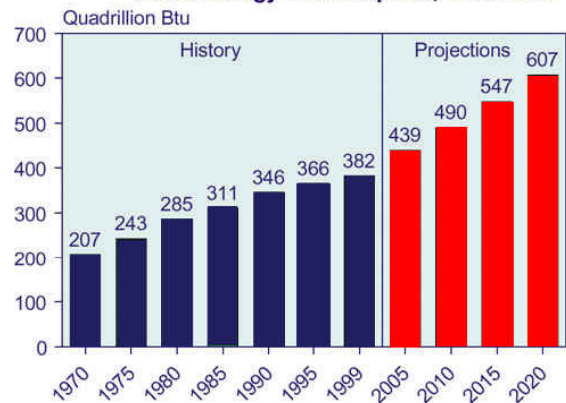
Coal-burning electricity generation and fuel burning for transportation and industry results in poor local air quality in many South African cities.

Particularly high levels of local air pollution occur in industrialised areas and in poor households where coal, wood and paraffin are used for cooking and heating.

Average world temperatures over the past 1000 years



World Energy Consumption, 1970-2020



Average planetary temperatures are rising, and global consensus is that this is due to the release of carbon dioxide and other greenhouse gases, largely linked to energy generation and use. Worldwide energy use predictions still point to a steady increase, indicating that the situation is likely to get worse before it gets better.

## 1.1 Better local air quality and human health

Local air pollutants from burning fossil fuels (power stations, petrol and diesel exhaust fumes) cause respiratory ailments and airborne particulate matter has been associated with cancer. Negative health effects of air pollution have been estimated to cost South Africa R4 billion annually.

## 1.2 Arrested global warming

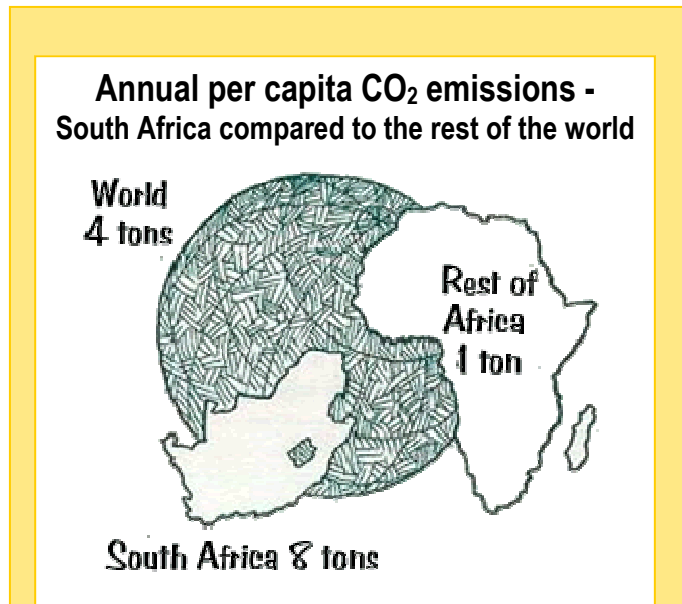
Climate change is an accepted reality. It will place enormous strain on our health sector, agricultural production, plant and animal biodiversity and water resources. Disruptions in agriculture are likely to result in increased urbanisation and pressure on urban resources. Fossil fuel-based energy use is the largest contributor to carbon dioxide emissions – the principle global warming gas. South Africa is almost entirely dependent on fossil fuels for electricity generation (i.e. coal) and for transport energy (oil products).

## 1.3 Energy security

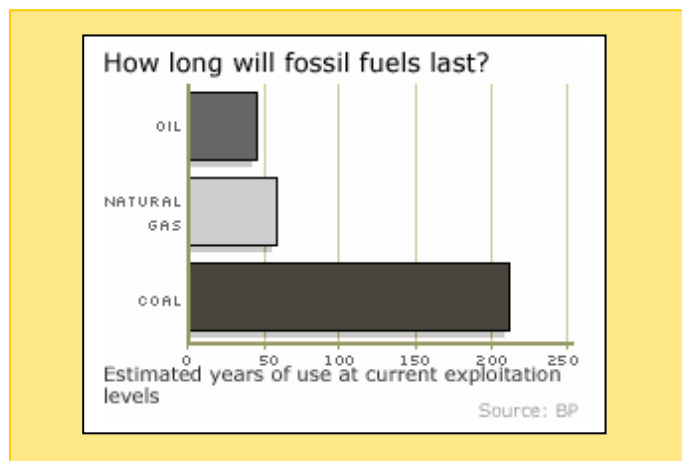
Fossil fuel reserves are finite. In particular, the relatively short horizon for oil reserve depletion means that there is an urgent need to find alternative transport fuels, transport modes and approaches to mobility.

## 1.4 Equity

Currently, there is a huge divide between the energy use patterns and problems of the wealthier and poorer sections of the population. The poor often are burdened with inadequate, unsafe and inconvenient energy sources while wealthier, particularly urban people consume high levels of energy and are inefficient in their use of energy.



The figure shows carbon emissions per person per year around the world. Although developed countries are the main global warming gas emitters, South Africa is the 11th highest contributor to global carbon emissions, and we can expect to come under increasing pressure to reduce our carbon emissions, and thus fossil fuel use, over the coming years.







Some 16% of city households are not electrified, including those informal settlements around South African cities. Here they have to rely on less convenient, dirtier and often unsafe energy sources.



Fires caused by paraffin appliances, for example, are alarmingly common in South Africa, and destroy hundreds of homes at a time.

## 1.5 Financial efficiency

Current inefficient energy use patterns mean that countries, cities and people have to spend more money than necessary for the energy service required (e.g. water heating, lighting etc). Many more efficient and cost-effective appliances and practices are available, including efficient lighting, using solar water heaters and constructing buildings to use less energy for heating, cooling and lighting.

## 1.6 City development

The energy sector in SA creates employment opportunities for about 250 000 people and contributes about 15% to the total GDP. However, it is highly centralized. Many sustainable energy initiatives could be undertaken locally, thus stimulating local economic development. Examples of this could be the manufacture and installation of solar water heaters, putting ceilings in houses, energy efficient building retrofits and small local power generation plants (wind farms etc).

