**DEPARTMENT OF ENVIRONMENTAL AFFAIRS**

**NO. 666** **17 MAY 2019**

## NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT, 2004 (ACT NO. 39 OF 2004) STRATEGY TO ADDRESS AIR POLLUTION IN DENSE LOW-INCOME SETTLEMENTS

I, Nomvula Paula Mokonyane, Minister of Environmental Affairs, hereby publish the strategy to address air pollution in dense low-income settlements, as set out in the schedule hereto, for implementation.

**NOMVULA PAULA MOKONYANE**
**MINISTER OF ENVIRONMENTAL AFFAIRS**

# SCHEDULE

# STRATEGY TO ADDRESS AIR POLLUTION IN DENSE LOW-INCOME SETTLEMENTS

## A “burning” issue

## October

## 2018

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## List of Abbreviations

| | |
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| APPA | Atmospheric Pollution Prevention Act |
| AQA | Air Quality Act |
| AQMP | Air Quality Management Plan |
| CFLs | Compact Fluorescent Lamps |
| CoGTA | Department of Cooperative Governance and Traditional Affairs |
| DCOG | Department of Cooperative Governance |
| DEA | Department of Environmental Affairs |
| DHS | Department of Human Settlement |
| DoE | Department of Energy |
| DoH | Department Of Health |
| GIS | Geographical Information System |
| IP&WMP | Integrated Pollution and Waste Management Policy |
| NEMA | National Environmental Management Act |
| NCC | National Coordinating Committee |
| NGOs | Non-Government Organisations |
| Stats SA | Statistics South Africa |
| SWH | Solar Water Heating |
| RDP | Reconstruction Development Programme |
| ToRs | Terms of Reference |

## EXECUTIVE SUMMARY

Air pollution monitoring data has shown that there are some geographic areas within the country, where ambient air quality standards are being exceeded and this is posing a threat to human health and the environment in those areas. What has become clear is that household utilisation of dirty fuels is one of the major contributors to the observed exceedances, particularly in residential areas. The problem of residential air pollution is more often than not, associated with dense low-income settlements.

Air pollution in dense low-income settlements in the South Africa poses numerous challenges. These challenges are interrelated and intertwined with the conditions of living making clean air quality in dense low-income settlements almost impossible to achieve when the problem is addressed in isolation.

A number of interventions that directly and indirectly address air pollution in dense low-income settlements have been implemented over the years whereas some were meant to primarily address energy shortages and energy conservation; some were aimed at controlling indoor air pollution and addressing household fuel-related accidents. While the general outcome was some improvement in air quality, for most of the interventions there was no deliberate alignment with ambient air quality objectives.

The goal of the strategy is to map out the path that the country needs to take in reducing the impact of air pollution in dense low-income settlements. Its aims to provide a coordinated approach in implementation of efforts directed at ensuring that ambient air quality in dense low-income settlements is in compliance with National Ambient Air Quality Standards, thereby ensuring the right to air that is not harmful to people's health and well-being as required by section 24 of the Constitution of South Africa.

The objectives of the Strategy are:

**Objective 1: Ensure that efforts to address air pollution in dense low-income settlements are undertaken in a coordinated and coherent manner**

This will be achieved through:

Activity 1a: Establishment of a coordinating structure: The National Coordinating Committee on Residential Air Pollution (NCC)

Activity 1b: Ensure, through the NCC, that interventions aimed at reducing air pollution in dense low-income settlements are effectively prioritised

**Objective 2: Facilitate, through the NCC, the implementation of interventions aimed at reducing emissions from dense low-income settlements**

This is will be achieved through:

Activity 2a: Provision of affordable or subsidised clean energy alternatives

Activity 2b: Ensure that low-income households are energy efficient

Activity 2c: Influence development planning initiatives to take into account air quality issues

Activity 2d: Encourage social upliftment programmes with air quality benefits

Activity 2e: Create public awareness on air pollution

**Objective 3: Ensure continued monitoring, evaluation and reporting on the successes and failures of the proposed interventions and on air quality improvements**

This is will be achieved through:

Activity 3a: Monitoring and Evaluation of Implementation

Activity 3b: Reporting

To achieve the goal and objectives, a clear understanding of the different needs in our targeted areas is crucial. This is to help the country develop and implement sustainable intervention measures (e.g. clean fuels or energy services to households in the targeted areas. In order to ensure that adequate resources are allocated to these areas, there is a need to have formation on:

- Extend of the problem – As evident in the measured ambient air quality data and existing health studies. This information will allow the implementers in prioritising areas of concerns.
- Factors driving the use of dirty fuels – Information on the reasons for using dirty fuels should be identified. If costs is the issue, then the costs should be known so that any alternative provided or the subsidy provided can compete with the currently used dirty fuels. These driving forces will differ slightly from one location to the other.
- Barriers to specific interventions – Information on what has and has not worked in the past in attempting to address the issue for example, poverty, infrastructure issues, security etc.

Financial viability of energy technology and/or intervention measure has the greatest influence on the sustainability of its adoption. The re-prioritisation of existing government budget allocations towards activities that have positive air quality impacts in dense low-income settlements will be motivated and justified by appropriate cost-benefit analyses.

To ensure the strategy is implemented, the Government will not only have input over decisions made and resources allocation to targeted areas but will also participate in the actual implementation of the strategy. The following organisations will have a role in the implementation of the strategy

- Department of Environmental Affairs
- Department of Energy
- Department of Human Settlement
- Department of Health

- Department of Cooperative Governance
- Department of Social Development
- Provinces and Municipalities
- Parastatals and Private organisations
- Non-Governmental Organizations (NGOs) and Communities

It is only with successful partnerships between the Government, private sector and civil societies, particularly those working in rural areas, that the strategy can be effectively implemented.

# 1. INTRODUCTION

## 1.1. Background

The Constitution of the Republic of South Africa (Act No. 108 of 1996) (the Constitution) provides the foundation for environmental regulation and policy in South Africa. The right to environmental protection and to live in an environment that is not harmful to health or well-being is set out in Section 24 of Chapter 2 of the Bill of Rights. This fundamental right underpins environmental policies and laws.

From 1965 to 2005, the approach to air quality management in South Africa was informed and driven by the Atmospheric Pollution Prevention Act (Act No. 45 of 1965) (APPA). For many years, this Act was regarded as ineffective for a number of reasons, not least of which was the broadly-held belief that APPA, and specifically the way APPA was implemented, had not defended South Africa's air quality from the emergence of various air pollution "hotspots" around the country. In essence, the emergence of these hotspots is often considered to be as a result of APPA's specific focus on individual source emissions without effectively considering the cumulative impacts of these emissions.

In this regard, the Constitution's Bill of Rights directly challenged the APPA approach by focussing on the quality of the environment and, by extension, the quality of the ambient air in the Republic. Government's Integrated Pollution and Waste Management Policy (IP&WM, 2000) put a further nail in APPA's coffin by requiring a new approach to air quality governance – an approach that used improved ambient air quality as the objective for governance.

In response to these developments, the President of South Africa assented to the National Environment Management: Air Quality Act (AQA, Act No. 39 of 2004) on 19 February 2005. AQA marked a change in South Africa's approach to air quality management, an approach that is now fully aligned with international best practices. The AQA makes provisions for receptor-based air pollution management by setting the targets for air quality management in the form of national ambient air quality standards (i.e. ambient air quality levels below which human health is generally protected). AQA also provides a host of regulatory tools to assist government in meeting these ambient air quality standards. In order to assess compliance with the standards, government has procured and deployed more than 90 ambient air quality monitoring stations throughout the country. The stations measure the levels ambient air quality in relation to the National Ambient Air Quality Standards.

Ambient air quality monitoring data obtained from these stations indicates that there are some geographic areas within the country, where ambient air quality standards are being exceeded and this is posing a threat to human health and the environment in those areas. This observation has led to the declaration of such areas as National Air Pollution Priority Areas in accordance with section 18 of the AQA. To date, three priority areas have been declared, these are shown in figure 1 below. The first priority area, the Vaal Triangle Airshed Priority Area (VTAPA) which covers parts of Gauteng and Free State provinces, was declared in 2006. This was followed by declaration of the Highveld Priority Area (HPA) which covers parts of Mpumalanga and Gauteng provinces, in 2007. For these two priority areas, substantial evidence that ambient air quality standards are being exceeded as a result of activities that are causing air pollution in the area. The Waterberg-Bojanala Priority Area (WBPA) was the third to be declared in 2012 and it encompasses parts of in Limpopo and Northwest Provinces. With regard to the Waterberg-Bojanala

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Priority Area substantial evidence exists that national ambient air quality standards have the potential to be exceeded in future as a result of current (and planned) activities that contribute (or may contribute) to air pollution in the area. The Waterberg Bojanala priority area declaration therefore presents a proactive approach to air quality management, seeking to provide guidance to development activities in order to avoid an irreparable state of air in the region.

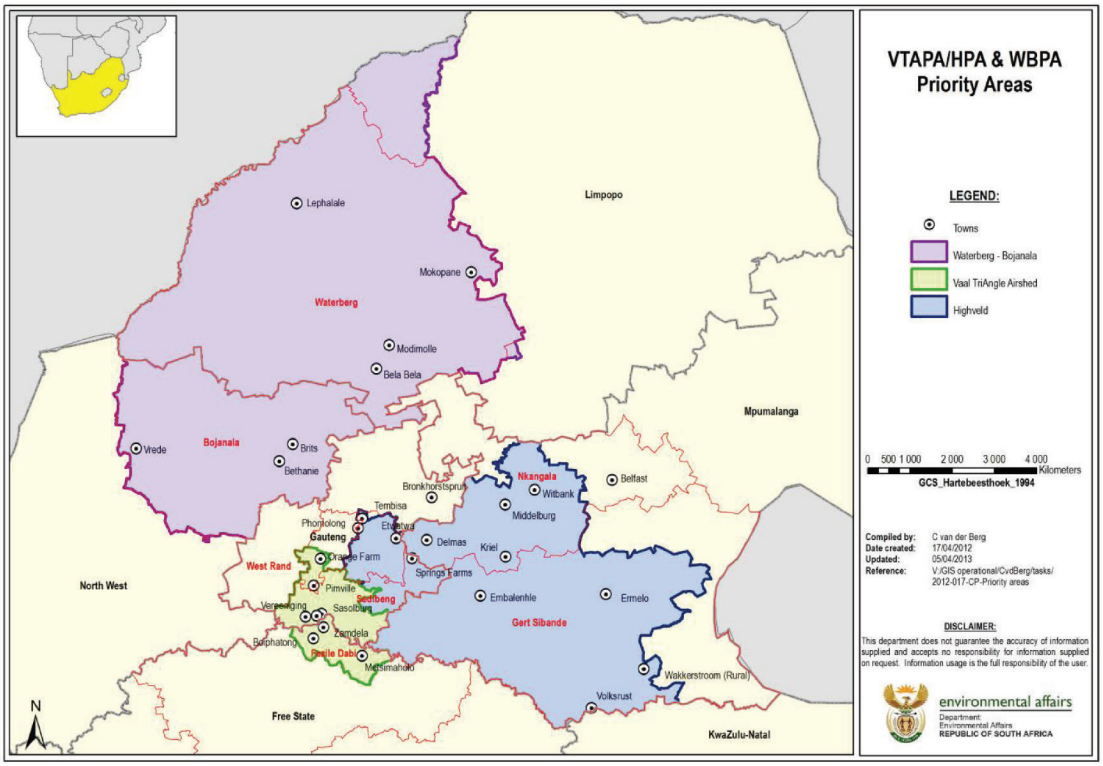


**Figure 1: National Priority Areas declared under section 18 of the Air Quality Act**

Once an area is declared a priority area, the AQA requires that an Air Quality Management Plan (AQMP) for that area be developed. One of the steps involved in the development of an AQMP is the baseline assessment which characterises the extent of the air quality problems in that area. Air quality baseline assessments undertaken in the currently declared priority areas have shown that domestic/residential fuel burning is one of the significant contributors to air pollution in these areas (see Figure 2).

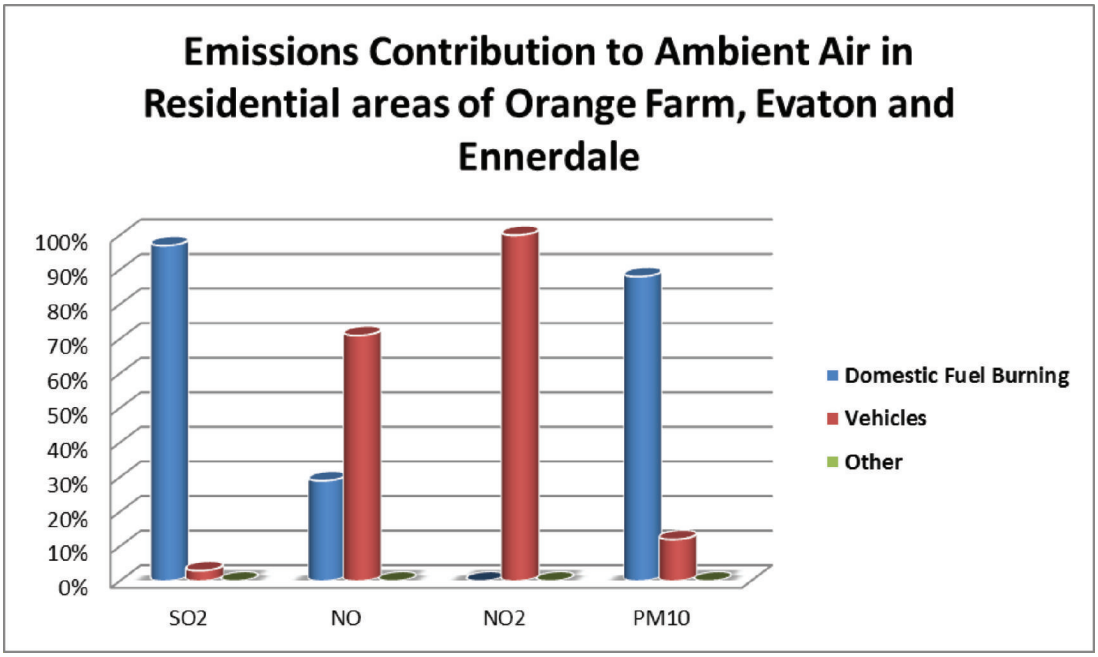


**Figure 2: The contribution of residential air pollution (blue) to ambient air pollutants concentration in the Vaal triangle Priority Area "hotspot",Residential areas of Orange Farm, Evaton and Ennerdale, (VTAPA AQMP, 2009)**

Emissions from domestic fuel burning has two consequences that makes them worse than their industrial counterparts and all other sources. Firstly, unlike industrial emissions that are emitted higher up in the atmospheres through the stack, household emissions occur within the breathing zone of a human being, which exposes people to immediate and therefore highest concentration of pollutants, with more severe health impacts. Secondly, household pollution is experienced both indoors and outdoors. According to World Health Organisation (WHO), indoor smoke can be 100 times higher than acceptable levels for fine particles. Exposure is particularly high among women and young children, who spend the most time in houses or near emission sources.

### 1.2. Objectives of the strategy

The purpose of the strategy is to map out the path that the country needs to take in reducing the impact of air pollution in dense low-income settlements. The strategy comes about as a result of recognition of the need for a multi-departmental, multi-stakeholder approach to resolve the problem. As a result the objectives of this strategy are centred on pulling resources and efforts of all departments and stakeholders together to evaluate and measure all efforts to resolve the problem.

The objectives of the strategy are:

1) To ensure that efforts to address air pollution in dense low-income settlements are concerted and coordinated;

2) To facilitate the implementation of interventions aimed at reducing emissions from low-income settlements; and

3) To ensure continued monitoring, evaluation and reporting on the successes and challenges in the implementation of the proposed interventions.

### 1.3. Approach and methodology

The development of the strategy addressing emissions in dense-low-income settlements has been guided by a consultative process with relevant national and provincial departments.

This Strategy and Action Plan was developed in accordance with the spirit and letter of the cooperative and participatory governance requirements and principles contained in Chapter 3 of the Constitution; the NEMA and the AQA. Consultation included public participation workshops for various stakeholder including academics, NGOs as well as interested and affected parties; consultation with provincial governments through the Provincial Air Quality Officers forums; consultation with national departments through interdepartmental meetings; and consultation with communities and NGOs through, community roadshows. Details of the consultation process are shown in Table 1.

**Table 1: Phases for developing the strategy to address air quality in dense low-income settlements**

| | PHASE | ACTIVITIES AND OUTPUTS |
|---|---|---|
| 1. | Strategy drafting<br>**January to June 2013** | Strategy was drafted by the Department of Environmental Affairs taking into account the outcomes of the preliminary bilateral meetings held with the relevant departments (Department of Energy, Department of Human Settlements and Department of Health). |
| 2. | Stakeholder Workshop<br>**October 2013** | Multi-stakeholder workshop was held on 31 October 2013 at Protea Hotel OR Tambo. Provincial and municipal officials and representatives from the private sector participated in the workshop. |
| 3. | Strategy finalisation<br>**November 2013- 2014** | The strategy was finalised in consultation with the relevant departments (Energy, Housing and Health) and taking into account inputs made by stakeholders. Further consultations were made with departments of Cooperate Governance, Trade and Industry as well as Science and Technology. |
| 4. | Cabinet clusters consultations<br>**2015** | The strategy was presented to different cabinet clusters. |
| 5. | Consultation with the Department of Trade and Industry as per Cabinet recommendation<br>**24 August 2015** | The meeting consultation was held at the DTI Campus in Sunnyside as recommended by Cabinet. The main comment was that dirty fuel solutions should create opportunities for local suppliers. This aspect was considered in the strategy. |
| 6. | Presentation to cabinet<br>**25th of February 2016** | The minister presented the strategy to the cabinet, recommending that cabinet approve its publication for public comments .Cabinet accepted the recommendation and approved the publication of the strategy for public comments. |
| 7. | Draft Strategy gazette for public comment | The Strategy was published in a Government Gazette by the Minister for members of the public to submit to the DEA, within 60 (sixty) days written representations or objections on the draft strategy. |

| | | |
|---|---|---|
| | **24 June 2016** | Members of the public submitted their comments and DEA responded to those comments. |
| 8. | Consultation with communities - roadshows<br><br>**November 2016 to January 2017** | Community consultations were held in the most affected areas as per the cabinet advice, those areas are as follows;<br>A. Emalahleni (Witbank) in Emalahleni Local Municipality (25.11.2016)<br>B. Zamdela in Fezile Dabi Municipality (27.01.2017)<br>C. Ivory Park in City of Joburg Metropolitan Municipality (09.11.2016)<br>These areas were chosen based on the size of the population affected, number of people using dirty fuels, ambient air quality conditions and logistics. |
| 9. | Final consultations with departments<br><br>**June 2017** | Last consultations which focused on the 'implementing departments' were held at the DEA as follows:<br>A. Department of Energy (01.06.2017)<br>B. Department of Health (01.06.2017)<br>C. Department of Human Settlement (26.06.2017) |

Consultation with government departments, provinces and municipalities has ensured that this strategy is an integrated strategy for the whole of government, and is aligned with institutional capacity and intergovernmental systems. This strategy seeks to mainstream government planning and reporting systems in all efforts to address air pollution in dense low-income settlements.

### 1.4. Definition and scope

For the purpose of this document, dense low-income settlements are considered to be communities characterised by compacted dwellings belonging to people earning minimal wages. Of these areas, this strategy is concerned with those that, according to data from Stats SA, have the highest usage of dirty fuels (coal, wood, paraffin). These areas are largely located within district municipalities in **Error! eference source not found.**. Within these municipalities, further assessments (e.g. research studies and AQMP baseline assessments) have pointed specific towns that could be having high dirty fuel burning problems and associated air pollution. The specific towns are highlighted in Table 2. Please note that the list is non-exhaustive.

**Table 2: A non-exhaustive list of areas where residential air pollution problems**

| **Areas within the national priority areas** | | | | |
|---|---|---|---|---|
| **AREA** | **ENERGY SOURCE** | **CRITICAL AREAS IDENTIFIED** | **SOURCE OF INFORMATION** | **YEAR PUBLISHED** |
| Vaal Triangle Airshed Priority Area | Coal | Soweto, Orange Farm, Evaton, Sebokeng, Sharpville, Boipatong, Bophelong, Zamdela | VTAPA AQMP Baseline Assessment Report | 2009 |

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| | | | | |
|---|---|---|---|---|
| Highveld Priority Area | Wood and Coal | Lesedi, Ekurhuleni, Victor Khanye, Steve Tshwete , Emalahleni, Secunda, Ermelo, Standerton, Balfour | HPA AQMP | 2011 |
| Waterberg-Bojanala Priority Area | Wood and coal<br>Coal, wood and paraffin | Lephalale, Mogalakwena, Bela-Bela. Madibeng, Rustenburg | Waterberg District AQMP<br>Bojanala District AQMP | 2009<br>2011 |
| **Areas outside the national priority areas** | | | | |
| **AREA** | **ENERGY SOURCE** | **CRITICAL AREAS IDENTIFIED** | **SOURCE OF INFORMATION** | **YEAR PUBLISHED** |
| **GAUTENG PROVINCE** | | | | |
| City of Tshwane | Not Specified | Mamelodi, Marabastad | Not Specified | 2006-2008 |
| Ekurhuleni Metro | Coal and wood | Brownfield, Tembisa, Etwatwa | Ekurhuleni Metro AQMP | 2005 |
| City of Johannesburg | Coal and Parrafin | Ivory | City of Johannesburg AQMP | 2003 |
| **WESTERN CAPE PROVINCE** | | | | |
| City of Cape Town | Wood, household waste, used tyres | Khayelitsha | WCHR | 2013 |
| **LIMPOPO PROVINCE** | | | | |
| Capricorn District | Wood, coal and paraffin | Polokwane Local Municipality | Capricorn District AQMP | Not Specified |
| **KWAZULU-NATAL PROVINCE** | | | | |
| KZN-wide | Wood, Paraffin, Coal | Magwaveni, Cato Crest, Hammers Estate, Umlazi, Maphela, Mkholombo, Emvini, Lindelani, Seacow Lake, Gologodo- Ensimbini, bhambayi, Mdunduma. | NOVA Fridge Report | 2006 |
| eThekwini Metro | Paraffin | Cato Crest | Durban Kerosene Study | 2007 |

## 2. POOR AIR QAULITY AND DENSE LOW-INCOME COMMUNITIES

The problem of residential air pollution is more often than not, associated with dense low-income communities rather than the more affluent residential communities. This difference in air quality, especially during winter, provides a key insight into the root causes of poor air quality in dense low-income communities:

- Low-income households cannot afford cleaner fuel options even if they are available. Lack of financial resources limits fuel choices to the cheapest fuels namely: coal, wood and paraffin. Unfortunately, these are the dirtiest of fuels.
- Dense low-income settlements often have dirt roads, inadequate waste collection services, few trees, ground-cover etc., all of which contribute to or exacerbate air pollution.
- Dense low-income settlements are often located in areas directly impacted by other significant sources of air pollution including industrial and mining activities.
- Low-income households include shacks or houses (including some government subsidised houses) that are poorly insulated. This means that they are often too cold in winter or too warm in summer – conditions that require disproportionate energy inputs, i.e. low-income households use proportionally more of their resources to heat their homes in winter than middle-to-high income households.

Besides the contribution of income to the situation, the impact of residential air pollution is often heightened by the density of the settlements. The density of the settlement have an impact on dispersion of pollution e.g. in less dense settlements, there is relatively more rigorous dilution of pollutants, which reduces the concentration of pollutants over the area. Dense settlements on the other hand experience less pollutant dilution, and therefore high pollutants concentrations. This is particularly the case if the source of pollution is individual households and not industry.

In South Africa the impact of residential fuel burning on ambient air quality has been observed though various State of Air reports showing exceedances of ambient air quality standards in areas where domestic fuel burning is known to exist. The following figures (Figure 3-Figure 5) show examples of areas where ambient air quality standards are being exceeded in the country. What is clear from the graphs is that in some of the areas where exceedances are reported, domestic fuel burning activities are also known to occur (e.g. Zamdela, Olivenhoutbosch in City of Tshwane and Secunda in HPA).

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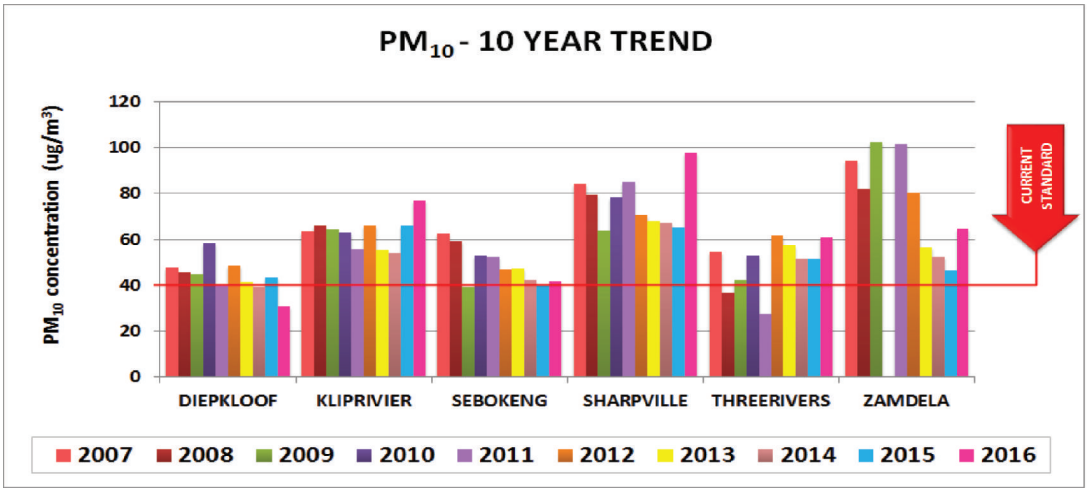


**Figure 3: State of Air in the Vaal Triangle Airshed Priority Area**

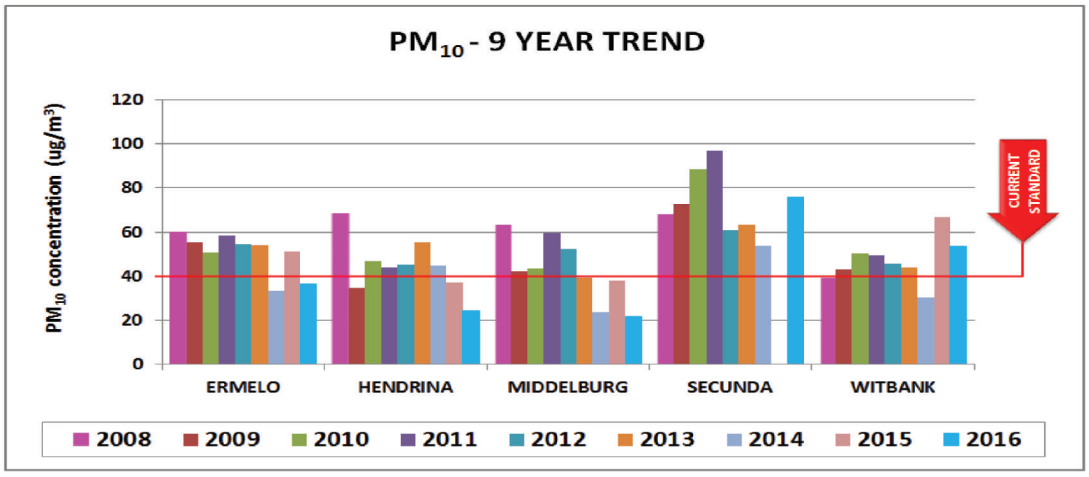


**Figure 4: State of Air in the Highveld Priority Area**

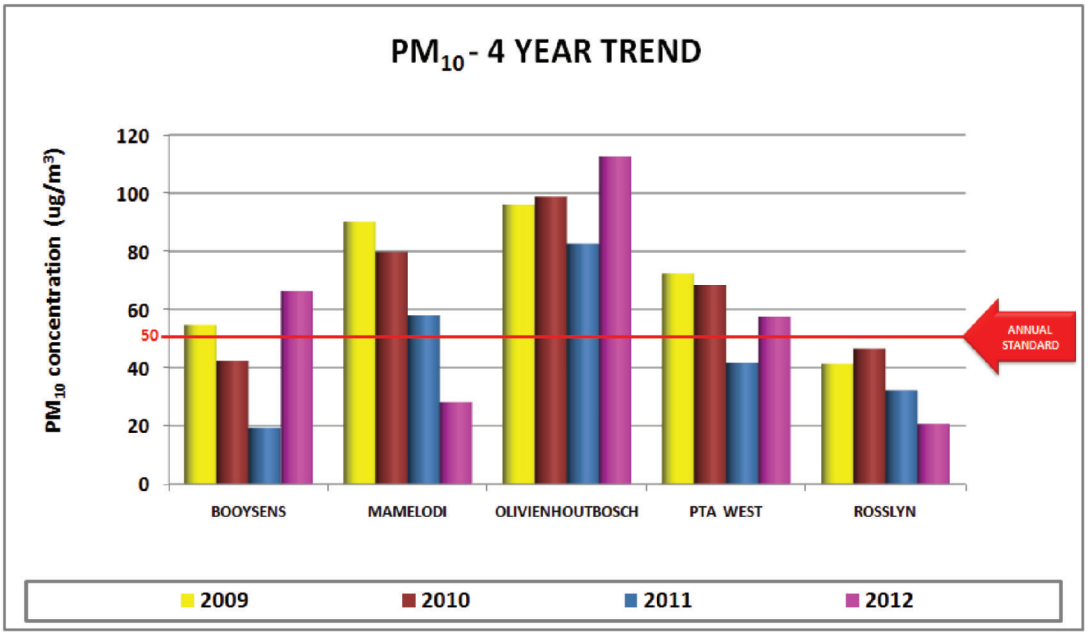


**Figure 5: Historical state of air in Tshwane Metro**

From the regulatory perspective, residential air pollution presents a complex challenge because unlike industrial emissions which can be regulated through emission limits (AQA section 21- listed activities and minimum emission standards) air pollution from residential areas cannot be regulated through a clear phase out or posing of limits approach. This is because the polluter-pay-principle cannot be applied to poor indigent households. It is for this reason that the implementation of a strategy addressing emissions from dense low-income settlements is required.

The following characteristics of dense low-income settlements make the air pollution problem to thrive in these areas:

### 2.1. Poverty and the lack of fuel or energy-carrier choices

Even though many people living in dense low-income settlements know and acknowledge that the burning of coal or wood may have a negative impact on their health and well-being, they continue to burn these “dirty” fuels. The reason for this is simply one of poverty and survival because these fuels are the only affordable options. Indeed, even when households have access to electricity, many still use coal and wood for the energy intensive applications of cooking and heating because they simply cannot afford the cost of electricity for these applications. Thus, fundamentally, the issue of air pollution and associated health impacts from coal and wood burning in dense low-income communities is a symptom of poverty because, people simply cannot afford cleaner alternatives to coal or wood.

### 2.2. Poor fuel conversion technologies

Very little strides in generating cheap improved technology for household energy consumption have been achieved. Many households in developing countries such as South Africa are therefore still reliant on "dirty" fuels for everyday use. The negative impact of the use of these "dirty" fuels is exacerbated by their burning in inefficient fuel conversion technologies, e.g. open fires, braziers (imbawula or umbaola) etc. Thus, not only are the fuels themselves "dirty", but they are often inefficiently combusted producing products of incomplete combustion, such as swirling pawls of thick choking smoke.

### 2.3. Low energy efficiency

Ironically low-income households often use more energy than is generally necessary for energy-intensive tasks. The following examples illustrate this point:

- Low-cost houses - Shacks and some government subsidised houses often do not have insulation of any kind. These dwellings become swelteringly hot in summer and bitterly cold in winter and as a result excessive amounts of energy must be used to cool and warm these houses in summer and winter respectively.

- Electrical appliances – In houses with electricity, owners often cannot afford to buy high-quality energy-efficient electrical appliances. Thus, electricity is wasted through the use of cheap energy- guzzling household appliances.

### 2.4. The double burden – poverty and illness

Air pollution from coal and wood burning in dense low-income communities ensures that people living in these areas carry a double-burden. Not only are they impoverished, they are also prone to air quality related illnesses. Illness in turn reduces potential productivity and, in so doing, reinforces the poverty cycle.

### 2.5. The 'victim' of pollution is also the 'polluter'

From a regulatory perspective, air pollution from coal and wood burning in dense low-income communities presents a dilemma. This is because the traditional "command and control" approach to emission control is inappropriate as this approach would simply "criminalise" the poor, a situation that is morally and ethically unacceptable.

### 2.6. The 'polluter cannot pay'

Section 2(4)(p) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) requires that "the costs of remedy of pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects

be paid for by those responsible for harming the environment". This "polluter pays principle" would be inappropriate in respect to air pollution from coal and wood burning in dense low-income communities because the polluter simply "cannot afford to pay".

### 2.7. Other sources of air pollution in dense low-income communities

Although the burning of solid fuels is the most significant contributor to poor air in many South African dense low-income communities, especially in winter, there are also a number of other air pollution sources of varying impact and significance. These include:

- Un-surfaced roads – Dirt roads in many dense low-income communities give rise to dust.
- Veld fires – Veld fires adjacent to dense low-income communities frequently occur in the winter months and this is when emissions from coal and wood burning are at their worst.
- Waste burning – Poor waste management services often lead people to burn waste, including the waste in overflowing waste skips. Related to this is the burning of waste in poorly managed landfill sites.
- Tyre and cable burning for metal recovery – Random burning of tyres and scrap equipment such as old cars in order to recover scrap metals is a usual phenomenon in some townships.
- Street burning for vendors – Fires that are made on road-sides either to cook meals or roast meat, among others for the purpose of selling.
- Heating in public spaces – On cold winter morning people queuing for transport on open streets sometimes set tyres alight or have open fires to warm themselves. During service delivery protest people normally burn tyres to demand attention from political heads so that they can voice out their dissatisfaction.
- Neighboring sources, especially industry – Industry is often the magnet for the development of dense low-income communities and in many instances industrial emissions simply add to the cocktail of atmospheric emissions. As stated in the 2005 State of the Air Report, the collocation of heavy industries and communities presents a continued source of health risks and consequent conflict and this is currently exacerbated by increased pressure to place residential areas within former industrial buffer zones.
- Vehicle emissions – Most of the low-income settlements, especially in urban areas, are established along major roads and so vehicle emissions also add to the cocktail of atmospheric emissions in these localities.
- Non-fuel burning indoor sources of pollution – Many researchers who study indoor air quality believe that overall exposure to air pollutants is greater indoors than outdoors, even in non-fuel burning households. The reason for this being that there are various sources of emission located indoors and people frequently spend most of their time indoors i.e. in houses, offices,

schools, shops, etc. Inadequate ventilation can increase indoor pollutant levels by not bringing in enough fresh air to dilute emissions from indoor sources and by not carrying indoor air pollutants out of the building. Elevated temperatures and humidity levels can also enhance emissions of some pollutants. Sources of indoor air pollution include building materials and furnishings as diverse as deteriorated asbestos-containing insulation; wet or damp carpets; cabinetry or furniture made of certain pressed wood products (significant source of formaldehyde emissions); pesticides, paints solvents and cleaning agents; animals, moulds, dust mites and other biological sources; as well as tobacco smoke in some instances.

### 2.8. The financial cost of poor health

Air pollution is known to cause illnesses such as bronchitis, asthma exacerbation, underweight babies cardiovascular diseases, etc. and death. The evidence of negative health impacts and mortality from domestic fuel burning is in South Africa has not been properly documented but the existence of these negative impacts cannot be disputed. People living below the poverty line bear practically the entire burden of this health risk. The additional illness-related costs to those affected in terms of diminished quality of life and lost capacity to work are also significant.

Research from World Health Organisation suggests that air pollution kills 1 in 8 people and that air pollution kills more people than HIV and Malaria. A local study revealed air pollution related health can cost government approximately R2 Billion per year especially in the winter months (May-July) (FRIDGE, 2004). Although the implementation of this strategy will have cost implications, one of the biggest benefits is that such implementation will result in savings (in relation to avoided hospital admissions for pollution related illnesses and diseases) on the government health budget and improved quality of life.

## 3. CHALLENGES TO ADDRESSING AIR QAULITY IN DENSE LOW-INCOME COMMUNITIES

A number of interventions that address air pollution in dense low-income settlements have been implemented by government over the years. Most of them were meant to primarily address energy shortages and conservation while others were aimed at addressing indoor air pollution household, fuel-related accidents and other related challenges. Even though there was no deliberate alignment with ambient air quality objectives their general outcome was some degree of improvement in air quality. Some of them have achieved some measure of success yet air quality challenges persist.

There are a number of reasons why intervention efforts have not had a more measurable, sustained or wide-spread positive impact in improving air quality and they include the following:

### 3.1. Lack of funding

Financial viability of energy technology and/or intervention strategy has the greatest influence on the sustained adoption of the technology/intervention. Most of the strategies that were attempted in the past

e.g. supply of Liquefied Petroleum Gas (LPG) to communities by DoE and the insulation of houses provided by local government housing projects, required financial resources for them to be implemented. LPG, for example, would require substantial capital investment plus subsidies to enable households to refill the gas cylinders on a continuous basis. A considerable amount of funding will be required if such an intervention is to be rolled out on a large scale.

### 3.2. Criminalisation of poverty

Legislations and strict regulations are usually used as a key to providing solutions to most socio-economic and environmental problems. However, the issue of air pollution from the use of dirty fuels in domestic settings poses a unique challenge in the sense that it is a poverty-driven problem. Government cannot outlaw dirty fuels or their use, unless there is an alternative that allows people to meet their energy requirements at no additional costs or cheaper. This makes it difficult to address the problem through strict regulations.

### 3.3. The depth of research

The amount of research going into most intervention strategies is seldom comprehensive enough to allow for proper and continued implementation. For example, the DoE conducted field tests with solar cookers in 2000 but no further investigations were conducted on the stove since Phase 1. Few needs-oriented cooking profiles have been drawn up for target regions offering conditions conducive to the use of solar cookers. Yet such profiles are vitally important as a basis for appropriate selection and modification of solar cookers (*Biermann at al., 1999, Solar Cooker Fieldtests in South Africa*).

### 3.4. Limited awareness, buy-in and retention

People tend to use what they know, and mostly what has always been used. With a wide variety of energy technologies developed, some people are not aware of the many options they have. Meanwhile those who know about the technologies fail to trust them to the point of investing in them. In instances where intensive and extensive awareness campaigns have been rolled out, retention of methods remains a challenge. With Basa Njengo Magogo (BnM), for example, the method was widely campaigned, accepted by communities but some retention studies still shows that some people return to their old ways of doing things.

### 3.5. Performance and convenience of the technology

One of the factors affecting the use of a technology/technique is the relative or perceived convenience and performance. This means the ability to meet the required energy output from the technology without compromising on the level of convenience it terms of time and effort. Some of the technologies such as the box solar cooker are quite efficient but require the user's attention to keep them aligned with the sun and maintain good performance. Unlike the popular brazier, solar cookers can only be used for cooking and not heating, hence some users still find it more convenient to continue using the brazier.

### 3.6. Energy inefficiency (including fuel conversion appliances)

There is a false general assumption that good indoor air requires more energy. In reality, good air quality can be achieved while saving energy by simply using the energy efficiently – no trade-offs. Using energy efficiently means using the right appliances in the right way at the right time for the right purpose. Previous attempts to offer free electricity did not achieve optimum results because some people still find electricity costly, sometimes because they are using inefficient appliances.

### 3.7. Competing priorities

In some cases political influences have played a role in the implementation of long-term environmental strategies. This is mostly evident in cases where service delivery competes with environmental protection. For example, more often than not, a bid to deliver housing in large numbers in view of the immense backlog competes with a unique opportunity to provide environmentally sustainable and energy efficient housing units. The result is that low-cost housing is not designed to take advantage of the enabling climatic conditions that characterises our country, which would reduce the need to burn dirty fuels.

### 3.8. Lack of coordination

Overarching all the challenges listed above is the lack of coordination. It is clear that in order to efficiently and effectively address poor air quality in dense low-income settlements there is a requirement for the integration of policies and activities from various department/institutions towards a common objective. Previously, interventions have been made by individual departments working in isolation; and this has, as an example, led to interventions being implemented without the consideration of air pollution hotspots. Lack of coordination can also be attributed to limited awareness, buy-in and inefficient/ineffective exploration of funding opportunities. This evident lack of coordination has led to a lack of alignment of initiatives and information sharing. In essence, the opportunities associated with economies of scale, the whole being greater than the sum of its parts, and the symbiotic effects of different but mutually reinforcing interventions are often being missed. Coordinated efforts from various departments/institutions can help address both, energy, housing air pollution challenges experienced in dense low-income communities.

# 4. PROPOSED INTERVENSION MEASURES

The main aim/overall goal of this strategy is to map out the path that the country needs to take in reducing the impact of air pollution in dense law income settlements. The intention is to provide a coordinated approach in implementation of efforts directed at ensuring that ambient air quality in dense low- income settlements is in compliance with National Ambient Air Quality Standards, thereby ensuring the right to air that is not harmful to people's health and well-being as required by section 24 of the Constitution of South Africa. Listed below are the key objectives of the strategy, and associated activities/ intervention measures to be undertaken in order to ensure that this goal is realised.

**Objective 1: Ensure that efforts to address air pollution in dense low income settlements are undertaken in a coordinated and coherent manner**

It is clear that in order to efficiently and effectively address poor air quality in dense low-income settlements, there is a requirement for the integration of policies and activities from various department/institutions towards a common objective. Previously, individual departments working in isolation have made interventions, and this has yielded limited awareness, buy-in, and inefficient/ineffective exploration of funding opportunities. With coordinated efforts from various departments/institutions, energy and housing shortages can be addressed, while at the same time addressing air pollution problems.

Below is a list of role-players that would need to collaborate in the formulation and implementation of the strategy:

- National government departments (Particularly, DEA, DoE, DoH, DSD, DHS,DST, COGTA);
- All Municipalities;
- Provinces;
- Provincial sector and line departments, including development and trade forums and organisations;
- Parastatals;
- National and regional community based organisations;
- Corporate bodies/private companies; and
- Academic and research institutions;

To achieve this objective the following activities shall be undertaken:

**Activity 1a: Establish a Coordinating structure: National Coordinating Committee on Residential Air Pollution**

The Department of Environmental Affairs (DEA) shall establish and convene an intergovernmental structure "National Coordination Committee (NCC) on Residential Air Pollution" for the coordination of this strategy. Initially, this forum will consist of the Department of Environmental Affairs (DEA), Department of Human Settlement (DHS), Department of Energy (DoE) and Department of Health (DoH) as well as other relevant departments and representatives from provinces and municipalities. The

objective of the forum will be to provide overall direction and oversight of the implementation of the strategy. The functions of the forum will include but not be limited to the following:

- Continuous update and monitoring of the progress on strategy implementation.
- Continuous evaluation / review process:
    - Evaluate the effectiveness or the overall impact of the interventions within the agreed timeframes.
    - Identify gaps, improve processes, and prioritise the interventions.
    - Evaluate improvement in air quality through research studies and/or the National Ambient Air Quality Monitoring Network (NAAQMN)
    - Review the interventions to focus more on the remaining sources.
- Develop reporting mechanisms.
- Facilitate the inputs for the progress report from the respective departments.
- Compile a detailed annual progress report to the Minister clearly indicating the activities undertaken by various government and non-government entities.

The Department of Environmental Affairs will make every attempt to facilitate the coordination and alignment of various activities aimed, specifically, at improving air quality in dense low-income settlements by providing a referral and clearing-house facility in respect of such activities.

All spheres of government (national, provincial, and local) involved in implementing activities aimed specifically at improving air quality in dense low-income settlements, or implementing activities that have known positive air quality impacts, will actively provide up to date information on such activities to the NCC.

**Activity 1b: Ensure, through the National Coordination Committee (NCC) that interventions aimed at reducing air pollution in dense low-income settlements are effectively prioritised.**

Interventions aimed at addressing poor air quality impacts in dense low-income settlements will be prioritised based on the seriousness of the air quality problem and the number of people affected, i.e. interventions that provide the greatest possible air quality improvements for the largest number of people will be prioritised.

To achieve this, it is necessary that a comprehensive baseline assessment be undertaken to provide a better understanding of issues on the ground. A baseline assessment should investigate, among other things:

- Levels of air pollution in the target area(s)
- Sources of pollution in those areas
- Basic health impact assessment
- Energy installations in the households

- Socioeconomic assessment (including culture assessment)
- Supply, distribution and cost of currently used dirty fuels
- Potential local suppliers and distributors of cleaner alternatives

With respect to nationally coordinated or implemented activities aimed specifically at improving air quality in dense low-income settlements, the implementation of such activities in areas with the most population affected by poor air quality, including those in areas declared as Priority Areas in terms of the AQA (See Figure 1 and Table 2) must be prioritised.

All relevant national departments in collaboration with provinces, district, and local municipalities must be involved in the development and facilitation of identified possible interventions to improve air quality in low-income settlements.

**Objective 2: To facilitate the implementation of interventions aimed at reducing emissions from dense low-income settlements**

Proposed interventions need to be carried out in a manner that will yield results that are beneficial to both the affected communities and the environment. To ensure that these interventions yield maximum results proper facilitation mechanisms for implementation must be developed.

**Activity 2a: Provision of affordable or subsidised clean energy alternatives**

It has become clear that many of the dense low-income settlements are largely inaccessible. This makes it difficult for the infrastructure that is required for provision of electricity to each household in an effective and efficient manner to be developed. In instances where electricity is available, many low-income settlements are unable to afford it, thereby making coal and wood the only affordable alternative energy options. There is, thus, a need for provision of cleaner, yet affordable alternatives.

In order to facilitate this objective (objective 2), it is recommended that the DoE leads the investigation of the appropriateness of, and means to provide alternative energy sources to dense low income settlements, with priority given to settlements in the Air Pollution Priority Areas. This activity should involve consultation with identified communities where the project in to be undertaken. The following alternatives should be considers (only as a starting point):

*Solar tech alternatives*

Most low-income communities use coal and other dirty fuels not only for heating their homes, but also to heat water for bathing, cooking and others. Solar water geysers, for example, coupled with other cleaner cooking and heating alternatives could reduce the reliance on “dirty fuels” for such duties while also making a significant contribution towards poverty alleviation in terms of improving the general welfare of households as well as developing activities to generate employment.

South Africa has an average daily solar radiation of between 4.5 and 6.5 kWh per square metre. This resource is relatively predictable and well distributed throughout the country (with some regional variations). This makes the use of solar technologies beneficial in offering quality local government infrastructure services, saving households money over the long term, and reducing GHG emissions associated with the use of fossil fuel. A national programme focused on the delivery of residential solar technology alternatives could potentially reduce the overall national energy demand by 4.5% or 9 000 GWh/annum (Austin & Morris, 2005).

*Clean stoves*

While significant research has gone into clean stoves, cooking fuels and cooking methods, these have not yet been rolled out widely in South Africa (Financial Mail, 2005).There are clean cook-stove technologies, fuels, equipment, and practices that address the health and environmental impacts associated with traditional methods and cook-wares. The challenge with them, however, is that not everyone can afford them. New technology must meet the needs of the users and be culturally appropriate. Otherwise, it is not accepted or does not get a buy-in from the intended users. Clean cook stoves and other new technologies must be affordable, socially acceptable, easy to use, widely available, durable, and most importantly, desired.

**Free basic electricity with efficient appliances**

Government will explore new ways of providing electricity subsidies, such that the efficient use of electricity is encouraged. One example could be a subsidy that gives the user one (1) unit of electricity for every unit purchased. Alternatively, a stepped tariff which provides indigent households with the first specific kWh of electricity per month for free and charge a stepped tariff thereafter. Meanwhile, private institutions and parastatals such as Eskom are encouraged to continue providing energy efficient appliances to poor households, with priority given to dense low-income settlements. The provision of energy efficient appliances could result in the net reduction in electricity consumption, thereby making the overall electricity use by households less expensive.

**Subsidised Liquid Petroleum Gas**

The South African energy market is not the largest in terms of consumption of liquid petroleum gas (LPG) as household fuel. There is a general lack of awareness around the fact that this is amongst the cleanest fuels available for household use. The deployment of LGP as alternative fuel among low-income communities can reduce household emissions related to fossil fuels by as significant margin. This can only happen if the costs associated with purchasing and refuelling of LPG cylinders are regulated and made affordable to those who need it most. As with electricity, means to make subsidies available to low-income groups in densely populated areas must be sought.

**Activity 2b: Ensure that low-income houses are energy efficient.**

Adequate insulation of houses in low-income settlements can negate the need for using dirty fuels for space heating, especially in the winter months. Initially, nearly 3 million homes built as part of the Reconstruction and Development Programme (RDP) public housing scheme had no ceilings. As a result, many of these homes experience extreme temperatures due to the absence of this basic form of

insulation (Energy Ramblings, 2012). The extreme temperature means the houses are too cold in summer and too hot in winter. As a consequence, houses that are too cold in winter necessitate household heating and lead to the use of dirty fuels such as coal in instances where the household cannot afford cleaner heating fuels.

Fortunately, the Minister responsible for Human Settlement has approved specific national minimum and maximum norms and standards for all houses to be delivered in the Country through Governments National Human Settlements Programmes. These norms and standards were adjusted in 2014 to accommodate the energy efficient measures as required by the approved National Building Regulations and specifically SANS 10400 XA. The Ministerial norms and standards are obligatory and all newly built houses must meet these requirements. Any deviation will constitute irregular and un-authorised expenditure. In addition all housing subsidy scheme financed houses are subject to the National Building Regulations and the regulations instituted by the National Home Builders Registration Council (NHBRC).

The Norms and standards are the following:

a) Two bedrooms;

b) A separate bathroom with a toilet, a shower and hand basin;

c) A combined living area and kitchen with wash basin;

d) A standard basic electrical installation comprising a pre-paid meter with distribution box and lights and plugs in all living areas of the house;

The following minimum norms relate to the obligatory energy efficient measures

e) A ceiling with the prescribed air gap for the entire dwelling;

f) Above-ceiling insulation to meet the “R” values prescribed by SANS 10400 XA (the Subsidy quantum allows for 135 mm mineral wool blanked installation on the ceiling);

g) Plastering of all internal walls;

h) Rendering on external walls; and

i) Fenestration shall be in accordance with SANS 204 provisions: The fenestration provisions for the 40 square metre house for Climate Zone 1 is as follows:

- Window type NC4S: 1511 x 1245mm x2: Low E clear safety glass
- Wndow type NC4: 1511 x 1245mm x2: Low E clear safety glass
- Window type NE1: 533 x 654mm x1: Low E opaque safety glass.

j) Other climate zone will require calculation as prescribed by SANS 204.

The National Norms and Standards also contain a set of environmental considerations and measures that must be applied and adhered to in township design, house orientation and water saving measures.

Following the publication of the standards, DHS adopted the policy that ensures that all newly built RDP houses (post 2009) – now called BNG houses (Breaking New Grounds), are energy efficient, fitted with ceilings and electricity. Energy efficient housing provides for fuel savings, monetary savings, improved indoors comfort, and improved ventilation and air quality as well as reducing electricity demand.

Energy efficient housing projects can be combined with other related projects to assist with emission reductions in low-income settlements. An example in this case is the DoE and DHS collaboration in the Kuyasa energy efficiency project in Cape Town from 1999-2002. This project installed solar water heaters, ceiling insulation and compact fluorescent lamps (CFLs) in households that needed them. The project has saved 7.40 million kWh (34%) and 6.437 tons of $CO_2$ emission (33%) on an annual basis representing an aggregated savings of 155 million kWh and 135,187 tons of $CO_2$ of emission (Goldon, 2009)

This strategy will ensure that the collaboration on such initiatives are strengthened to deliver multiple benefits including air quality benefits and associated improvements in health.

**Activity 2c: Influence development-planning initiatives to take into account air quality issues**

Development Planning involves co-ordination of work by private, local and other spheres of government to improve the quality of life for all people living in affected areas. It takes into account the existing conditions, people and resources available/involved in the development of that particular area. Influencing development planning in low-income settlements will ensure that the existing conditions of poor air quality in densely populated areas are taken into consideration. It requires a coordinated approach between the air quality and development sections in municipalities. In order to achieve the objectives of this Activity, air quality officers should be part of development planning and should be in constant liaison with development sections to ensure that the following services are prioritised during development planning in dense low-income:

- Road surfacing;
- Regular refuse removal;
- Electrification; and
- Housing that is environmentally efficient.

In particular, it is recommended that Proper risk assessment should be undertaken to ensure that dense low-income settlements are not located in areas that will expose them by default, to increased air pollution episodes and environmental stressors, e.g., Physical environmental conditions (topography like valleys that cause inversion layers) and meteorological conditions (atmospheric stability, humidity, temperature, winds, etc.).

Including the above measures in development projects for communities earmarked for air quality improvement interventions will play a major role in improving the air quality conditions.

**Activity 2d: Encourage social upliftment programmes with air quality benefits through air quality offsets**

Offsets are one of the many ways where the private sector can play a role in reducing air pollution in areas where they operate. An example of an offset project is when pollution causing industries addresses local air pollution concerns by providing households with alternative energy, effective stoves, and adequate insulation. Overall, the implementation of such an offset should result in improved ambient air quality. Government will support corporate investments that are demonstrating effectiveness in improving air quality in low-income settlements. This shall be done in line with the air quality offset guideline published by DEA.

**Activity 2e: Create public awareness on air pollution**

Awareness should continue to be created among communities on all forms of air pollution i.e. not only pollution emanating from dense low-income settlements, but from all sources. The implementation of the Air Quality Act revealed that a large percentage of people dwelling in both rural and urban areas are not aware of the dangers of polluted air to their lives and their role in addressing emissions. Government, private, and civil organisations are to use awareness as a tool to disseminate, share and cascade information to communities.

To ensure that awareness is created in communities, various initiatives need to be carried out. These initiatives need to be sustainable, in that they need not only cater for current air quality challenges but also change the mindset of the youth and school-going children with the aim to resolve future challenges. The initiatives also need to be widespread, i.e. they must cover not only the affected areas but the whole country in order to build a lasting body of knowledge amongst the country's citizens. At a household or community level, strategies to reduce the risks from indoor air pollution include:

- Improving public awareness of the health risks of poor air quality resulting from burning of dirty fuels and what communities and individual households can do to reduce or eliminate the risks;
- Switching to cleaner fuels such as liquid petroleum gas, kerosene or biogas;
- Using well designed chimney stoves or smoke hoods, which can reduce indoor air pollution by up to 80 percent;
- Involving communities, particularly women, in developing solutions that suit their circumstances;
- Involving school children through the Department of Education; and
- Involving people in the medical field (e.g. nurses) to support the campaigns in order to get buy in from the communities.

The Department of Environmental Affairs together with other relevant stakeholder shall coordinate a nationwide awareness campaign using the following media avenues:

- Televised campaign advert relating to air pollution in low-Dense Income settlements and its impact on both the environment and human health;
- Form relationships with environmental journalists for better reporting on air quality issues;
- Radio inserts where air pollution awareness campaigns will be aired on community radio stations. The target number of radio campaigns will be agreed upon by those involved.
- Piggyback on cultural activities
- Posters and billboards to be placed in accessible spaces within communities e.g. taxi ranks. Posters to be simple and easy to understand so they can drive the message to the public and reach the most affected members of these communities. Information booklets/leaflets for school pupils in the communities. Booklets or leaflets to be distributed to schools, public hospitals, and other appropriate junctions to help accelerate information and awareness on air pollution to the different members of the communities. The booklets to be made easily understandable and be written in various official languages in order to include most members of the society and schools.

**Objective 3: Ensure continued monitoring, evaluation and reporting on the successes and challenges of the proposed interventions and on air quality improvements**

The ultimate aim of undertaking monitoring is to obtain information about the impact of the implementation of the agreed programmes and interventions. This information helps to evaluate the effectiveness of the programme and help motivate for actions to correct certain aspects of the programme where targets are not met.

Ambient air quality monitoring in dense low-income settlements will be done using existing monitoring stations and the installation of new stations where necessary to measure improvements or lack thereof, in ambient air quality.

The strategy will be evaluated based on the proposed interventions as documented in Section 5 below. Evaluation of interventions will help identify and inform the need for the review or necessary actions.

**Activity 3a: Monitoring, Evaluation and Reporting**

The NCC should monitor and evaluate the performance of the interventions against a known baseline. To achieve this, a database of project information, interventions, baseline, and performance should be developed.

The NCC should track progress on implementation of the strategy through a set of indicators and ensure that all stakeholders involved report to the committee on a quarterly basis. Reporting will be done against the set objectives, indicators and targets as shown in the table below:

**Table 3: Summary of Objectives, Activities, indicators and targets for the Strategy**

| **Objective 1: Ensure that efforts to address air pollution in dense low - income settlements are undertaken in a coordinated and coherent manner** | **Proposed indicators** | **Targets** |
|---|---|---|
| Activity 1a: Establish a coordinating structure: The National Coordinating Committee on Residential Air Pollution (NCC) | A functional committee and quarterly meeting minutes | One functional NCC established by end of **2018** |
| Activity 1b: Ensure, through the NCC, that interventions aimed at reducing air pollution in dense low-income settlements are effectively prioritised. | Number of prioritised areas and intervention measures for such areas identified | 10 areas prioritised for specific interventions by **2019** |
| **Objective 2: Facilitate, through the forum, the implementation of interventions aimed at reducing emissions from dense low-income settlements** | **Proposed indicators** | **Targets** |
| Activity 2a: Provision of affordable or subsidised clean energy alternatives | Percentage of households supplied with cleaner and cheaper energy alternatives | Rollout the appropriate energy alternative to at least 75% prioritised areas by **2023** |
| Activity 2b: Ensure that low-income and informal household are energy efficient | Percentage of new RDP houses built in line with the energy efficiency housing guidelines | 80 % of RDP houses built in line with the energy efficient housing guidelines by **2021** |
| Activity 2c: Influence development planning initiatives to take into account air quality issues | Number of development planning initiatives with positive air quality impacts | Different targets by municipalities ( to be included in AQMPs) |
| Activity 2d: Encourage social upliftment programmes with air quality benefits | Number of social upliftment programmes with air quality benefits | At least 2 offset projects implemented by **2020** |
| Activity 2e: Create public awareness on air pollution | Number of campaigns and information materials circulated in dense low-income communities | 5 Awareness billboards<br>1 television campaign televised.<br>2 Radio inserts<br>2 newspaper inserts<br>500 booklets/leaflets<br>(Annually) |
| **Objective 3: Ensure continued monitoring, evaluation and reporting on the successes and challenges of the proposed interventions and on air quality improvements** | **Indicator** | **Target** |

*Strategy to Address Air Pollution in Dense Low-Income Settlements*

| | | |
|---|---|---|
| Activity 3a: Monitoring and Evaluation | Annual report on implementation of the strategy | One annual report on implementation of the strategy |
| Activity 3b: Reporting | Annual report on implementation of the strategy | One annual report on implementation of the strategy |

# 5. INSTRUMENTS FOR IMPLEMENTING THE STRATEGY

This section describes the regulatory and economic instruments that will give effect to the objectives set out in Section 1.2. **Error! Reference source not found.**Different Departments and their regulatory tools will e used to implement this strategy.

## 5.1. Information

Energy needs vary among households, communities and geographic regions. A clear understanding of these differing needs is crucial to any targeted intervention to provide clean fuels or energy services to low-income households. In order to ensure that adequate resources are allocated to the relevant communities, there is a need for information on

- Extend of the problem in specific areas – As proven by measured ambient air quality data and existing health studies. This information will allow implementers in prioritising areas of concerns.
- Factors driving the use of “dirty fuels” – Information on the reasons for using “dirty fuels” should be identified. This could include resource availability, costs, culture etc. These driving forces will differ from one location to another.
- Barriers to specific interventions – Information on what has and has not worked in the past in attempting to address the issue is vital.

Government will actively support research aimed at ensuring that decisions relating to the selection and prioritisation of interventions to address poor air quality impacts in dense low-income communities are informed by reliable science, i.e. good science must inform decisions on where interventions must be prioritised and what activities should be prioritised. This will be informed by:

- Basic research
- Outcomes of community engagements
- Intervention concepts and approaches
- Technical testing and refinement of proposed interventions
- Small scale in-use evaluation of tested interventions
- Refinement and validation of intervention that has already undergone evaluation
- Piloting of refined and validated interventions
- Methods for monitoring large scale roll-out

Government will compile, publish and circulate up to date information on relevant case studies with a view to promote the implementation of the most efficient and effective interventions that will address poor air quality in dense low-income communities

### 5.2. Funding

The re-prioritisation of existing government budget allocations to activities that have positive air quality impacts in dense low-income communities will be motivated and justified by appropriate cost-benefit analyses.

Donor support for government programmes, research, development and testing of products and their subsequent implementation has been instrumental to the success of most programmes in many countries around the world is therefore recommended that this be encouraged.

The NCC will make all efforts necessary to secure funding from local and international organisations (private sector and government). Funding will be required mainly for the implementation of the following activities:

- Purchasing of alternative energy sources;
- Monitoring devices (for indoor and ambient air quality monitoring);
- Research;
- Educational campaigns;
- Energy efficiency projects; and
- Complementing development projects with air quality benefits

### 5.3. Partnerships and interlinkages

It is only with successful partnerships between the government, private sector and civil societies, particularly those working in dense low-income areas, that the goals of this strategy can be achieved. To ensure that this happens DEA will, through the NCC, form partnerships with other relevant government entities, private organisations and non-governmental organisations (both at national, regional or international levels).

In prioritising and planning activities aimed specifically at improving air quality in dense low-income communities, the implementing agents will make every reasonable effort to coordinate and/or align such activities with activities being implemented with the same purpose by other implementing agents, i.e. implementing agents will attempt to maximise the potential positive impact of activities aimed specifically at improving air quality in dense low-income communities by coordinating and/or aligning their activities with other related activities.

The NCC should appreciate the linkages between this strategy and other government initiatives. These include inter-alia:

- Priority Area Air Quality Management Planning and implementation matters;

- Energy related strategies by partner Departments, provinces and municipalities; and
- Feasibility studied undertaken by industries as part of their air quality offsets.

# 6. ROLES AND RESPONSIBILITIES

The general air quality management roles and responsibilities for the three spheres of government, the private sectors, households and community organisations are outlined in the National Framework for Air Quality Management in South Africa. Such roles and responsibilities have been considered in developing roles for the implementation of this strategy.

## 6.1. The role of private sector

Private companies are urged to partner with the government in selected areas around the country to implement interventions that will result in the improvement of ambient air quality in dense low-income settlements. This will include, but not limited to, the provision of free and/or subsidised alternative energy sources to needy households; paving of roads in relevant settlements; provision of energy efficiency fittings in the houses etc. This could be done as a social responsibility programme or as part of the emission offset programme.

## 6.2. The role of civil society and community based organisations

Community based organisations, NGOs and households play an important role in air pollution prevention as they can form part of air pollution awareness campaigns and education. Community based organisations will work with the NCC in creating awareness with respect to air pollution impacts and availability of affordable alternatives. The benefits and costs of such alternatives should be clearly communicated.

## 6.3. The role of government

Government will play the leading role in implementation of the strategy. The following departments will be at the helm of the government's leadership role:

### 6.3.1. The Department of Environmental Affairs

The DEA will play a role in

- Establishing and convening an intergovernmental structure "National Coordinating Committee on Residential Air Pollution" for the coordination of this strategy;
- Managing the development of rules, criteria, guidelines and/or protocols associated with industrial offset projects;
- Coordinating the compilation, submission and publication of strategy implementation progress reports, including Presidential Outcome 10 Progress Reports and The Medium Term Strategic Framework (MTSF);

- Actively pursuing and securing donor funding for national projects or campaigns prioritised by the National Coordinating Committee on Residential Air Pollution; and
- Ensuring, through the AQMP support programme that provincial and municipal AQMPs include interventions that are specifically aimed at reducing emissions from dense low-income settlements.
- Ensuring that there is monitoring of any improvements in ambient air quality as reported from various monitoring stations across the country.

#### 6.3.2. The Department of Energy

The DoE is responsible for the provision of alternative fuel sources, and for regulating the price and/ or subsidising cleaner fuels. Over the past years the DoE has played a key role in provision of electricity and investment in the renewable energy for both household and industrial use. To aid address pollution in dense low-income areas the DoE is expected to continue with work that is already doing and as part the proposed NCC participate by:

- implementing strategies through which the alternative energy projects can be expanded;
- Regulating prices for alternative energy for residential areas, and by so doing encourage people to switch from reliance on electricity and dirty fuels;
- Undertaking research that investigates key barriers such as prices, demand and supply, local infrastructure etc. to market absorption of alternative energy; and
- Actively pursuing and securing donor funding for national projects or campaigns prioritised by the NCC.

The DoE will also investigate the possibility of local manufacturing of alternative energy infrastructure as this will also reduce the final price. It is suggested that the DoE works hand in hand with other Departments (members of the NCC) to conduct a study(ies) to measure the impact of alternative energy projects on air pollution.

#### 6.3.3. The Department of Health

The Department of Health (DoH) is currently involved in the management of indoor air pollution which is synonymous to air pollution in dense low-income communities. DoH developed indoor air pollution guidelines that provide safe levels of air in the indoor environment. It is recommended that the DoH participate in the implementation of the strategy by:

- Contributing to the reduction of household fuel burning through the implementation of the indoor air pollution manual;

- Investigate the possibility of establishing a relationship between national health budget usage on respiratory illnesses and indoor air quality; and
- Investigate the existence of respiratory health data sets/reports from hospital cases, clinic reports and doctor consultations in order to assess the relationship with air quality.

#### 6.3.4. The Department of Human Settlement

The Department of Human Settlement (DHS) developed and is enforcing the National Housing Code's Technical Guidelines and the Energy Efficiency Regulations in government-sponsored housing projects. These regulations are aimed at minimising the use of fossil fuel by enforcing housing designs that are energy efficient. This and other work of this nature will be useful when implementing the strategy. It is recommended that the DHS contribute to the implementation of this strategy by:

- Facilitating housing subsidies that include finance for the installation of energy efficient systems.
- Reporting on the progress with respect to the DoE's/ DHS's Joint Position on the Full Electrification of subsidised Houses and the institution of Energy Efficiency Norms and Standards to improve the thermal performance of the subsidised houses.

#### 6.3.5. The Department of Science and Technology

The Department of Science and Technology (DST) is home to innovation and new technology research in the country. It works very closely with the various local and international institution on projects that seek to improve amongst others energy supply and efficiency. During the implementation of the strategy their role shall include:

- Bringing to the attention of the NCC any new technology that can help decrease household and ambient air pollution.
- Liaising with research institutions in the development of efficient technology and science for fuel combustion

#### 6.3.6. The Department of Trade and Industry

The role of Department of Trade and Industry (DTI) has always been on the broader perspective of Environmental Management focusing on support of the lead agents for water, land and air. Between 2011 and 2014, the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP Programme) lead by the Department of Energy (supported by the DTI) has awarded 4,944 MW to 64 projects, mostly solar photovoltaic and wind energy technologies. The renewable energy sector has committed an investments totalling R120 billion, with R39 billion committed to local content to promote local entrepreneurs and improve the local economy. For example, the DTI has received a proposal for the development and rollout of Ethanol Stove to low-income settlements in Gauteng.

With working relations already established with various government departments, the private sector and research institutions, the DTI can help implementation of the strategy by advising the NCC on mechanisms and opportunities available for communities in low-dense areas to get funding for entrepreneurial activities that may have an impact on the way communities consume dirty fuels.

#### 6.3.7. Provincial Government

The role provincial governments can be summarised as follows–

- Include the components of this strategy in the provincial Air Quality Management Plan and IDP (AQA section 15);
- Coordinating the implementation of the strategy within provincial boundaries;
- Including specific interventions aimed at reducing emissions from dense low-income settlements in their Air Quality Management Plans;
- Liaising with relevant provincial units that could assist in the implementation of specific interventions; and
- Reporting on progress on implementation of the strategy within the province.

#### 6.3.8. Local Government (represented by COGTA)

The role local government can be summarised as follows–

- Include the components of this strategy in the provincial Air Quality Management Plan and IDP (AQA section 15);
- Implementation of interventions in the strategy using findings and recommendations of the NCC;
- Liaising with relevant municipal units (e.g. development planning) that could assist in the implementation of specific interventions;
- Encouraging offset-projects during Atmospheric Emissions Licensing; and
- Report on progress with regard to strategy implementation within the municipality.

# 7. ACTION PLAN

***Activities to achieve Objective 1: Ensure that efforts to address air pollution in dense low-income settlements are undertaken in a coordinated and coherent* manner**

| Action | Responsibility | Time-frame | Dependency |
|---|---|---|---|
| **Activity 1a: Establish a coordinating structure: The National Coordinating Committee on Residential Air Pollution (NCC)** | | | |
| Convene the initial structure consisting of all relevant national departments | DEA | 2018 | Cooperation from relevant departments |
| Undertake a stakeholder analysis to identify other relevant stakeholders to form part of the NCC | NCC | 2018 | |
| Draft the TORs for the NCC | NCC | 2018 | |
| Attend quarterly NCC meetings | NCC | On-going | |
| **Activity 1b: Ensure, through the NCC, that interventions aimed at reducing air pollution in dense low-income settlements are effectively prioritised.** | | | |
| Baseline assessment: Collect, collate and analyse information (air quality, population data, socioeconomic data) with the aim of understanding the extent and nature of air quality challenges in an area. | DEA, NCC, Research Institutions (e.g. NACA, CSIR etc.) | 2019 | |
| Prioritise areas in terms of the state of the air quality and the number of people affected. | DEA, NCC | 2019 | |
| Prioritise interventions for specific areas of priority | NCC | 2019 | Cooperation from relevant departments |
| Develop a plan for piloting interventions in the prioritised area(s) and include the plan into specific departmental/organisational plans | NCC | 2019 | Cooperation from relevant departments |
| Pilot the interventions in the prioritised area(s) – *(The interventions will include those that are indicated under goal 2)* | NCC | 2020 | |

**Activities to achieve Objective 2: Facilitate, through the forum, the implementation of interventions aimed at reducing emissions from dense low-income settlements**

| Action | Responsibility | Time-frame | Dependency |
|---|---|---|---|
| **Activity 2a: Provision of affordable or subsidised clean energy alternatives** | | | |
| Undertake an assessment of available affordable cleaner energy alternatives | DoE, DTI, DST | 2019 | |
| Use the identified list of prioritised areas (the prioritised list as per Activity 1b) to identify the appropriate energy needs and preferred alternative for each community. | DoE | 2020 | |
| Estimation of ability/willingness to pay (subsidy need) as a function of income. | DoE | 2018 | |
| Procure adequate funding using mechanisms that include public, private and donor funding platforms | NCC | On-going | |
| Develop capacity and consciousness of the community about the proposed alternative | | On-going | |
| Rollout the appropriate energy alternative to at least 25 % of households identified | DoE, Private Companies | 2021 | Funding |
| Rollout the appropriate energy alternative to at least 50 % of households identified | DoE, Private Companies | 2022 | Funding |
| Rollout the appropriate energy alternative to at least 75% of households identified | DoE, Private Companies | 2023 | Funding |
| **Activity 2b: Ensure that low-income households are energy efficient** | | | |
| Participate in the continuous revision of low-cost housing design principles and guidelines that were published by the Department of Housing. | NCC | When required | |
| Communicate the benefit of accessing funding for energy efficiency housing projects. | DHS | On-going | |

| Action | Responsibility | Time-frame | Dependency |
|---|---|---|---|
| Ensure that at least 50% of all newly built RDP houses are built in consideration of energy efficiency guidelines. | DHS, Provinces, Metropolitan, District and Local Municipalities, SALGA | 2020 | Approval by relevant agencies and organisational structures |
| Ensure that at least 80% of all newly built RDP houses are built in consideration of energy efficiency guidelines. | Metropolitan, District and Local Municipalities | 2021 | Approval by relevant agencies and organisational structures |
| **Activity 2c: Influence development planning initiatives to take into account air quality issues** | | | |
| Air quality and other officials of all spheres of government, particularly municipalities, to participate in development planning and town planning forums | Metropolitan, District and Local Municipalities | On-going | |
| Identify and motivate for consideration of air quality issues in development projects and report to the NCC | Metropolitan, District and Local Municipalities | On-going | |
| **Activity 2d: Encourage social upliftment projects with air quality benefits (through air quality offsets)** | | | |
| Develop an offset policy to ensure that social upliftment programs have direct, effective and efficient social and air quality benefits | DEA | 2016 | Approval to publish the policy |
| Workshop the policy with the relevant stakeholders | DEA | 2016 | Cooperation from stakeholders |
| Implement offset project within a prioritised areas | DEA, Provinces, Municipalities Metropolitan, District and Local, Industry | 2016/17 | Financial and other resources |
| Implement offset projects as part of relevant development activities that have air quality impacts | Industry and Municipalities | On-going | Financial and other resources |

| Action | Responsibility | Time-frame | Dependency |
|---|---|---|---|
| Monitoring and evaluation of implementation of the offsets projects | DEA, Provinces, Metropolitan, District and Local Municipalities, Industry | Annually | |
| **Activity 2e: Create public awareness on air pollution** | | | |
| Awareness billboards distributed along highways and community junctions in at least three dense low-income settlements | DEA, Provinces, Metropolitan, District and Local | Annually | Funding |
| 1 nationwide campaign televised | DEA, Provinces, Metropolitan, District and Local | Annually | Funding |
| 2 Radio inserts aired on at least one community radio station | DEA, Provinces, Metropolitan, District and Local | Annually | Funding |
| At least 2 newspaper inserts published on local newspapers | DEA, Provinces, Metropolitan, District and Local | Annually | Funding |
| Minimum 500 booklets/leaflets distributed at schools, community health care facilities and community junctions. | DEA, Provinces, Metropolitan, District and Local | Annually | |
| Set an annual air quality theme | DEA | Annually | |

**Activities to achieve Objective 3: Ensure continued monitoring, evaluation and reporting on the successes and failures of the proposed interventions and on air quality improvements**

| Action | Responsibility | Time-frame | Dependency |
|---|---|---|---|
| **Activity 3a: Monitoring and Evaluation** | | | |
| Monitor and evaluate, using ambient air quality monitoring stations, any air quality improvements in the prioritised areas | DEA, SAWS | On-going | |
| Monitor the implementation of interventions and record projects in a database | NCC | On-going | |
| Monitor indoor air pollution levels using the indoor air pollution guidelines | DoH | On-going | |
| Evaluate the health impacts (improvement or otherwise) of this strategy's interventions | DoH | On-going | |
| **Activity 3b: Reporting** | | | |
| Report on ambient air quality status in prioritised area(s) where monitoring stations exist and record residential emissions | DEA | Annually | |
| Report on the rollout of specific interventions: successes and challenges | NCC, Private organisations, NGOs | Annually | |
| Report on indoor air pollution levels and associated health impacts | DoH | Annually | |
| | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 52 | Central Karoo | 195 | 2169 | 21 | - | 540 | 3991 | 71 | 5 |

## 8. CONCLUSION

This strategy, when implemented effectively and efficiently, should provide a means to reducing emissions and improving air quality in dense, low-income communities. This will ensure that people living in these areas are enjoying their constitutional right to air that is not harmful to their health and well-being. Although the implementation of this strategy will have cost implications, one of the biggest benefits is that such implementation will result in savings (in relation to avoided hospital admissions for pollution related illnesses and diseases) on the government health budget and improved quality of life.

It is important to note that the objectives of this strategy can only be achieved if there is an uncompromised coordination between the relevant national departments (DEA, DHS, DoE and DoH) together with the relevant provincial departments and municipalities.

## APPENDIX 1: District municipalities with the highest usage of dirty duels (Stats SA, 2011)

| Rank | District Municipality | Cooking | | | | Heating | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paraffin | Wood | Coal | Animal dung | Paraffin | Wood | Coal | Animal dung |
| 1 | O.R.Tambo | 30289 | 111703 | 484 | 6597 | 71321 | 142554 | 1956 | 2161 |
| 2 | Vhembe | 3496 | 212210 | 258 | 72 | 2556 | 174787 | 242 | 293 |
| 3 | Ekurhuleni ( Metropolitan) | 164793 | 4012 | 9283 | 422 | 95705 | 26962 | 66906 | 900 |
| 4 | City of Cape Town ( Metropolitan) | 41054 | 2766 | 460 | 441 | 159594 | 19611 | 1745 | 667 |
| 5 | Mopani | 2918 | 169961 | 182 | 66 | 2065 | 132998 | 320 | 165 |
| 6 | Amathole | 33379 | 59115 | 378 | 5229 | 64848 | 90196 | 3481 | 2656 |
| 7 | Chris Hani | 28397 | 35067 | 337 | 6725 | 68273 | 71549 | 1472 | 4231 |
| 8 | Alfred Nzo | 23311 | 81865 | 318 | 2705 | 34166 | 98404 | 739 | 2824 |
| 9 | Ehlanzeni | 14204 | 104672 | 2887 | 155 | 6828 | 73553 | 1904 | 433 |
| 10 | City of Johannesburg ( Metropolitan) | 115969 | 3229 | 1145 | 487 | 67877 | 26766 | 12427 | 1454 |
| 11 | Capricorn | 23700 | 95938 | 275 | 482 | 10633 | 96363 | 681 | 681 |
| 12 | Greater Sekhukhune | 15768 | 94032 | 5526 | 1204 | 5249 | 95791 | 11144 | 1179 |
| 13 | City of Tshwane ( Metropolitan) | 98621 | 9628 | 1473 | 263 | 42393 | 38996 | 7302 | 668 |
| 14 | Gert Sibande | 10495 | 53158 | 29651 | 1526 | 4172 | 57424 | 46509 | 1786 |
| 15 | Bojanala | 66369 | 35882 | 652 | 242 | 30664 | 53092 | 2016 | 481 |
| 16 | eThekwini ( Metropolitan) | 86839 | 14272 | 1261 | 505 | 34714 | 24854 | 2139 | 1166 |
| 17 | Thabo Mofutsanyane | 15990 | 17840 | 4288 | 1207 | 37974 | 33582 | 16486 | 1612 |
| 18 | Nkangala | 38024 | 28483 | 20609 | 250 | 9673 | 30502 | 48807 | 341 |
| 19 | Buffalo City ( Metropolitan) | 41404 | 5659 | 250 | 150 | 75401 | 10820 | 1251 | 206 |
| 20 | Mangaung ( Metropolitan) | 18467 | 1142 | 184 | 1019 | 75340 | 4487 | 1239 | 1560 |
| 21 | Sisonke | 8689 | 55238 | 244 | 320 | 12162 | 65717 | 593 | 444 |
| 22 | Umkhanyakude | 1692 | 74114 | 391 | 96 | 1056 | 55577 | 3032 | 342 |
| 23 | Nelson Mandela Bay ( Metropolitan) | 31001 | 1914 | 261 | 145 | 68550 | 5730 | 641 | 203 |
| 24 | Umzinyathi | 7808 | 51899 | 2413 | 4084 | 4343 | 59702 | 3829 | 5429 |
| 25 | Zululand | 6508 | 53873 | 2160 | 659 | 2998 | 63595 | 3137 | 1136 |
| 26 | Uthukela | 13856 | 41664 | 1223 | 1603 | 11792 | 53712 | 2047 | 2426 |
| 27 | Ukhahlamba | 17773 | 17958 | 153 | 1332 | 35926 | 29739 | 615 | 2088 |
| 28 | Ngaka Modiri Molema | 21730 | 39825 | 502 | 2892 | 8911 | 54684 | 1353 | 3347 |
| 29 | Ugu | 16891 | 49667 | 422 | 147 | 6752 | 57602 | 1715 | 370 |
| 30 | Uthungulu | 6940 | 56835 | 490 | 269 | 3041 | 52043 | 2205 | 566 |
| 31 | UMgungundlovu | 16851 | 33132 | 317 | 146 | 7013 | 53747 | 773 | 303 |
| 32 | Waterberg | 12591 | 44172 | 140 | 59 | 5582 | 42009 | 209 | 103 |
| 33 | West Rand | 46465 | 3047 | 435 | 115 | 23873 | 17985 | 3714 | 238 |
| 34 | Dr Ruth Segomotsi Mompati | 9132 | 25146 | 169 | 452 | 4934 | 44185 | 456 | 480 |
| 35 | iLembe | 8988 | 38562 | 549 | 86 | 2783 | 37267 | 2059 | 145 |
| 36 | Lejweleputswa | 16286 | 2753 | 135 | 229 | 28565 | 13351 | 827 | 511 |
| 37 | Cape Winelands | 7815 | 3515 | 165 | 61 | 15760 | 20388 | 287 | 83 |
| 38 | Cacadu | 11218 | 6271 | 153 | 54 | 15622 | 17245 | 753 | 70 |
| 39 | Dr Kenneth Kaunda | 21793 | 7499 | 321 | 496 | 8870 | 18664 | 2165 | 828 |
| 40 | Amajuba | 8015 | 6971 | 8772 | 947 | 3454 | 9305 | 15193 | 1356 |
| 41 | Eden | 7036 | 6991 | 137 | 70 | 12172 | 16456 | 350 | 109 |
| 42 | Fezile Dabi | 8706 | 4251 | 1903 | 521 | 8022 | 9761 | 9478 | 780 |
| 43 | Sedibeng | 20548 | 2870 | 2195 | 127 | 8969 | 10203 | 7480 | 314 |
| 44 | John Taolo Gaetsewe | 2212 | 11096 | 50 | 349 | 1098 | 17949 | 161 | 578 |
| 45 | Xhariep | 3335 | 1974 | 47 | 186 | 11208 | 6860 | 278 | 264 |
| 46 | Frances Baard | 10707 | 3826 | 95 | 29 | 5665 | 12502 | 326 | 56 |
| 47 | Pixley ka Seme | 2073 | 5498 | 146 | 41 | 4416 | 12397 | 1020 | 63 |
| 48 | Overberg | 4704 | 1510 | 62 | 38 | 4564 | 9303 | 94 | 45 |
| 49 | West Coast | 1274 | 3731 | 76 | 27 | 1616 | 11242 | 144 | 45 |
| 50 | Siyanda | 823 | 5927 | 46 | 15 | 317 | 10534 | 120 | 36 |
| 51 | Namakwa | 195 | 3075 | 82 | 6 | 205 | 6649 | 56 | 20 |