

**DEPARTMENT OF ENVIRONMENTAL AFFAIRS
NOTICE 356 OF 2016**

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

I, Bomo Edith Edna Molewa, Minister of Environmental Affairs, hereby give notice of my intention to publish the strategy to address air pollution in dense low-income settlements, set out in the Schedule hereto.

Members of the public are invited to submit to the Minister, within 60 (sixty) days after the publication of the notice in the *Gazette*, written representations or objections on the draft strategy to address air pollution in dense low-income settlements to the following addresses:

By post to: The Director-General: Department of Environmental Affairs
 Attention: Adv Avhantodi Munyai
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By e-mail: amunyai@environment.gov.za,

Any inquiries in connection with the draft Strategy can be directed to Ms Elizabeth Masekoameng at 012 399 9202/1 or Adv Avhantodi Munyai at 012 399 9211

Comments received after the closing date may not be considered.


BOMO EDITH EDNA MOLEWA
MINISTER OF ENVIRONMENTAL AFFAIRS

SCHEDULE

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

**June
2016**

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List of Abbreviations

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 some fossil fuels/dirty fuels are a major contributor to the observed exceedances of ambient air quality standards 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. 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 communities. 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 prioritized

Objective 2: Facilitate, through the forum, 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 household 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 differing needs in our targeted areas is crucial. This is to help the country develop and implement sustainable intervention measures/solutions (i.e. clean fuels or energy services to households) in the targeted communities. In order to ensure that adequate resources are allocated to these, there is a need for information on:

- Extend of the problem – As evident by the measured ambient air quality data and existing health studies. This information will allow the implementers in prioritising areas of concerns
- Driving factors to the use of dirty fuels – Information on the reasons for using dirty fuels should be identified. If price is the issue, then the price 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 strategy has the greatest influence on the sustained adoption of the technology/intervention. 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.

To implement the strategy, the Government will have control over decisions and resources and participate in the implementation of the strategy. The following organizations 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 organizations
- 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 there can be greater effective in implementation of the strategy.

1. INTRODUCTION

1.1. Background

The Constitution of South Africa, 1996 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 summary, APPA was broadly regarded as being outdated and unconstitutional.

The President assented to the National Environment Management: Air Quality Act (AQA, Act No. 39 of 2004) on 19 February 2005. Given the short-comings of APPA, the AQA marked a sea-change in South Africa's approach to air quality management, an approach that is now fully aligned with international best practice. 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 and then provides a host of regulatory tools to assist government in meeting these targets. These are levels of pollutants below which ambient air quality can be considered to be not harmful to human health. The National Ambient Air Quality Standards were promulgated in 2009. There are more than 90 Ambient Air Quality monitoring stations in the country measuring the levels ambient air quality in relation to the National Ambient Air Quality Standards.

Ambient air quality 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. 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 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 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.

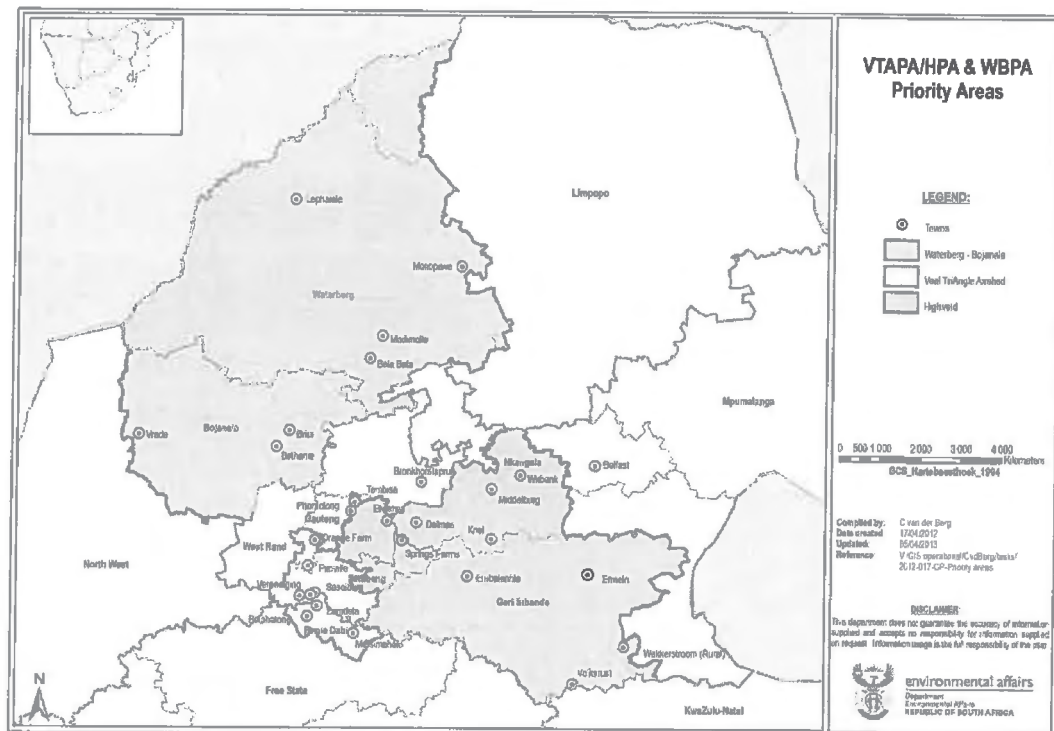


Figure 1: National Priority Areas declared under section 18 of the Air Quality Act

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 the 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).

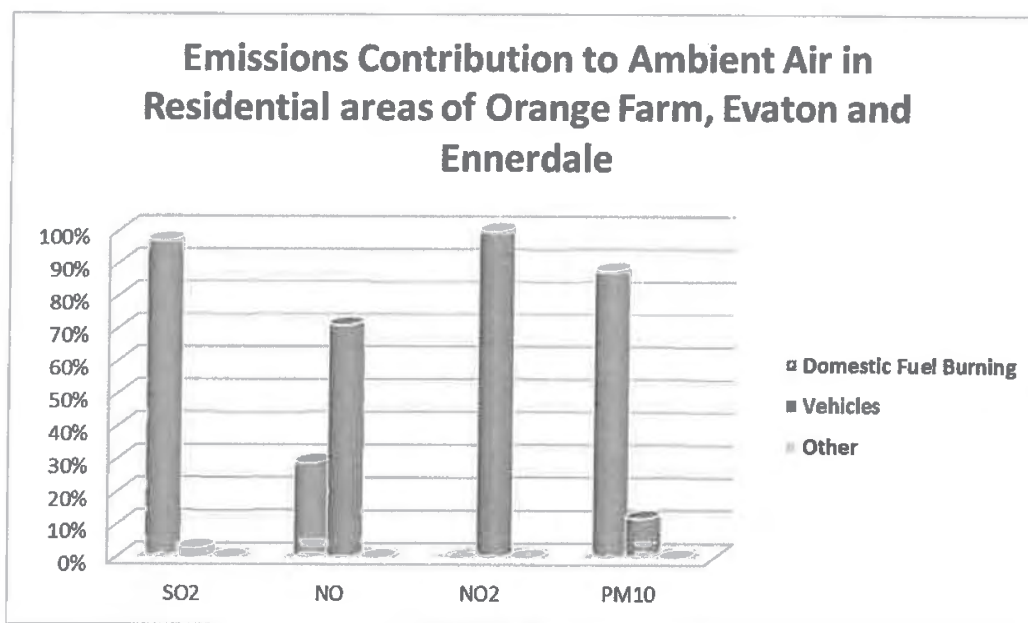


Figure 2: The contribution of residential air pollution (blue) to ambient air pollutants concentration in the Vaal triangle Priority Area "hotspot" zone 5, Residential areas of Orange Farm, Evaton and Ennerdale, (VTAPA AQMP, 2009)

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 communities. The strategy comes about as a result of recognition of the need for a multi-departmental, multi-stakeholder approach to resolution of the problem. As a result the objectives of this strategy are centred on pulling resources and efforts of all departments and stakeholders together to value and measure their all efforts to resolve the problem.

The objectives of the strategy are:

- 1) Ensuring that efforts to address air pollution in dense low
- 2) Facilitating the implementation of interventions aimed at reducing emissions from low-income settlements
- 3) Ensuring continued monitoring, evaluation and reporting on the successes and challenges of the proposed and on air quality improvements.

1.3. Approach and methodology

The development of the strategy addressing emissions from 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, consultation with provincial governments through the Provincial Air Quality Officers forums and National departments through the Intermediate National Coordination Committee. 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
Strategy drafting 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 Housing and Department of Health)
Stakeholder Workshop 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
Strategy finalisation 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 DCOG, DTI and DSD
Cabinet clusters consultations 2015	The strategy was presented to different cabinet clusters

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

According to Stats SA, low-income households refers to housing for people whose combined monthly household income is below R 3 500 per month (Census, 2011). For the purpose of this document, low-income settlements will refer to all areas that have been identified by various studies and AQMP baseline assessments as having relatively high emissions as a result of domestic burning of dirty fuels. These areas are highlighted in

Table 2.

Table 2: Areas where residential air pollution problems were identified as part of baseline assessments of the air quality management plans and in other studies

<u>Areas within the national priority areas</u>				
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
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	Lephalale, Mogalakwena, Bela-Bela, Madibeng, Rustenburg	Waterberg District AQMP	2009
	Coal, wood and paraffin		Bojanala District AQMP	2011
<u>Areas outside the national priority areas</u>				
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			City of Johannesburg AQMP	2003
WESTERN CAPE PROVINCE				
City of Cape Town	Not Specified	Khayelitsha	City of Cape Town AQMP	2005
LIMPOPO PROVINCE				
Capricorn District	Wood, coal and paraffin	Polokwane Local Municipality	Capricorn District AQMP	Not Specified
KWA-ZULU NATAL PROVINCE				
KZN- wide	Wood, Paraffin, Coal	Magwaveni, Cato Crest, Hammers Estate, Umlazi, Maphela, Mkhholombo, Ermvini, Lindelani, Seacow Lake, Gologodo- Ensimbini, bhambayi, Mdunduma.	NOVA Fridge Report	2006
eThekweni Metro	Paraffin	Cato Crest	Durban Kerosene Study	2007

2. POOR AIR QUALITY IN 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 recourse 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 often 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 impact on the intensity of pollution and therefore of pollutants dispersion e.g. in less dense settlements, there is relatively more rigorous dilution of pollutants than in highly dense settlement patterns.

In South Africa the impact of residential fuel burning on ambient air quality has been observed through 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 (**Error! Reference source not found.**, **Error! Reference source not found.** & **Error! Reference source not found.**) show examples of areas where ambient air quality standards are being exceeded in the country. What is also clear from the graphs is that in some of the areas where exceedances are reported, domestic fuel burning activities are also known to occur, in conjunction with other polluting activities (e.g. Zamdela (see table C of the VTAPA AQMP executive summary in Annexure 2), Olivenhoutbosch in City of Tshwane and Secunda in HPA).

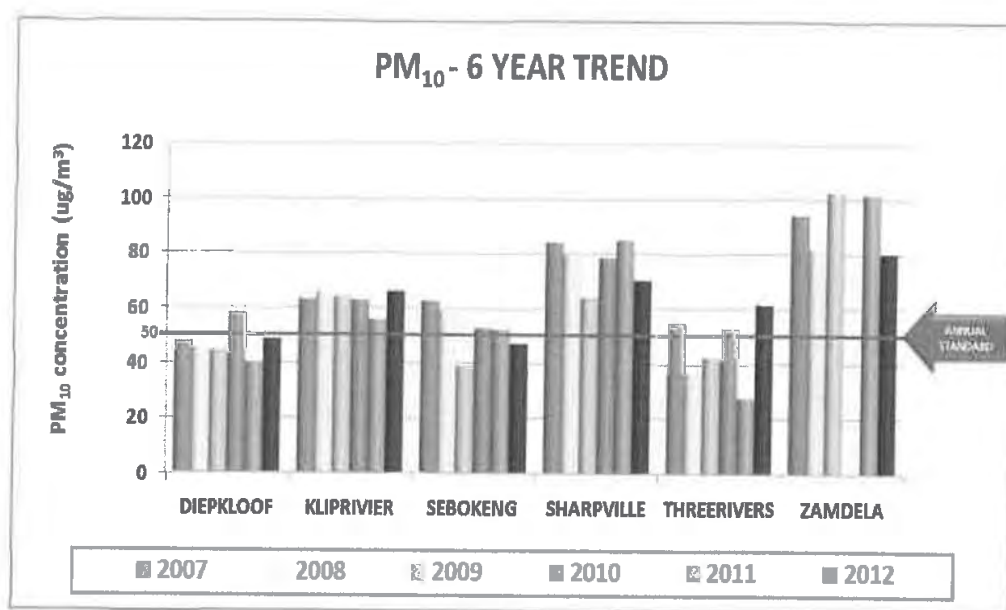


Figure 3: State of Air in the Vaal Triangle Airshed Priority Area

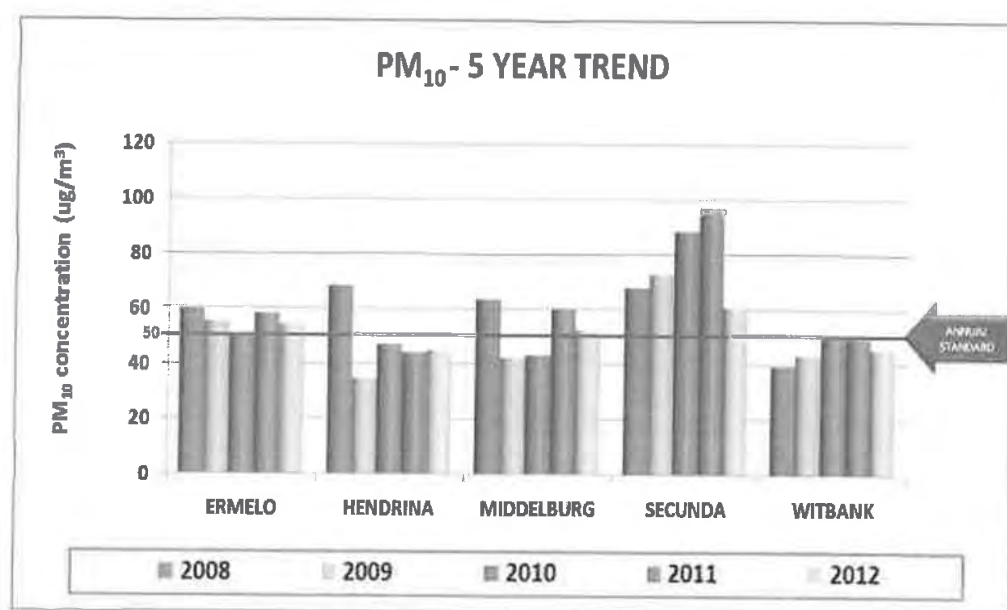


Figure 4: State of Air in the Highveld Priority Area

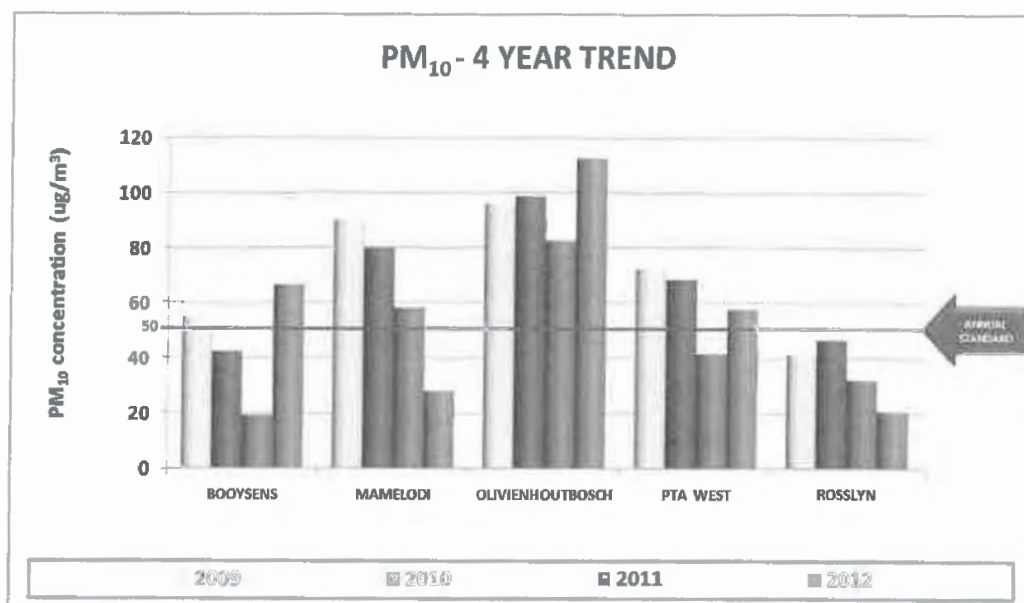


Figure 5: State of Air in Tshwane Metro

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 in a clear phase out or posing of limits approach. It is for this reason that the development and implementation of a strategy addressing emissions from dense low-income settlements requires integrated efforts from various national departments and across the three spheres of government

The following characteristics of dense low-income settlement make the air pollution problem to continue 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 communities 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 – 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

Technology has had a great impact on human development and civilization expansion throughout all history. 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, umbaola etc. Thus, not only are the fuels themselves "dirty", but they are often inefficiently combusted producing products of incomplete combustion, such as swirling paws 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 as 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'

Although 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" is also inappropriate in respect to air pollution from coal and wood burning in dense low-income communities.

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 equipments 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 mealies, among others, for sale.
- Heating in public spaces – On cold winter mornings people queuing for transport on open streets sometimes set tyres alight or have open fires to warm themselves.
- 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. Air quality in dense low-income communities as an indicator for poverty alleviation

From the above one can safely argue that poverty, poor town planning, inadequate services and infrastructure (especially the low thermal efficiency of low-cost houses) are the root of air pollution in many dense low-income communities. Many of these root causes are primary or secondary focus areas for many of the Government's efforts to alleviate poverty and facilitate service delivery. The quality of air in dense low-income communities can thus be used as an excellent proxy measure or indicator of the success, or lack thereof, of Government's poverty alleviation and service delivery efforts in these areas. Moreover, ambient air quality can serve as an indicator that is measurable, reportable and verifiable.

2.9. The financial cost of health due to poor air quality in dense low-income communities

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 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, 2003). 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 QUALITY 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 these 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 et 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 in 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 INTERVENTION 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 low income communities. This is with the intention to provide a coordinated approach in implementation of efforts directed at ensuring that ambient air quality in dense low- income communities 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 measure 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, interventions have been made by individual departments working in isolation 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.

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

- National government departments (in particular DEA, DoE, DoH, DSD, DHS, DST, COGTA);
- Metropolitan, district and local 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 will 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 time frames.
 - 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 communities by providing a referral and clearing-house facility in respect of such activities.

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

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.

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 communities 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.

In prioritising and planning for activities such as electrification, road-surfacing, waste collection services, tree-planting and general "greening" activities, priority should be given to low-income communities

because such services will have positive air quality impacts. It is recommended that air quality benefits also be considered when deciding where electrification, road-surfacing, waste collection services, tree-planting and general "greening" activities will be implemented,

With respect to nationally coordinated or implemented activities aimed specifically at improving air quality in dense low-income communities, 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 the 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 mechanism for implementation need to be in place.

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 has been provided many low-income households are unable to afford electricity, thereby making coal and wood the only affordable energy options. This means that there is a need for provision of cleaner, yet affordable alternatives.

In order to achieve this objective, it is recommended that the DoE investigates the appropriateness of, and investigate means to provide the following alternative energy sources to dense low income settlements, with priority given to settlements in the Air Pollution Priority Areas:

Solar water heating (SWH)

Most low-income communities use coal and other dirty fuels not only for heating, but also to heat water for bathing, cooking and others. Solar water heaters 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). Providing hot water using SWH technologies has the benefit of offering quality local government infrastructure services, saving households money over the long term, and mitigating GHG

emissions associated with fossil fuel usage. SWHs are also the least expensive means of heating water for domestic use on a life-cycle cost basis (Austin & Morris, 2005).

A national programme focused on the delivery of residential SWHs could potentially reduce the overall national energy demand by 4.5% or 9 000 GWh/annum, and do this at the critical peak times of the day (Austin & Morris, 2005). The high level of solar radiation could provide around 25% of the 2013 energy (DME, 2002b).

Clean stoves

While significant research has gone into clean cook 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-ware. 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 will fail to be utilized over the long term. Clean cook stoves and other new technology must be affordable, socially acceptable, easy to use, widely available, durable, and most of all, that the technology is desired.

Free basic electricity

Government will explore new ways of providing electricity subsidies such that the efficient use of electricity is encouraged. One example would be a subsidy that gives the user 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. 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 will 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 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 LPG as alternative fuel among low-income communities can reduce household emissions related to fossil fuels by a significant margin. This can only happen if the costs associated with purchasing and refilling of LPG cylinders are regulated and made affordable to those that need to use 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 as a result of the absence of this basic form of insulation (Energy Ramblings, 2012).

One way of achieving energy efficient houses is to construct houses which allow the inside temperature to be adjustable. The building must consider its environment so that the need for active space heating or cooling by mechanical or electrical means is reduced through the use of the solar passive design principle. These principles and guidelines are published in the Energy Efficiency Housing Guidelines published by the Department of Human Settlement.

Following the publication of the guideline, DoH 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. The new houses are also bigger in size (40 square meters), which adds to the improvement in energy efficiency. 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 DoH 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 CO₂ emission (33%) on an annual basis representing an aggregated savings of 155 million kWh and 135,187 tons of CO₂ of emission (Goldon, 2009)

Government should ensure that all houses are, as far as possible, built using the Energy Efficiency Housing Guidelines and best practices.

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 a certain area. 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 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 in dense low-income:

- Road surfacing;
- General greening activities;
- Regular refuse removal;
- Electrification;
- Tree planting; and
- Housing that is environmentally efficient.

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

Most efforts geared towards social upliftment and development can have air quality benefits. For example, energy efficient housing (i.e. houses that allow for proper sunlight propagation, with effective ventilation system, etc.) will directly or indirectly reduce air pollution in communities.

Another example is tarring of streets in dense low-income settlements as a developmental initiative. Tarring of roads eliminates dust from unpaved roads, thereby improving the quality of ambient air.

Social upliftment and development requires an integrated approach that involves all stakeholders affected and interested. This may include government departments, private companies, business and communities.

This activity will be accomplished by the promoting air quality related corporate social investments in low-income communities. This can be done in line with the offset policy guideline that is currently being developed by the DEA.

Corporate social investments are one of the many ways where the private sector can play a role in reducing air pollution in areas where they operate. The concern is that they have been misused and in some level misunderstood by both the public and private sector where offset policies have been regarded as replacing corporate social responsibilities. The activities may include funding of projects that are geared towards the improvement in air pollution such as the replacement of umbrellas with energy effective stoves, replacing normal light bulbs with fluorescent bulbs etc.

Activity 2e: Create public awareness on air pollution

This objective is aimed at accelerating the awareness of the communities on all forms of air pollution i.e. not only pollution emanating from dense low-income communities 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. Government, private and civil organizations are to use awareness as a tool to disseminate, share and cascade information to communities.

To ensure that awareness is built in communities, various initiatives need to be carried out. These initiatives need to be sustainable, in that they must not only cater for current air quality challenges but 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 tools:

- Televised campaign advert relating to air pollution in low-Dense Income areas and its impact both on the environment and human health;
- Foster 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.
- Posters and bill boards 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 meet.

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: Reporting

The National Coordination Committee on Residential Air Pollution for the coordination of this strategy will 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 2017
Activity 1b: Ensure, through the NCC, that interventions aimed at reducing air pollution in dense low-income settlements are effectively prioritized.	Number of prioritised areas and intervention measures for such areas identified	10 areas prioritised for specific interventions by 2018
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 2020
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 2020
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 1 television campaign televised. 2 Radio inserts 2 newspaper inserts 500 booklets/leaflets (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
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 **Error! Reference source not found.** Different Departments and their regulatory tools will be used to implement this strategy.

5.1. Information

Energy needs vary between genders and age groups and 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. If price is the issue, then the price should be known so that any alternative provided or the subsidy provided can compete with the cost of currently used fuels. 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.

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.

New sources of funding may be mobilised from industries that contribute to poor air quality in dense low-income communities in the form of formal air pollution offset agreements where appropriate. The rules and criteria for formal air pollution offset agreements will be formalised before any agreements are entered into.

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. In general, funding will be required for the following implementation 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

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).

6. ROLES AND RESPONSIBILITIES

The general air quality management roles and responsibilities for the three spheres of government, the private sectors, households and community organizations are outlined in the 2007 National Framework for Air Quality Management in South Africa. Partnership between these sectors will lay the basis of air pollution prevention and compliance monitoring which will assist in the implementation of this strategy.

The process of stakeholder consultation will be on-going as new stakeholders are added and adjust the roles of current stakeholders throughout the development and implementation stages of the strategy. Based on the above understanding the following is a list of possible stakeholders that the NCC will need to collaborate with when implementing 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 subsidized 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 organizations, 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 can educate the people living in dense low-income settlements on alternative affordable technologies and techniques that are available and have less impact on ambient air quality. The benefits of such alternative techniques and technologies should be clearly communicated. Civil society can also participate in planning for specific interventions as part of their area's Air Quality Management Plans that are developed in terms of section 15 of the Air Quality Act.

6.3. The role of government

The 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:

- Providing 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; and
- Undertaking research that investigates key barriers such as prices, demand and supply, local infrastructure etc. to market absorption of alternative energy.

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 Department (members of the NCC) to conduct a study (ies) to measure the impact of alternative energy projects in terms of residential air pollution reduction.

6.3.3. The Department of Health

The Department of Health (DoH) has 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 and doctor consultations in order to assess the relationship with air quality. A memorandum of understanding for the sharing of data between the DEA and the DoH will be developed.

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 based 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. The Department has received some technology proposal from local business community (particularly through the Gauteng Department of Agriculture and Rural Development), the proposal to minimise the use of dirty fuel in informal settlements. The proposed technology submitted by the local business community is the Ethanol Stove.

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–

- 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 departments 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

The role local government can be summarised as follows–

- Implementation of interventions in the strategy through alignment with their services by refocusing existing resources;
- 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	2017	Cooperation from relevant departments
Undertake a stakeholder analysis to identify other relevant stakeholders to form part of the NCC	NCC	2017	
Draft the TORs for the NCC	NCC	2017	
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 prioritized.			
Collect, collate and analyse information (both air quality and population 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.)	2017	
Prioritise areas in terms of the state of the air quality and the number of people affected.	DEA, NCC	2018	
Prioritise interventions for specific areas of priority	NCC	2017	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	2016/2017	Cooperation from relevant departments
Pilot the interventions in the prioritised area(s) – (The interventions will include those that are indicated under goal 2)	NCC	2018	

Objectives with respect to 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	2017	
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	2017	
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, Companies	2018	Funding
Rollout the appropriate energy alternative to at least 50 % of households identified	DoE, Companies	2019	Funding
Rollout the appropriate energy alternative to at least 75% of households identified	DoE, Companies	2020	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	2018	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	2020	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 programmes with air quality benefits			
Develop an offset policy to ensure that social upliftment programs have direct, effective and efficient social and air quality benefits	DEA	2016	
Workshop the policy with the relevant stakeholders	DEA	2016	Approval of the policy by cabinet
Implement offset project within a prioritized area	DEA, Provinces, Municipalities Metropolitan, District and Local, Industry	2016/17	Approval of the policy by cabinet
Implement offset projects as part of relevant development activities that have air quality impacts	Industry and Municipalities	2017	Approval of the policy by cabinet

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 with respect to 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	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	

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.