

	<b>Air Quality Offsets Implementation Plan for Lethabo Power Station</b>	<b>Eskom</b>
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## **EXECUTIVE SUMMARY**

Eskom is pursuing a multi-pronged approach to improving ambient air quality, including reducing emissions at the existing coal-fired fleet, investing in power generation from renewables and nuclear, and implementing air quality offsets. Retrofitting abatement technology and diversifying the energy fleet are extremely costly (hundreds of billions of rands) and take a long time to implement. Air quality offsets address emission sources directly within vulnerable communities, targeting greater improvement in community experienced air quality than is achievable from other approaches. In addition, such offsets are more cost effective and result in meaningful improvement of air quality within a shorter time frame.

This Air Quality Implementation Plan for Lethabo Power Station covers the period from April 2017 to March 2025, and aims to improve ambient air quality in several communities around Lethabo.

This high-level plan has been compiled in order to:

- solicit information from key stakeholders into the design of the offsets programme
- obtain approval from the authorities on the proposed offsets methodology, the types of offsets to be implemented, and the areas for implementation
- form the basis of Eskom's request for offset funding in its Multi-Year Price Determination 4 (MYPD4) application to the National Electricity Regulator (NERSA)
- fulfil the requirement in Lethabo Power Station's Atmospheric Emission Licence to submit an offsets implementation plan

This plan has been developed based on rigorous scientific methods and testing, and in consultation with key stakeholders. Consultation conducted for the development of this high-level plan is merely the start of the public participation process that will be undertaken for the air quality offsets programme. In-depth community consultation will be undertaken once this high level plan has been approved (in particular, once the areas for offsetting have been agreed on), and prior to the implementation of the interventions. This community consultation will inform the offsets project design for each area, and ensure support for and correct implementation of the offsets in each community.

This Air Quality Offsets Implementation Plan is an update of the plan submitted in April 2016, and it will be updated further at regular intervals, as experience is gained and more detailed information becomes available. Main updates from the April 2016 version of the plan include:

- For household interventions, coal-using households residing in formal dwellings will be switched to electricity wherever possible, and not liquid petroleum gas (LPG). Electricity is the cleanest form of energy for domestic use and the promotion of electricity is aligned with Eskom's mandate.
- Households which do not use coal will be offered a ceiling
- The start of the roll-out has been delayed by Eskom's protracted authorisation and procurement process, and the change from LPG to electricity which required new planning.

The baseline assessment in Sharpeville is currently underway, and confirms waste burning as an important local source of emissions.

The Air Quality Offset Implementation Plan for the Lethabo Power Station proposes the following:

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## 1. A phased approach

Air quality offsets is a nascent field, and interventions of the type and scale contemplated in this document have not been implemented before. Accordingly, a phased approach is adopted to increase probability of success and to ensure that learnings from early phases are incorporated into an accelerated large scale roll-out:

*Phase 0: Pilot project.* An intervention is tested on a small scale to discover practically what works.

*Phase 1: Lead implementation.* The intervention is tested on an entire community to see how best to scale up an initiative. The lead implementation is designed to benefit the specific local community, minimize implementation risk, increase practical and scientific knowledge, and develop and refine monitoring, reporting and verification processes.

*Phase 2: Full implementation.* Once the intervention has been refined and the learnings of the lead implementations incorporated, the intervention will be rolled out at several communities.

A typical offset implementation in a community will have three phases:

- i) *Baseline establishment:* The baseline will provide a basis for comparison to determine the improvement in air quality due to the offset, and information gathered from the community will inform the project design for the offset roll-out.
- ii) *Implementation:* The speed of implementation depends on the number of work teams set up in the community. Teams need to be mainly recruited from the local community as far as possible.
- iii) *Maintenance, monitoring and verification:* A structure will be set up to ensure that the interventions can be maintained by local entities, and the effectiveness of the interventions will be monitored.

## 2. Selection of offset interventions

Scientific studies have repeatedly shown that, in areas where households burn coal or wood for cooking and heating, it is emissions from this domestic burning that makes the greatest contribution to ambient levels of particulate matter (FRIDGE, 2004; MRC, 2008; Lim et al. (2012)). However, there has been a steady move away from domestic coal burning in the Vaal over the last decade or so, and it is estimated that between 10% and 20% of households in lower income areas use coal for cooking and heating (compared to 50-70% of households in lower income areas in Mpumalanga). It is clear then that a focus on reducing domestic burning alone will not be adequate for the Vaal, and so Eskom is exploring alternative ways to improve local air quality. Waste burning has been identified as another significant source of local emissions in many settlements.

Lethabo's offsets programme will have two main thrusts: addressing waste burning and domestic fuel burning for heating and cooking. This Air Quality Offsets Implementation Plan is based on a **Programme of Activities** comprising of:

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- i) *Waste burning interventions*: Reasons for burning and waste burning practices will be identified in the baseline phase of the project through engagements with the community and air quality monitoring, and then an intervention will be developed. This intervention will be tested and refined in a pilot study before it is scaled up.
- ii) *Household interventions*: Emissions from the domestic burning of coal/wood will be reduced through one or more of the following:
  - Assist households to move to a cleaner source of energy (like electricity)
  - Providing households with cleaner burning heating and/or cooking devices (such as a low emission coal/wood stove)
  - Reducing the need for heating by better insulating houses, where possible
- iii) *Education and awareness raising*: Continual interaction with the community is needed to ensure that the interventions are used and maintained properly (for example, that waste should be recycled or disposed of in dumpsters, and not burnt on open land), and to encourage behavioural change to reduce exposure and smoke generation.
- iv) *Projects in development*: Since this Air Quality Offsets Implementation Plan spans 9 years, the interventions cannot remain static but need to change as new technologies become available and as circumstances of communities change.

### 3. Selection of areas for offsets

Areas are selected based on the following criteria:

- i) Areas are prioritised based on the impact of emissions from the power station (in order to achieve the objective of 'counterbalancing the adverse and residual environmental impact of atmospheric emissions').
- ii) Only areas where there is (probably) non-compliance with ambient air quality standards are considered.
- iii) Only areas where opportunities for improving ambient air quality through offsetting exist, are considered (i.e. areas where there are local sources of emissions which significantly impact ambient air quality and can be addressed through offsets).

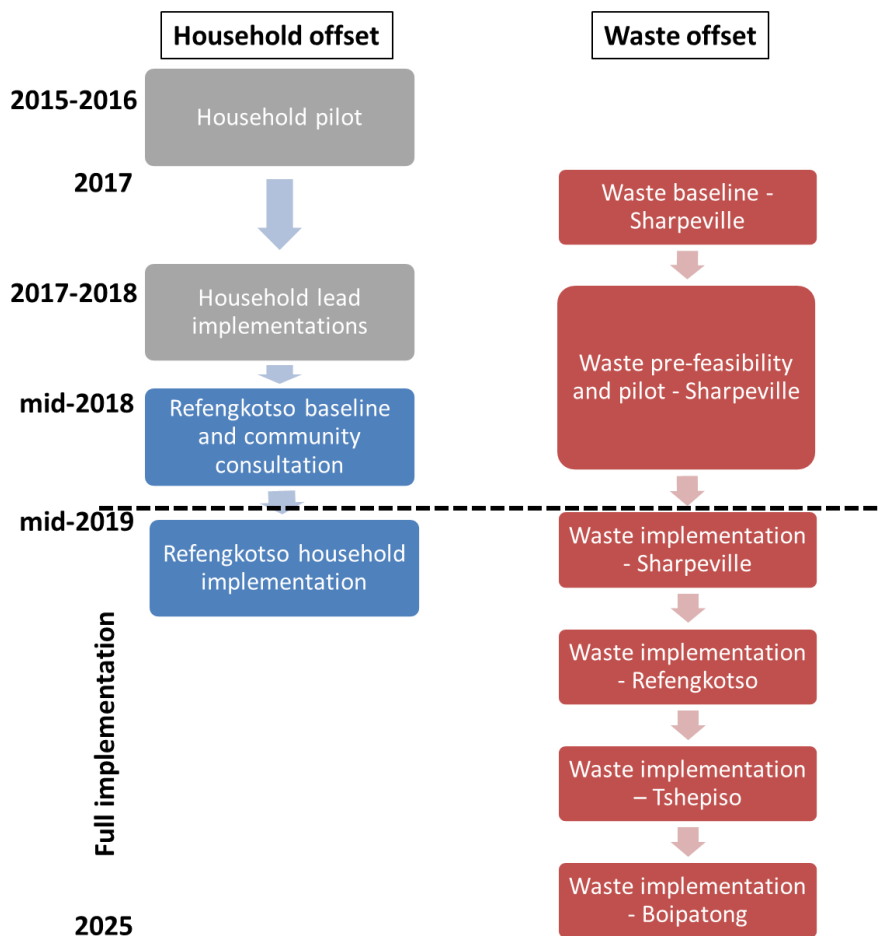
The areas proposed for Lethabo's offsets roll-out are:

**Table 1: Areas selected for Lethabo Power Station's air quality offsets roll-out**

Settlement	Intervention type
Sharpeville	Waste pilot and waste offset full implementation
Refengkotso	Household and waste offsets
Tshepiso	Waste offset
Boipatong	Waste offset

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The plan for the Lethabo offsets roll-out is as follows:



**Figure 1: Preliminary schedule for the roll-out of the air quality offsets for Lethabo. This schedule will be refined after community engagements and the scope of interventions for each community decided on.**

The implementation timeline is dependent on procurement approvals and on funding being sustained by Eskom and approved by NERSA in Eskom's MYPD4 application.

We propose that this Air Quality Offsets Implementation Plan for Lethabo Power Station be updated annually, as experience is gained and more information becomes available. In addition, we propose that Eskom's implementation of air quality offsets in the vicinity of Lethabo Power Station be documented in an annual progress report. We expect to be able to submit a Project Design Document for the offsets roll-out in the first settlement by end 2018.

The offset plan described in this document illustrates that improvement of community environmental parameters are achievable within the context of limited national resources and competing national imperatives.

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The air quality offset implementation plan submitted in April 2016 was approved by the National Air Quality Officer, after consultation with the Atmospheric Emission Licencing Authority, in a letter to Eskom dated 16 September 2016. We consider that this approval extends to this revised version of the implementation plan, as the changes to the original plan are not substantial and the additional conditions of the approval will still be complied with.

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## ABBREVIATIONS

Abbreviation	Description
AEL	Atmospheric Emission Licence
AQA	National Environmental Management: Air Quality Act (Act No 39 of 2004)
CPA-DD	Component project activity design document
DEA	Department of Environmental Affairs
DoE	Department of Energy
ESP	Electrostatic precipitator
FFP	Fabric filter plant
LPG	Liquid petroleum gas
LSRG	Local Stakeholder Reference Group
MYPD	Multi-Year Price Determination (for Eskom's electricity tariff)
NERSA	National Electricity Regulator
NO <sub>x</sub>	Oxides of nitrogen
PDD	Project design document
PM	Particulate matter
PoA	Programme of activities
PoA-DD	Programme of activities design document
RDP	Reconstruction and Development Programme
SO <sub>2</sub>	Sulphur dioxide

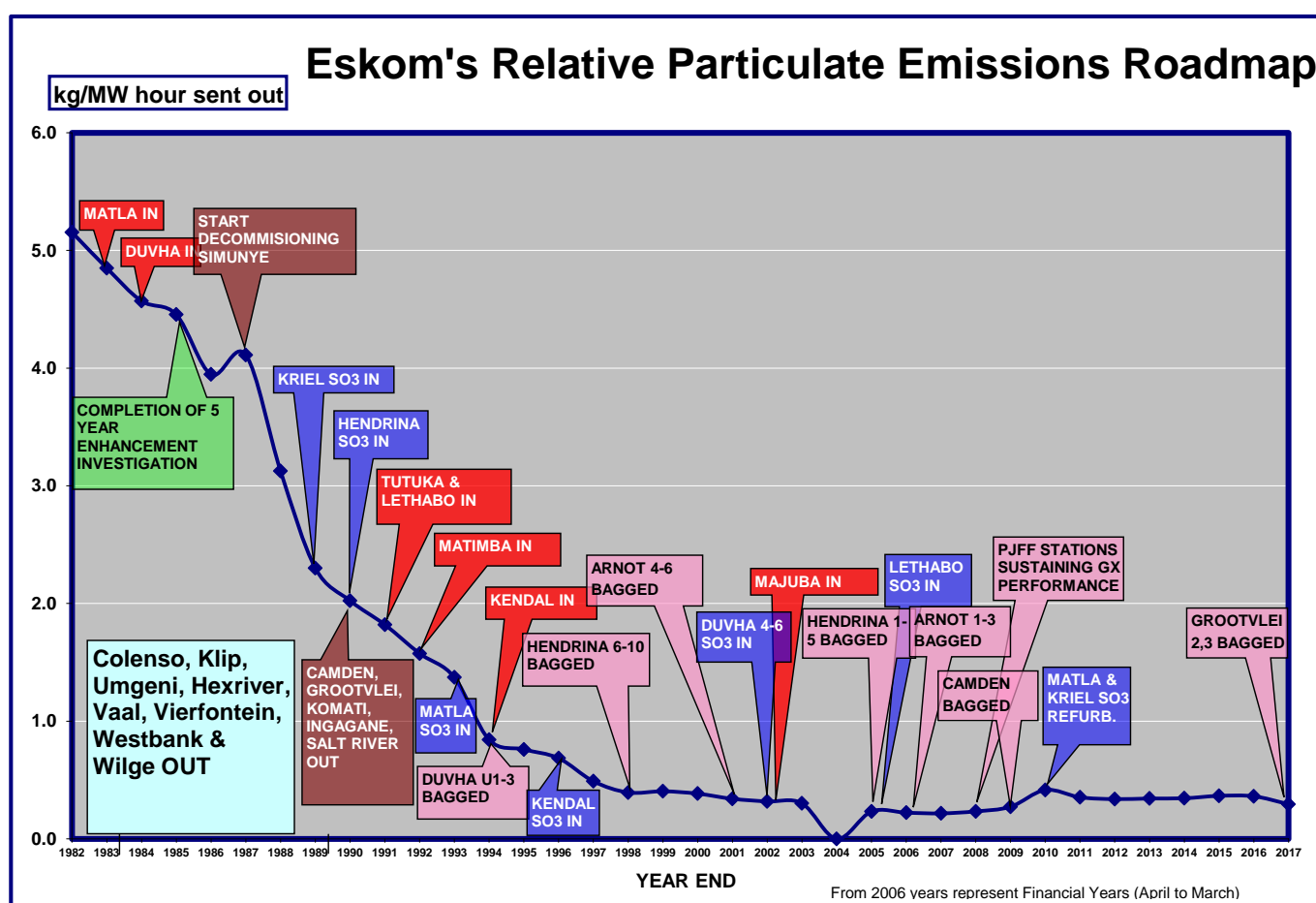
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## 1. INTRODUCTION

Eskom is pursuing a multi-pronged approach to improving ambient air quality, including investing in power generation from renewables and nuclear, reducing emissions at the existing coal-fired fleet (Figure 2), and air quality offsets. Air quality offsets are designed to reduce human exposure to harmful levels of air pollution by reducing emissions from local sources, like domestic coal burning and waste burning. Examples of air quality offsets are switching households from coal to cleaner energy sources, and improving waste collection and recycling. Air quality offsets can counterbalance the effect of emissions from power stations on the air quality in the vicinity of power stations. This document deals with the offset initiative, while the emission reduction plans are embedded in Eskom's capital expenditure budgets.



**Figure 2: Change in relative emissions of particulates (ash) from Eskom's power stations from the early 1980s to present. Upgrades on power stations to reduce emissions are indicated ('bagged' refers to fabric filter plant retrofits; 'SO<sub>3</sub>' refers to the installation of SO<sub>3</sub> plants which improve the efficiency of the electrostatic precipitators). Newer power stations have more efficient abatement technology**

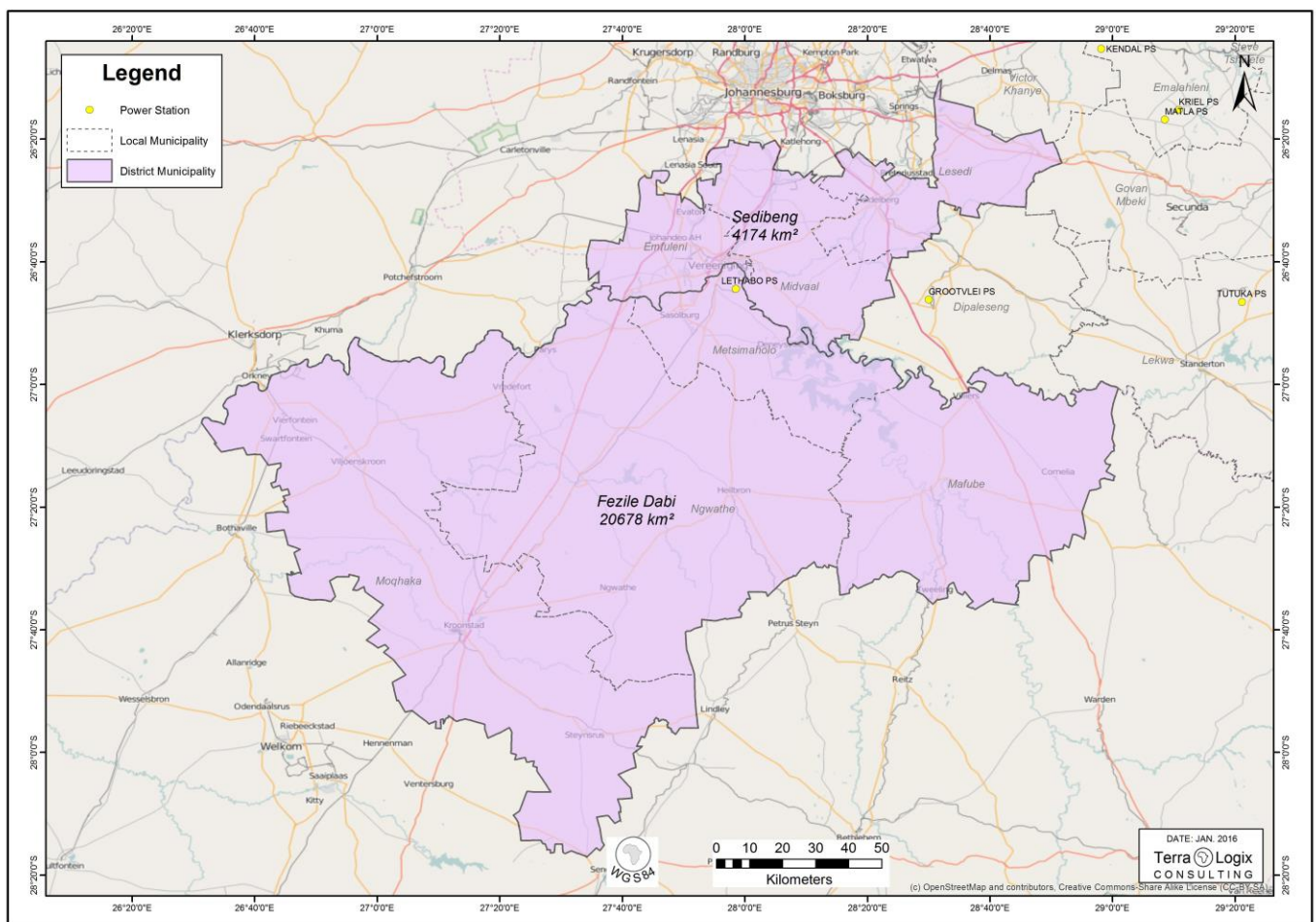
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Lethabo Power Station wishes to implement air quality offsets in order to:

- Improve the air quality of communities affected by emissions from Lethabo
- Comply to the requirements of Lethabo's Atmospheric Emission Licence
- Achieve a solution to air quality issues that is beneficial to affected communities and the South African economy, while also meeting the requirement of the relevant authorities

This Air Quality Offsets Implementation Plan is for Lethabo Power Station (Figure 3). It covers the period from April 2017 to March 2025. This document has been developed for submission to the National Air Quality Officer and the Licencing Authority (the Fezile Dabi Municipality), and also to elicit input from key stakeholders into the development of the power stations' air quality offsets programme.



**Figure 3: Location of Lethabo Power Station in the Fezile Dabi District Municipality**

This is a high-level plan, based on the information available at the time of compilation. It is an update of the first plan, published in April 2016. The plan details, to the extent possible, the proposed offset interventions per selected settlement. It details the approach followed in selecting settlements; selecting, designing and implementing interventions; and assessing the effectiveness of the interventions. Detailed plans per community can only be developed based on extensive consultation with each community and baseline monitoring conducted in each community. However, the extensive community consultation and monitoring can only take place once there has been high level approval of the principles used to compile

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the offset plans, the areas where offsets are to be implemented, and the timeline for implementation which form the basis of the extensive community consultation and monitoring. This plan will be updated and refined annually as more information becomes available.

The implementation of this plan is subject to approval of the funding required by the National Electricity Regulator (NERSA) in the Multi-Year Price Determination 4 (MYPD4) application.

## **2. APPLICABLE LEGISLATION AND REGULATORY REQUIREMENTS**

### **2.1 ATMOSPHERIC EMISSION LICENCE**

Section 4.4 of Lethabo Power Station's Atmospheric Emission Licence (AEL) number FDDM-MET-2011-08-P1 states that:

*'A definite offsets implementation plan to reduce PM pollution in the ambient/receiving environment is to be presented to the NAQO and the Licensing Authority by 31 March 2016 and followed by an appropriate public participation process.'*

### **2.2 DECISION ON POSTPONEMENT OF COMPLIANCE TIMEFRAMES WITH MINIMUM EMISSION STANDARDS**

The AEL requirement is similar to a condition in the National Air Quality Officer's decision (February 2015) on Lethabo Power Station's application for postponement of the compliance timeframes with the National Environmental Management: Air Quality Act (Act No 39 of 2004) section 21 Minimum Emission Standards, which states that Lethabo is *'to implement an offset programme to reduce PM in the ambient/receiving environment. A definite offset implementation plan is expected from Eskom by 31 March 2016.'*

### **2.3 AIR QUALITY OFFSETS GUIDELINE**

This Air Quality Offsets Implementation Plan has been drafted according to the Air Quality Offsets Guideline (Notice 333 of 2016) published on 18 March 2016.

Eskom adopts the definition of an air quality offsets given in this document as *'an intervention, or interventions, specifically implemented to counterbalance the adverse and residual environmental impact of atmospheric emissions in order to deliver a net ambient air quality benefit within, but not limited to, the affected airshed where ambient air quality standards are being or have the potential to be exceeded and whereby opportunities and need for offsetting exist.'*

The Air Quality Offsets Guideline lays out the legislative context for air quality offsets, and states that *'offsets can provide an option for achieving improvements in ambient air quality, thereby improving human health while promoting justifiable economic development.'*

The Air Quality Offsets Guideline lists the following air quality offsetting principles:

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- a) Outcome based: The primary aim of air quality offsets is *'improvements in ambient air quality within the airshed.'*
- b) No "like for like": Offsets should *'address pollutant(s) whose ambient concentration is/are of concern in a particular area, and not necessarily the pollutant(s) whose emission from a specific facility is/are of concern.'*
- c) Transparency and acceptability: *'Air Quality offsets should be based on open, fair and accountable administrations by both the applicants and the authorities. A public consultation process should be undertaken to ensure public buy-in of offsets.'*
- d) Complementarity: *'The facility must make all reasonable efforts to avoid and reduce/mitigate emissions before offsets can be considered'*
- e) Sustainability: *'Offset projects should be based on long-term air quality improvement without impeding on other socio-economic and environmental objectives.'*
- f) Measurable and scientifically robust: *'Any approved offset must have measureable air quality outcomes ... In order to quantify emission reduction of an offset, [a] realistic baseline representing forecasted emission levels in the absence and presence of the offset project should be established.'*

### 3. ESKOM'S AIR QUALITY OFFSETTING PRINCIPLES

Eskom has strived to align its understanding of air quality offsetting with others as far as possible by basing this plan on the Air Quality Offset Guideline (published on 18 March 2016), and through consultation with key stakeholders in the development of this plan.

The following principles underpin Eskom's offsetting philosophy:

- i) Do no harm:
  - All households and communities should be better off after an offsets roll-out
  - Offset interventions must have a *positive impact on both the livelihoods and the quality of life* of the community where they are implemented.
  - Households will not be required to pay more for fuel after the offsets implementation than before.
- ii) Complementary measure to power station abatement efforts:
  - Air quality offsets are to be implemented *in conjunction with emission reductions at power stations* through upgrades and emission abatement retrofits. Lethabo Power Station will be reducing particulate emissions by installing high frequency transformers, refurbishing the electrostatic precipitator and dust handling plants, and upgrading the SO<sub>3</sub> plants.
- iii) Cost effective:
  - Offsetting is a *cost effective* way of improving poor air quality and reducing exposure to harmful levels of pollution, at least cost to the South African economy. If an emission reduction retrofit can achieve a greater improvement in air quality at less cost than an offset, then the retrofit will be conducted rather than the offset.

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- iv) Focus on communities and reducing human exposure:
  - The main objective of air quality offsetting is to *improve ambient air quality*. Only projects which have the potential to improve ambient air quality will be included in the offsets programme.
  - Offsets specifically target ambient air quality as experienced by impacted *communities* (thus not all air is of equal importance)
- v) A transitional solution:
  - Offsetting is seen as an *interim measure* to address poor air quality, while the South African electricity generation mix transitions to cleaner technologies, and while communities move up the energy ladder and have access to improved services. Nevertheless, offsets which are implemented need to be sustainable.
  - Offset interventions that decrease structural (long term) energy requirements are preferred over interventions that merely move pollution to other areas or temporarily avoid pollution
- vi) Transparent and acceptable:
  - Participation in the offsets interventions is *voluntary*. People will not be coerced to participate in the project.

## 4. PROCESS FOLLOWED TO DEVELOP THE AIR QUALITY OFFSETS IMPLEMENTATION PLAN

This Air Quality Offsets Implementation Plan has been based on a scientific process of feasibility studies, testing and demonstration, and on consultation with key stakeholders. . It is also influenced by the role that Eskom is required to play in the South African economy. Cognisance was taken of the synthesis in *Air Pollution in Dense, Low-income Settlements in South Africa* (Pauw et al., 2008).

### 4.1 SCIENTIFIC DEVELOPMENT PROCESS

Between 2011 and 2013, Eskom conducted a *desktop pre-feasibility study* to identify the most feasible household emission offsets. Based on studies like those conducted by Scorgie et al. (2004a), Friedl et al. (2008) and Norman et al. (2007a and 2007b), which show that the domestic burning of fuels like coal and wood have the greatest negative impact on human health of all sources of air pollution in South Africa, the focus of this study was on reducing household emissions. An exhaustive list of interventions was evaluated against a number of weighted criteria, the most important of which was community acceptance. The weighted criteria and the results of this study are summarised in Appendix B.

In 2015, the most feasible options identified in the pre-feasibility study were tested in a *pilot project* on 120 formal houses in KwaZamokuhle (a community 17 km from Hendrina Power Station and 3 km from Hendrina town in Mpumalanga). Each participating household was given either a ceiling or a full insulation retrofit (ceiling and insulation on three exterior walls), AND either a low emission coal-burning stove, or a liquid petroleum gas (LPG) stove and heater, or an electricity subsidy. Forty-eight (48) members of the local community were employed to conduct the surveys and installations.

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The following findings of the pilot study informed the household offset component of this Implementation Plan:

- Domestic coal burning in KwaZamokuhle does emit a large proportion of the ambient particulate matter, and presents the greatest opportunity for improving local air quality and improving health
- Residents were very willing to participate in the project (>80%), and preferred the new stoves/heaters that they were given during the offsets roll-out to their old ones
- The electricity subsidy without a stove swop did not eliminate coal burning, but an LPG stove and heater swapped for the coal stove did
- A stove swop and housing insulation (to raise the indoor temperature, especially on winter nights) are needed to eliminate domestic coal burning

More information on Eskom's air quality offsets pilot project is in Appendix C.

Interventions other than those that address household fuel burning need to follow a similar process of a pre-feasibility study followed by a pilot study.

## **4.2 STAKEHOLDER CONSULTATION**

In parallel in the latter half of 2015, input was obtained from key stakeholders, particularly from government, into the implementation of air quality offsets.

Public input into the original version of this Implementation Plan was solicited during a 30-day public comment period from 22 February to 23 March 2016. An independent consultant, EKOInfo CC, was employed to facilitate an objective public participation process. The public participation process and outcome are detailed in EKOInfo's *Public Participation Report* which accompanies this report.

Information about the Air Quality Implementation Plan for the Lethabo Power Station was distributed through the following means:

- i) An email was sent to Interested and Affected Parties
- ii) Newspaper notices were published in a number of local and national newspapers
- iii) A draft of this Implementation Plan was made available for downloading on EKOInfo's website
- iv) Copies of the Draft Implementation Plan were made available for viewing at several public libraries
- v) Notices were posted at the power stations
- vi) Public meetings were held to present and discuss the implementation plan in Vanderbijlpark on 14 March 2016 and at the Lethabo Power Station Visitors' Centre on 19 April 2016. The second meeting held on 19 April 2016 was facilitated by Eskom, and the attendance register and minutes of this meeting are included as Appendix D of this document.

The issues raised formally during the public participation process and Eskom's responses to these comments are summarised in the Comments and Responses Report (Appendix D of the *Public Participation Report*).

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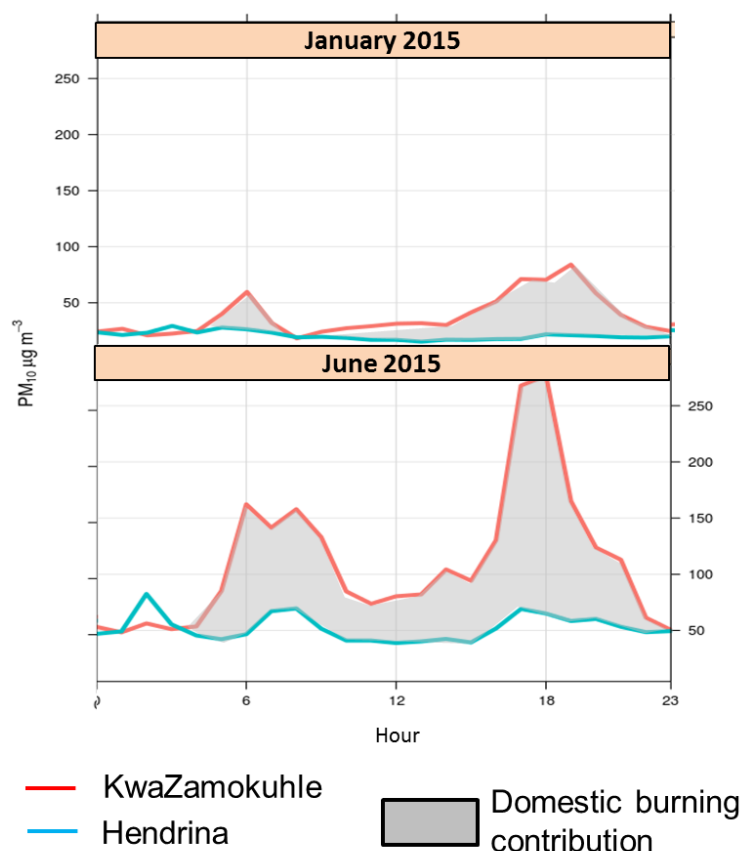
The stakeholder consultation thus far has focussed on the offset strategy and high-level plan. Prior to the implementation of offsets, in-depth engagement with each community will be conducted to provide local perspective, understand the baseline and inform the project design.

## 5. METHODOLOGY

The approach to be followed to develop and implement air quality offsets for Lethabo Power Station is described in this section.

### 5.1 DUAL FOCUS ON REDUCING DOMESTIC BURNING AND WASTE BURNING EMISSIONS

Scientific studies have repeatedly shown that, in areas where households burn coal or wood for cooking and heating, the emissions from the domestic burning make the greatest contribution to ambient levels of particulate matter (FRIDGE, 2004; MRC, 2008; Lim et al. (2012)). The proximity of people to domestic burning also plays a crucial role in exposure since people are very close to the source. Additionally, the fact that the source is often indoors further exacerbates the impact on human health.



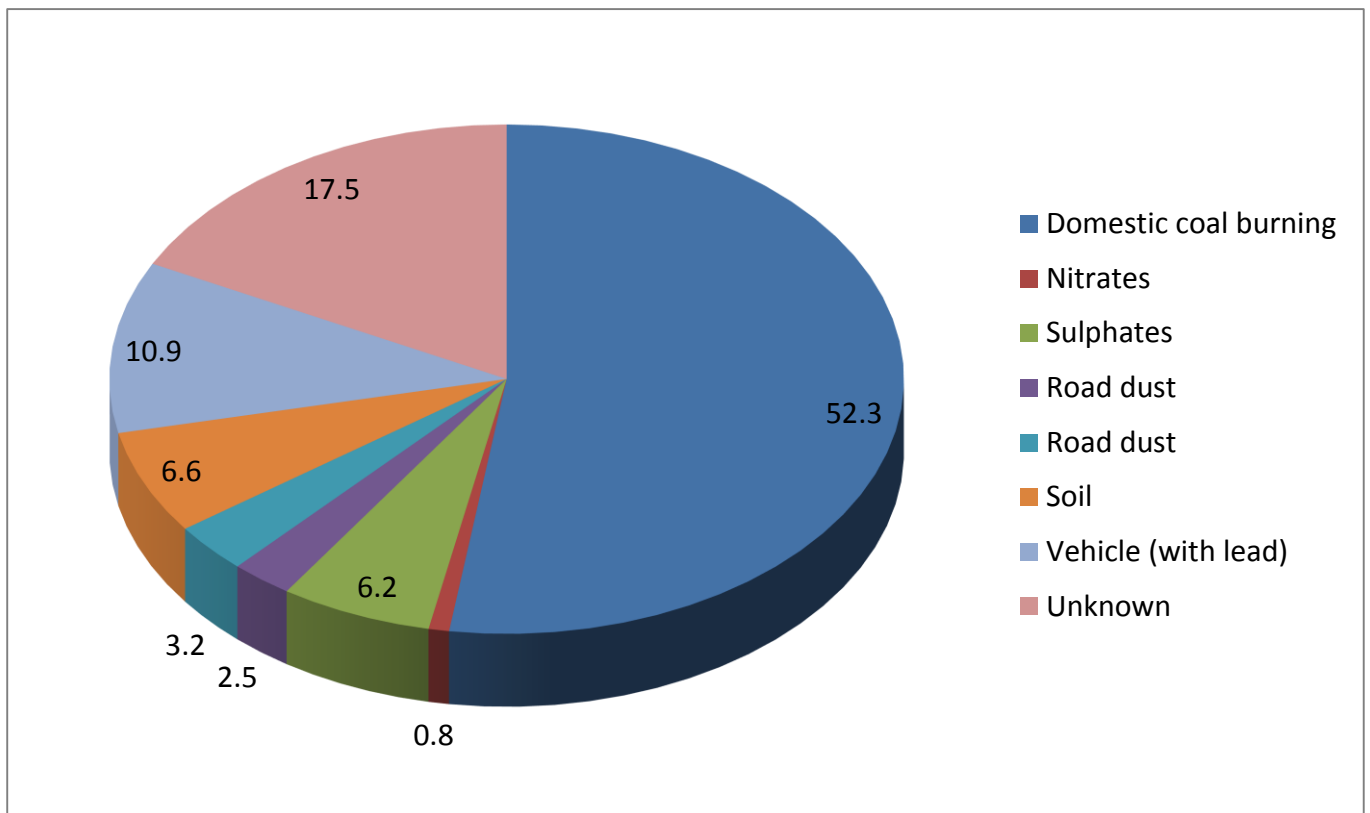
**Figure 4: Average diurnal ambient PM<sub>10</sub> concentrations (µg/m<sup>3</sup>) measured in KwaZamokuhle and neighbouring Hendrina in summer (January 2015) and winter (June 2015). The difference in concentration between the two areas, shaded in grey, is mainly due to domestic burning in KwaZamokuhle.**

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Ambient air quality measurements collected in 2015 in Hendrina (where there is influence of regional air pollution sources but no significant local source) and in KwaZamokhule (3 km away, affected by the same regional sources and domestic coal burning) showed that domestic coal burning is responsible for a significant proportion of PM<sub>10</sub> in the winter (June 2015), and also raises ambient PM<sub>10</sub> levels in the summer (January 2015 – upper graph; Figure 4). In fact, between April and November 2015, ambient PM<sub>10</sub> and PM<sub>2.5</sub> levels in KwaZamokhule were more than double levels in Hendrina. Moreover, from January to November 2015, SO<sub>2</sub> levels in KwaZamokhule were on average 67% higher than SO<sub>2</sub> levels in Hendrina.

The large contribution to particulate matter concentrations from domestic burning has been confirmed by the source apportionment conducted in KwaZamokhule in winter 2015. More than 50% of the fine particulate matter (PM<sub>2.5</sub>) is from domestic coal burning (Figure 5).



**Figure 5: Source apportionment of the fine particulate matter (PM<sub>2.5</sub>) in KwaZamokhule in winter 2015**

Modelling conducted for the FRIDGE Report for the year 2002 (Scorgie et al., 2004b) showed that in the Vaal Triangle, highest ambient PM<sub>10</sub> levels from domestic burning are more than 10 times higher than those from power generation (Table 2). Due to the high exposure to domestic burning emissions, it was calculated that in 2002 domestic burning accounted for 77% of hospitalisations for respiratory illnesses (Scorgie et al., 2004b).

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However, the domestic burning figures that were used as an input for the FRIDGE model are no longer an accurate reflection of the present situation in the Vaal. There has been a steady move away from domestic coal burning in the Vaal over the last decade or so, and it is estimated that between 10% and 20% of households in lower income areas use coal for cooking and heating (compared to 50%-70% of households in lower income areas in Mpumalanga). The proportion of households in the Vaal using coal continues to decline. It is clear then that a focus on reducing domestic burning alone will not be adequate for the Vaal, and so Eskom is exploring alternative ways to improve local air quality.

**Table 2: Predicted air pollution concentrations due to domestic burning and power generation in the Vaal Triangle for 2002 (concentrations are highest hourly, highest daily and annual average ground-level concentrations in  $\mu\text{g}/\text{m}^3$ ) (Scorgie et al., 2004b)**

		Domestic coal burning	Power generation – 2002 emissions	Power generation – 2011 predicted emissions
PM10	Hourly	1879	137	169
	Daily	288	17	21
	Annual	49	2	3

Waste burning has been identified as another significant source of local emissions (Figure 6). Waste is burnt in areas where the waste collection services are unreliable or non-existent, and also in areas where there is an adequate waste collection service. The burning of old tyres to extract the steel reinforcing inside has been identified anecdotally as a significant source of emissions.

Initial observations in Sharpeville indicate that many residents dispose of their household waste in open spaces close to people's houses, for example in the veld on the edge of the township, the road servitude, the power line servitude between Sharpeville and Tshepiso, a traffic circle or an open stand, and even an open stand right across from the memorial (Figure 7 and Figure 8). There is evidence that this waste is then regularly burnt. From informal interviews with residents we infer that there is a regular municipal waste removal service. However, households do not have waste bins. There is therefore a problem of keeping household waste for a week until the next removal. This makes dumping / burning an attractive solution. There are also waste recyclers walking around with carts collecting metal, paper and plastic and sometimes glass for recycling. Apparently there is a place in Sharpeville that takes the paper and plastic. We also found people recovering wood from the waste dumps - likely for firewood. A quick visit to Boipatong and Tshepiso showed that the same pattern is also present there.

In an explorative paper by Fischer and Sanchez (2013), it was estimated that PM10 emissions from waste burning in the Sedibeng District Municipality was around 130 tons per annum in 2001 (Figure 9). Some of the highest emission rates were calculated to be found in the Sedibeng District Municipality. More work is needed to refine these estimates, and to understand where, when and why waste is burnt.

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**Figure 6: Waste burning in Sebokeng on 30 August 2012 (photo credit: Theo Fischer)**



**Figure 7: Waste next to a road in Sharpeville, containing burnt and unburnt material (photo credit: Nova Institute, 2017)**

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Figure 8: Waste disposed of in servitude in Sharpeville (photo credit: Nova Institute, 2017)

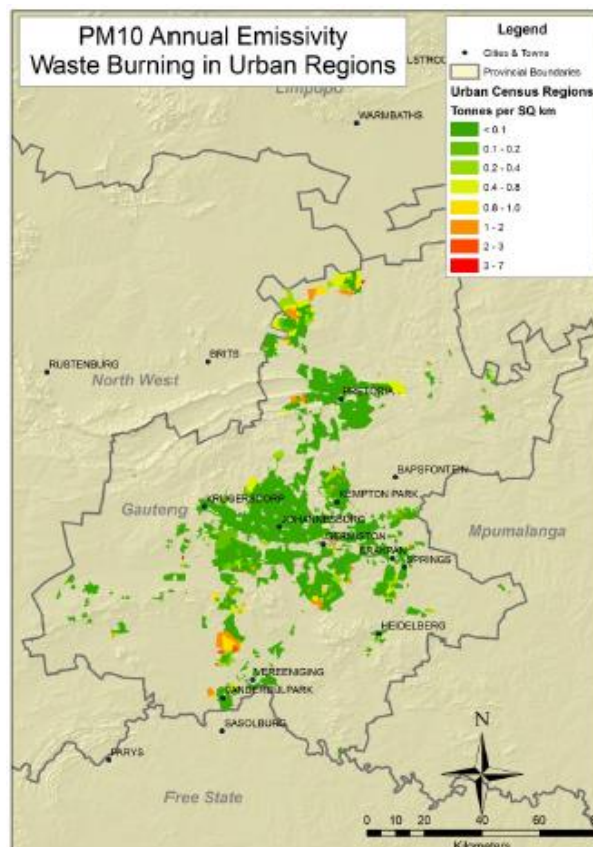


Figure 9: PM10 emissions (tons per square kilometre per annum) from waste burning in urban areas in Gauteng (Fischer and Sanchez, 2013)

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## 5.2 OFFSETS IMPLEMENTATION STRATEGY FOR LETHABO POWER STATION: A PHASED APPROACH

The need for rapid implementation of offsets needs to be balanced with the need to reduce the risk of undertaking initiatives which have not been previously undertaken in South Africa. Given the state of air quality on the Highveld, initiatives which promise to improve air quality and reduce exposure to harmful levels of air pollution need to be rolled out as quickly as possible. On the other hand, rolling out an untested intervention on a large scale (tens of thousands of households) may lead to failed interventions, and the negative sentiment may then lead to offsets being abandoned completely and forfeiting the potentially massive benefits that air quality offsets may have if successful.

Eskom has been proactive in exploring and supporting the science relating to atmospheric emissions and dispersion, offset selection, and the practicalities of implementing interventions in households, as well as creating procedures and methods for offset accounting thereby increasing the available knowledge and the probability of success of air quality offsets. However, Eskom is required to plan and implement air quality offset interventions despite medium term uncertainty and constraints, particularly:

- Lack of quantified scientific understanding of how an offset will affect ambient air quality (in the context of many other factors that affect air quality, like meteorology and change in source strengths over time)
- Offset measurement methodology is in an early stage of development and has not been agreed upon
- Understanding practical aspects of specific interventions and community dynamics requires further development
- Financial constraints on Eskom specifically, and South Africa generally
- The regulatory framework relating to offsets is still developing

The bulk of Eskom's work so far has focused on the situation in the Mpumalanga Highveld, where domestic coal use is still prevalent and household emission offsets offer the greatest potential for improving local air quality. Addressing local waste burning is a new area of work for Eskom's offsets efforts, and thus levels of uncertainty are higher than for addressing domestic burning emissions.

It is proposed that the risks of rolling out untested interventions be reduced by following a phased approach to air quality offset implementation. For each type of offset intervention, the following phases need to be followed as the interventions are successively scaled up, and the learnings from each phase incorporated to deal with implementation problems that arise:

*Phase 0: Pilot project.* An intervention is tested on a small scale to discover practically what works.

*Phase 1: Lead implementation.* The intervention is tested on an entire community to see how best to scale up an initiative. The lead implementation is designed to benefit the specific local communities, minimize implementation risk, increase practical and scientific knowledge, and develop and refine monitoring, reporting and verifications processes.

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*Phase 2: Full implementation.* Once the intervention has been refined and the learnings of the lead implementations incorporated, the intervention will be rolled out simultaneously at several communities

Eskom will develop offsets to address waste burning in the Vaal, and will have to follow phases 0-2 as part of Lethabo's offsets implementation. Household offsets are being developed in other district municipalities, so it is proposed to incorporate the learnings of the lead implementations for household offsets in the Gert Sibande District Municipality (at Ezamokuhle) and Nkangala District Municipality (at KwaZamokuhe) into the full implementation of household offsets for Lethabo Power Station.

### 5.3 OFFSETS IMPLEMENTATION PROCESS PER COMMUNITY

A typical offset implementation in a community will have three phases:

- i) *Baseline establishment.* This is conducted for roughly a year (depending on the size of the community) prior to the implementation of the offset and informs the project design. See section 5.6 for more information on how the baseline will be established.
- ii) *Implementation.* The speed of implementation depends on the number of work teams set up in the community and the specific offset being implemented.
- iii) *Sustainability, monitoring and verification.* Once the implementation is underway and after it has been completed, infrastructure will be set up to ensure that the implementation can be maintained. The effectiveness of the intervention will also be monitored. See section 5.9 for information on monitoring and verification.

**Table 3: Activities to be conducted during each phase of the offsets roll-out in a community**

Baseline	Implementation	Maintenance and monitoring
<ul style="list-style-type: none"> <li>Community consultation</li> <li>Ambient air quality monitoring (and source apportionment)</li> <li>Community focus groups (optional)</li> <li>Education and awareness</li> <li>Planning for implementation</li> </ul> <p><b>For household offsets:</b></p> <ul style="list-style-type: none"> <li>Socio-economic surveys of households</li> <li>Inventory of number of households and energy usage patterns</li> <li>Placement of bulk supply contracts</li> </ul> <p><b>For waste offsets:</b></p> <ul style="list-style-type: none"> <li>Investigate waste collection and recycling services</li> </ul>	<ul style="list-style-type: none"> <li>Roll-out of intervention(s)</li> <li>Ambient monitoring continues</li> <li>Recruitment and training of local community members for implementation of interventions</li> <li>Monitoring of success of interventions through follow-up surveys and monitoring</li> <li>Education and awareness</li> <li>Auditing of implementation</li> </ul> <p><b>For household offsets:</b></p> <ul style="list-style-type: none"> <li>Implementation of interventions in houses</li> <li>Set up fuel distribution network (if required)</li> <li>Develop locally owned SMME(s) to satisfy household maintenance requirements</li> </ul>	<ul style="list-style-type: none"> <li>Ensure required supply chain remains in place, including supporting SMMEs</li> <li>Ambient monitoring continues</li> <li>Reporting and awareness</li> <li>Independent verification</li> </ul> <p><b>For household offsets:</b></p> <ul style="list-style-type: none"> <li>Measures to ensure that new fuel introduced is dependably available and affordable</li> </ul>

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## 5.4 SELECTION OF AREAS FOR OFFSETTING

The methodology used to select the areas for offsetting for each power station is based on the definition of an air quality offset in the Department of Environmental Affairs's Air Quality Offsets Guideline published on 18 March 2016:

*'an offset is an intervention, or interventions, specifically implemented to counterbalance the adverse and residual environmental impact of atmospheric emissions in order to deliver a net ambient air quality benefit within, but not limited to, the affected airshed where ambient air quality standards are being or have the potential to be exceeded and whereby opportunities and need for offsetting exist'.*

In accordance with this, the following **area selection criteria** have been used to select the areas where offsets will be implemented for power stations that are required to implement offsets:

- i) Areas are prioritised based on the impact of emissions from the power station (in order to achieve the objective of 'counterbalancing the adverse and residual environmental impacts of atmospheric emissions').
- ii) Only areas where there is (probably) non-compliance with ambient air quality standards are considered.
- iii) Only areas where opportunities and need for improving ambient air quality through offsetting exist, are considered (i.e. areas where there are local sources of emissions which significantly impact ambient air quality and can be addressed through offsets).

Points ii) and iii) can be considered to be 'pre-qualifying' criteria.

Other considerations used in the selection of areas are as follows:

- i) An offset should preferably not be rolled out to a section of a community only. The large-scale roll-out of the offset needs to include the entire community or at least large discrete sections where emissions influence air quality. (Only activities causing air pollution can be addressed, however.)
- ii) Eskom will not implement offsets in communities where other industries are already embarking on offset projects
- iii) While each power station needs to have their own offset project, there needs to be cognisance of the bigger picture when planning the offsets. In some cases, power stations in close proximity to each other impact on an overlapping area. In these cases, areas for offsets need to be selected to ensure that all priority settlements area allocated to a power station, although it may not be the power station in closest proximity to them.

Standard RDP houses inhabited by legal occupants in urban areas are obvious candidates for household emission offsets since the houses are of fairly uniform design, and these households often use solid fuels. However, many South Africans live in other types of dwellings and settlements, and household offsets also need to be implemented there as far as is feasible.

Informal dwellings pose perhaps the greatest challenge for offset implementation, and the approach to be adopted towards informal dwellings was much debated with stakeholders in the development of this

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plan. On the one hand, shacks are often illegally located, and their temporary nature means that any intervention may not have a lasting impact (shacks could well be moved, for example). On the other hand, shack dwellers are subjected to some of the worst air quality and are a highly vulnerable group, and as such are most in need of an intervention. Many urban areas have both formal and informal houses. If emissions from informal dwellings are not reduced, an offsets project may fail to significantly improve ambient air quality.

As such, Eskom will be adopting a nuanced approach towards informal dwellings. Dwellings which are semi-permanent and have been somehow 'officially' established will be considered candidates for an offsets roll-out. Appropriate interventions still need to be evaluated through a pilot study, planned to be conducted in KwaZamokuhle. A stove swap is a promising intervention for an informal dwelling, but insulation will be trickier, and needs to be properly tested before it is suggested for implementation.

## 5.5 SELECTION OF OFFSET INTERVENTIONS

Lethabo's offsets programme will have two main thrusts: addressing domestic burning and waste burning. It is proposed that this Air Quality Offsets Implementation Plan is based on a **Programme of Activities**, comprising of:

- i) *Waste burning interventions*: Reasons for waste burning practices will be identified in the baseline phase of the roll-out through engagements with the community and air quality monitoring, and then an intervention will be developed. This intervention will be tested and refined in a pilot study before it is scaled up.
- ii) *Household interventions*: Emissions from the domestic burning of coal/wood will be reduced through one or more of the following:
  - Assist households to move to a cleaner source of energy (like electricity, or LPG for unelectrified houses)
  - Providing households with cleaner burning heating and/or cooking devices (such as a low emission coal/wood stove)
  - Reducing the need for heating by better insulating houses, where possible

Space heating is a key structural cause for coal use in urban areas. Coal use is seen as economic and practical when there is a requirement for space heating (in which case users also get "free" cooking and water heating). When there is no need for space heating (i.e. in summer) people tend to cook and heat water on non-coal stoves rather. Effective interventions thus need to both reduce the need for space heating through improving housing insulation, and moving households to a cleaner burning fuel or stove/heater.

The interventions need to be tailored to each community based on the dwelling type and energy use. They will also be informed by the lead implementations in KwaZamokuhle and Ezamokuhle, where all qualifying and willing households residing in formal dwellings will receive an insulation retrofit and an electricity starter pack. A suitable intervention for informal dwellings still needs to be developed..

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- iii) *Education and awareness raising:* Continual interaction with the community is needed to ensure that the intervention is used and maintained properly (for example, that waste should be recycled or disposed of in dumpsters, and not burnt on open land), and to encourage behavioural change to reduce exposure and smoke generation. Schools will be one of the main targets for education initiatives. These initiatives will need to be done in partnership with local environmental health practitioners.
- iv) *Projects in development:* Since this Air Quality Offsets Implementation Plan spans 9 years, the interventions cannot remain static but need to change as new technologies become available and as circumstances of communities change. Renewable energy technologies, in particular, are developing rapidly, and may be a viable offset option in future, especially in more remote areas which are not connected to the electricity grid. Initially, the projects in development will focus on:
- Non-household intervention pilot: This will be conducted in the Vaal, also from 2017, and will test ways of reducing emissions from local waste burning through improving waste collection and/or recycling.
  - Informal housing pilot: This will be conducted in KwaZamokhule from 2018, during the lead implementation there. Some of the most feasible options for reducing emissions from informal dwellings will be tested, taking into account the interventions and supply networks that are being set up for the roll-out targeting formal households.
  - Farm dwelling/rural pilot: Farm and rural dwellings are often not uniform, and use wood rather than coal. Solutions for these types of communities will be tested at Sheepmoor (in the vicinity of Camden Power Station).

The intervention designed for each community will need to be tailored to take into account:

- The main source(s) of local emissions in the community
- The energy sources used by the community
- The size of the community (which may determine the available energy sources or level of municipal services provided, for example)
- The housing structures and permanence thereof (insulation may not be a viable option for all housing structures, for example)
- Service provision in a community

## 5.6 BASELINE ESTABLISHMENT

A baseline needs to be established for each community prior to implementation of the offset intervention in order to:

- Provide a basis for comparison to determine the improvement in air quality due to the offset
- Inform the scope of the offset intervention and the project design

For example, the number of households eligible to participate in the offsets intervention will be established based on the number of solid fuel-using households in the area immediately prior to the start of the implementation. Additional households established during the implementation (which may be stimulated by the revenue and benefits brought by the intervention) can unfortunately not be considered

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in this phase of the offsets roll-out (although they would probably be candidates should there be a future offsets roll-out).

Furthermore, the success of the intervention will be evaluated relative to the baseline as it changes over time. An offset cannot be considered to fail if the number of households in an area doubles (and thus local emissions double) during the offset roll-out. Similarly, an offset intervention cannot be considered to be successful if it is not additional to changes that would have happened in the absence of the roll-out (for example, the trend of decreasing coal use). As such any foreseen changes in the community must be determined during the baseline assessment before a roll-out can be planned.

The baseline will be established in each community through two main activities:

- i) Air quality monitoring, to establish baseline levels of PM and SO<sub>2</sub>
- ii) Surveys focussing on quality of life (comprising objective living standard and subjective well-being), energy use and waste disposal practices of a sample of willing households in the community

Additional tools may be employed from time to time to aid in the understanding of the offset on the community and the air quality, for example air quality and/or dispersion modelling and source apportionment measurements.

### **5.6.1 Air quality monitoring**

Since the overarching objective of Eskom's air quality offsets is to improve ambient air quality, specifically ambient PM levels, ambient air quality measurements need to be performed before the implementation of the offsets to establish baseline conditions (for a year); during the implementation; and after the implementation for at least a year to monitor retention.

A 'standard' monitoring station will be sited in all larger areas where offsets are implemented. The following parameters will be continuously monitored at the standard monitoring stations:

- PM10 and PM2.5
- SO<sub>2</sub>
- NOx
- Meteorology: temperature, wind direction, wind speed, pressure, humidity, rainfall

Where possible, an additional 'standard' monitoring station will also be sited upwind of the area where the offsets are implemented. It is hypothesised that regional and large pollution sources (like power stations and biomass burning in August/September) will have a similar impact on both monitoring stations, but that the influence of local emissions in the offset area will not greatly influence measurements at the upwind monitoring station. The difference between the measurements collected at the two monitoring stations will provide a good indication of the influence of local emissions on air quality in the area selected for the offset and how they decrease over time, and will hopefully allow for the variability introduced by meteorological conditions and changing strengths of regional sources to be accounted for. It may not be possible to establish upwind monitoring stations in Emfuleni, since the communities identified for offsets border other communities or activities. In this case, other methods will need to be used to quantify the influence of the offset intervention on ambient air quality.

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In addition to the standard permanent monitoring stations, standard mobile monitoring stations (equipped to measure the same set of parameters as the standard permanent monitoring stations) will be deployed for shorter periods of time, in order to ascertain the effectiveness of the offsets roll-out in smaller settlements.

Lastly, a mobile monitoring station equipped with a much more extensive set of instruments will be moved between communities to ensure that we obtain a good scientific understanding of the impact of the offset interventions on ambient air quality. Parameters monitoring by this 'scientific' mobile monitoring station may include:

- Black carbon
- Carbon monoxide
- Ozone

## **5.7 COMMUNITY CONSULTATION**

Community support is vital to the success of offsets. Communities have not been consulted in the development of this high-level plan, as approval of the proposed methodology and areas selected is needed before the expectation of an intervention can be created with communities. It is also preferable to engage with communities shortly before an intervention roll-out, not several years before.

Nevertheless, very comprehensive community consultation needs to be undertaken before the implementation of offsets in a community. This consultation will inform the development of a project plan for each community. Through the community consultation, we will:

- i) Ascertain what the significant local emission sources are, and how they can best be addressed.
- ii) Establish a baseline for a community (how many households are there? What are their energy usage patterns? What type of housing structures do they have?). This baseline will be used to scope the intervention, and evaluate success of the intervention.
- iii) Understand levels of service provision (how frequently is refuse removed? Is there a waste recycling programme?)
- iv) Identify troublesome sources of emissions
- v) Create awareness as to how air pollution affects health and what can be done to stay healthy
- vi) Educate the community members on how to best employ and maintain the offset
- vii) Get buy-in from the community

In each community where offsets will be implemented, a Local Stakeholder Reference Group (LSRG) will be set up. The LSRG is a forum through which Eskom and the local community communicate with each other.

The LSRG will be established before project implementation and continue throughout it, with at least three LSRG meetings per year. Community understanding and support of the intervention is fundamental to the implementation of air quality offsets. The communities are much more likely to accept an offsets intervention if there is transparent and active communication between all parties. The aim of the LSRG is to achieve such communal support.

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Key stakeholders for the LSRG and associated engagements include all households in the engaged community, qualifying intervention households in particular, political leaders (such as councillors and ward committees), social leaders (such as religious leaders, traditional leaders and educators), local government, the South African Police Service, Eskom and Eskom contractors.

Communication with the community may proceed in four stages if necessary:

*Stage 1: Engage licensing authorities, local government and formally elected leaders.* These introductory engagements will also align Eskom's LSRG strategy with local protocol. Issues to be discussed include the project history and objectives, the choice of the particular community, the choice of interventions, qualifying criteria for participating households, technical information, funding, expectations from all sides and risks.

*Stage 2: Establish a LSRG.* A comprehensive selection of representatives will be invited personally and/or publicly (through advertisements and public notices) to participate in the LSRG, including partners from Stage 1. The LSRG meetings will have a clear and fixed procedure with a strong focus on the Offset Programme, thereby preventing secondary issues impeding on available time. The LSRG meetings will take place on an ongoing basis and be scheduled at prominent periods of implementation. The LSRG will address all the elements of stage 1, as well as having a focus on the community perspectives and the promotion of better energy use choices and practices.

*Stage 3: Conduct public communication meeting(s) if needed.* There might be a need for one or more public communication meetings, depending on the outcomes of stages 1 and 2. A public meeting might coincide with existing meetings conducted by the political leadership. These public meetings will discuss all the issues mentioned in stage 1 and stage 2, with a strong focus on the community perspectives.

*Stage 4 for household offsets: Communicate with qualifying households.* Following the successful completion of stages 1 to 3, communication with qualifying households must take place. This part of the communication will continue over a longer period than stages 1 to 3, and parallel to the start of implementation. The aim of this communication will be to inform households about the planned interventions so that they can make a decision whether to participate in the project or not. Stage 4 will have as content all the elements of stage 1, as well as the household selection process, technical information, household responsibilities including maintenance, contractual considerations, contract and construction scheduling.

*Stage 4 for waste offsets: Communicate with participating individuals and/or companies.* Communication with those participating in the waste pilot will continue in parallel to the implementation, in order to inform, monitor and continually improve implementation.

The following administrative requirements will be adhered to during community engagements:

- Strict and comprehensive documentation will be kept
- Where possible, audio recordings of proceedings will be taken

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- Full meeting scripts will be circulated to all invitees whether they attended or not
- The local project office will be accessible to the public for enquiries
- Translation services at meetings and documents in multiple languages will be provided

## 5.8 LOCAL EMPLOYMENT CREATION

The air quality offsets programme offers potential for creating local employment (albeit on a temporary basis), which needs to be taken advantage of. Teams which conduct the socio-economic surveys and implement the interventions need to be mainly recruited from the local community. The project team can help to establish a locally owned company which can assist with the maintenance of the installations (for household offsets) in the longer term.

## 5.9 MONITORING, VERIFICATION AND REPORTING

The effectiveness of the offsets roll-out will be tracked through monitoring, independently verified, and reported on annually to the Fezile Dabi District Municipality and National Air Quality Officer.

A project design document (PDD) will be compiled for every area where offsets are to be implemented, after the baseline measurements and consultation with the community but before implementation starts. This PDD includes a monitoring plan that describes the parameters that will be monitored as well as the frequency and method of monitoring.

We foresee that following an initial design phase, monitoring and reporting will take place annually. Each project design will be aligned to a calculation methodology relevant to its intervention type.

Some monitoring activities will take place during the design phase (i.e. before the project is implemented) and will include the initial state of the parameters that will be monitored annually but also includes parameters that will only be monitored once during the project lifetime. Parameters monitored only once during the project lifetime include emission factors for specific fuel-device type combinations as well as certain modelling parameters.

It is proposed that three indicator domains be monitored before and during the offsets implementation, namely *the state of ambient air*, *emissions* and *quality of life*. Over every monitoring period the project scenario (as it actually took place) will be compared to a credible baseline scenario (i.e. the situation that would have been the case if the project was not implemented). It is just as important to monitor parameters that allows one to describe the project scenario as it is to monitor parameters that allows one to construct the baseline scenario. The terms *describe* and *construct* are significant: after the project starts, the project scenario is the state of affairs that exists in reality and must therefore be described while the baseline scenario does not exist (because the baseline is what would have existed without the offset intervention) and must therefore be theoretically constructed.

Examples of the parameters monitored include:

- i) Ambient air quality
  - a. Hourly, daily and annual PM and SO<sub>2</sub> concentrations within the implementation area

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- b. Hourly, daily and annual PM and SO<sub>2</sub> concentrations at a reference site outside the implementation area
- ii) Household emissions (for household offsets)
  - a. Number of solid fuel using households within the project boundary per fuel type
  - b. Average solid fuel use per household per season per fuel type
  - c. Number of households at which the offset has been successfully implemented
- iii) Waste emissions (for waste offsets)
  - a. Additional waste collected and/or recycled
- iv) Quality of life
  - a. Demographic factors such as age and sex distribution which is important to monitor the level of vulnerability due to exposure to air pollution in a community
  - b. Health and well-being such as poverty lines and employment, as well as perceptions regarding air quality and the desirability of the air quality offset project
  - c. Services and infrastructure such as water, waste removal and sanitation, as well as housing with particular emphasis on measuring temperature inside homes, in order to determine the appropriate indoor thermal range which influence domestic energy usage patterns
  - d. Education, safety and security aspects as far as it relates and could be impacted by the offset project

The relationship between the emissions from households/waste and the state of ambient air must be established through some form of modelling (dispersion modelling, receptor modelling or both). Model validation forms an important part of the design phase of the project.

The offset project impact is the difference between the baseline scenario and the project scenario. The principle indicator for the success of the intervention will be related to a change in exposure to air pollution. This can be expressed as a reduction in the ambient concentration of particulate matter, or as a reduction in standards weighted pollution intake, or a reduction in inhalation related health risk or a reduction in the expected burden of disease from air pollution. The particular method and indicators for success will further be described in the project design document (PDD) of the lead implementations and in the programme of activities design document (PoA-DD) and the component project activity design document (CPA-PDD).

Relevant reporting will take place at each stage of the project. Before the project starts, a baseline study and detailed project design are undertaken. The results will give shape to a project design document in the case of the lead implementations or a PoA-DD later in the programme. This document will contain details of the exact project location and boundary, the project schedule over the whole lifecycle, the specific intervention design and the monitoring plan. This PDD will be validated by the regulator or by an independent third party.

Details of the project implementation will be monitored continuously and stored in a project database that will contain details of every installation.

Annual monitoring of relevant indicator domains will be conducted in accordance with the monitoring plan. An annual monitoring report will be produced in accordance with the PDD and methodology and verified by an independent third party.

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We envision that after some refinements during the lead implementation, the air quality offset initiative will be structured as programme of activities (PoA). The monitoring and reporting requirements are essentially the same as described above except the third party validation and verification takes place at the scale of the programme and not at the scale of each project (referred to as a component project activity (CPA) in PoA terminology).

## **5.10 HEALTH IMPACTS ASSESSMENT**

Exposure to air pollution is strongly associated with respiratory health impacts, especially in vulnerable groups, such as young children. Acute respiratory health impact, especially pneumonia, continues to count among the top five causes of death in South African children under the age of five years. It is therefore proposed to establish a partnership with a reputable research institution to determine the health impacts of the air quality offsets roll-out in one area (which will not necessarily be in the Fezile Dabi District Municipality).

The aim of the study will be to determine the personal health effects of chosen offset interventions in one settlement compared to a control site. To fully comprehend the personal health effects related to air pollution exposure, a two-pronged approach is necessary. First, a household survey to establish symptoms and pre-existing diseases in relation to risk factor and exposure pathways provides a snapshot view of the health status of a community. Second, vulnerable sub-population groups within a community are most likely to experience the subtle effects of increased or decreased air pollution levels in their places of work, play and residence. In this respect, it is important to assess physiological responses i.e. lung function, to air pollution exposure. Children under the age of 10 years are an important target group for assessment since they are usually not actively smoking and their physiology is susceptible to small increment pollution changes. By focussing on a susceptible group, the likelihood of detecting change is higher.

## **6. AIR QUALITY OFFSET IMPLEMENTATION PLAN SPECIFICS**

The communities which have been proposed for offsets and the timeline for implementation are described in this section. Figure 10 shows the area of impact of the emissions from Lethabo (annual average concentrations), and was extracted from the Atmospheric Impact Reports submitted in support of Lethabo's application for postponement of the Minimum Emission Standards compliance timeframes (uMoya-NILU 2014).

### **6.1 LETHABO POWER STATION**

Lethabo Power Station is a six-pack coal-fired power station with an installed capacity of 3708 MW, commissioned between 1985 and 1990. Lethabo is situated in the Free State, between Sasolburg and Vereeniging. Electrostatic precipitators (ESPs) are installed at the station to remove the ash from the flue gas before it exits to the atmosphere. A flue gas conditioning plant increases ESP efficiency.

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Lethabo has not committed to any emission abatement retrofits, as there is currently compliance with the SO<sub>2</sub> and NO<sub>2</sub> ambient air quality standards and the power station contributes very marginally to the measured concentrations of PM<sub>10</sub>.

## **6.2 TARGET AREAS AND INTERVENTIONS**

Large numbers of people live in the vicinity of Lethabo Power Station (within 50 km of Lethabo), but the area most highly impacted by emissions from Lethabo (to the east and south-east of the power station) is relatively sparsely populated.

The proposal on areas for offsets implementation is based on considering, in accordance with the area selection criteria in section 5.4:

- Which areas are impacted the most by Lethabo's emissions?
- Where is ambient air quality the worst?
- Where can offsets make the greatest improvement to ambient air quality?

The following settlements have been selected for Lethabo's air quality offsets implementation since they are the largest areas affected by Lethabo's emissions (Figure 10), where there is the potential to significantly improve ambient air quality through offsets:

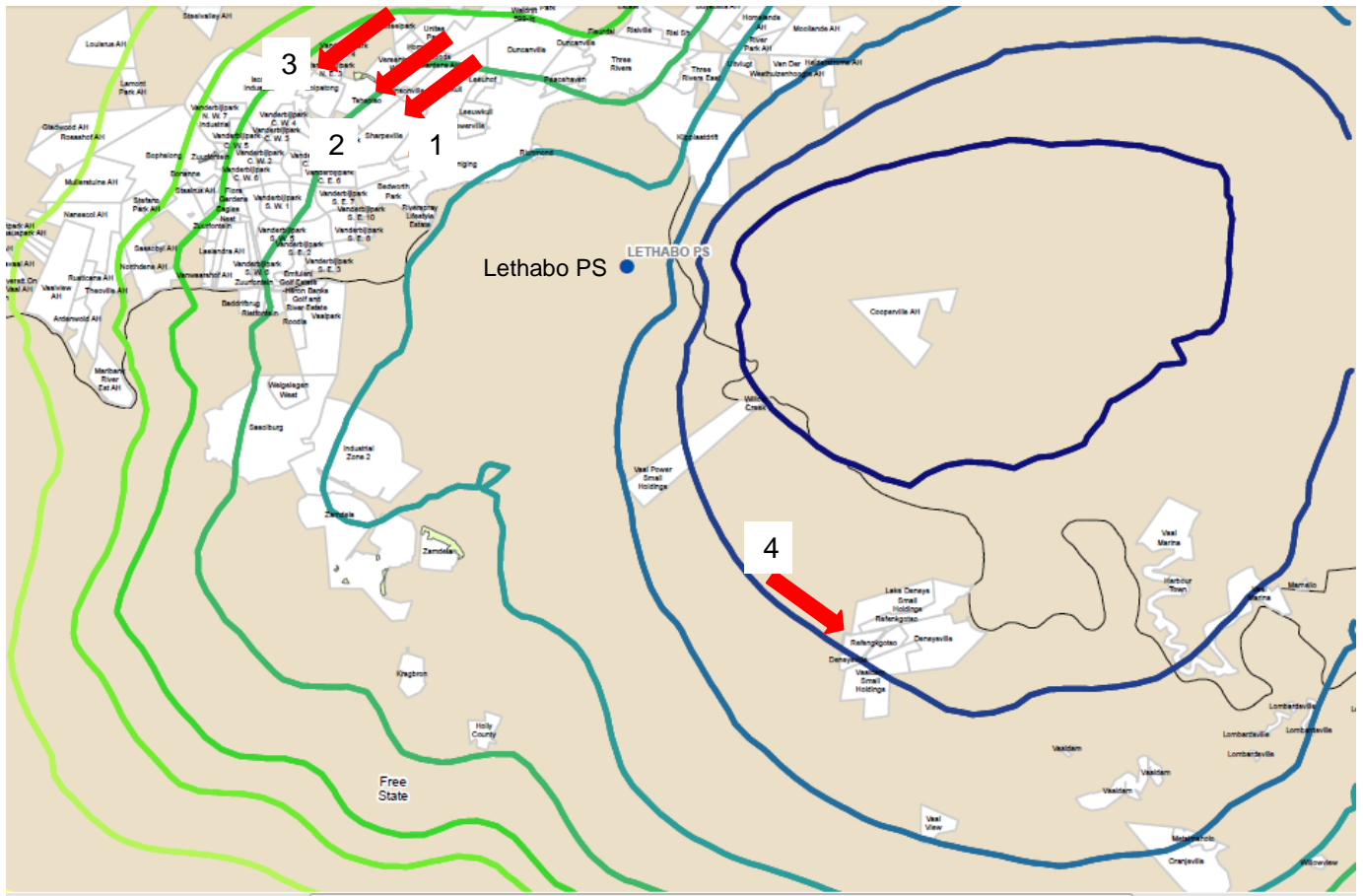
- Refengkotso
- Sharpville
- Tshepiso
- Boipatong

Lethabo is aware that residents of Three Rivers are at times affected by fugitive emissions from Lethabo's ash dump. Unfortunately, there are no significant sources of emissions in Three Rivers which can be addressed through offsets, and so it is not possible for Lethabo to implement offsets at Three Rivers.

Zamdela is also influenced by Lethabo's emissions, but since Sasol is implementing offsets in Zamdela, Eskom will not.

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Lethabo SO2	Lethabo NOXs1	Lethabo PMs1
Concentration	Concentration	Concentration
Contours	Contours	Contours
0.556539633	0.229866087	0.025289989
0.771808068	0.318777546	0.035072091
0.897296981	0.370607729	0.040774485
0.97044968	0.400821695	0.044098647
1.09593859	0.452651878	0.049801041
1.31120703	0.541563337	0.059583143
1.68048666	0.694085424	0.076363732
2.31396294	0.955727592	0.10514979
3.40065215	1.40455848	0.154530485

Figure 10: Area of impact of Lethabo Power Station's emissions (annual average concentrations in  $\mu\text{g}/\text{m}^3$  from uMoya-NILU, 2014), and locations of intervention target areas (indicated with red arrows). Areas for offsets are: 1: Sharpeville; 2: Tshepiso; 3: Boipatong; 4: Refengkotso

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**Table 4: Total population, number of households and energy usage patterns in the target areas for Lethabo's offsets programme**

<b>Settlement</b>	<b>Refengkotso</b>	<b>Sharpeville</b>	<b>Tshepiso</b>	<b>Boipatong</b>
Population	17 646	37 599	29 271	22 167
Number of households	4 883	12 170	8 998	7 059
Number of households using coal according to Census 2011	390	214	114	66
Number of households using wood according to Census 2011	510	159	680	108
Number of households using coal according to NOVA's Carbon Monitoring Report (2013-2014)	n/a	2772*	n/a	1 369
Type of intervention proposed	Waste and household	Waste	Waste	Waste

\*The number of coal users in Sharpeville was 2772 in 2012 according to NOVA's Carbon Monitoring Report. The number of coal users is falling rapidly, and is currently estimated to be around 1000.

It is proposed that the starting point for Lethabo's offsets roll-out be a waste pilot project in Sharpeville. Offset interventions to reduce waste burning emissions will then successively be rolled out in Sharpeville, Refengkotso, Tshepiso and Boipatong. In addition, household emission offsets will be conducted in Refengkotso. Although Lethabo Power Station is situated in Fezile Dabi District Municipality and it has the greatest impact on ambient air quality in Fezile Dabi District Municipality, most of the people affected by Lethabo's emissions live in Sedibeng District Municipality. This is why Lethabo's offset efforts will start in Sedibeng, and why more people in Sedibeng will be eventually affected by the offsets roll-out. However, in acknowledgement of the fact that people in Fezile Dabi living downwind of Lethabo are subjected to the highest impact of Lethabo's emissions, both waste and household offsets will be rolled out in Refengkotso. This should result a greater improvement in ambient air quality than a waste roll-out alone.

The baseline assessments that will be conducted in all four areas and the results of the waste pilot and household lead implementations in other district municipalities will be used to compile Project Design Documents for each area, which will identify the extent to which the household and/or waste offsets can be implemented.

The household emission offset will be informed by the lead implementations in KwaZamokhule and Ezamokuhle, but will likely be the installation of housing insulation and swapping of coal stoves for cleaner energy.

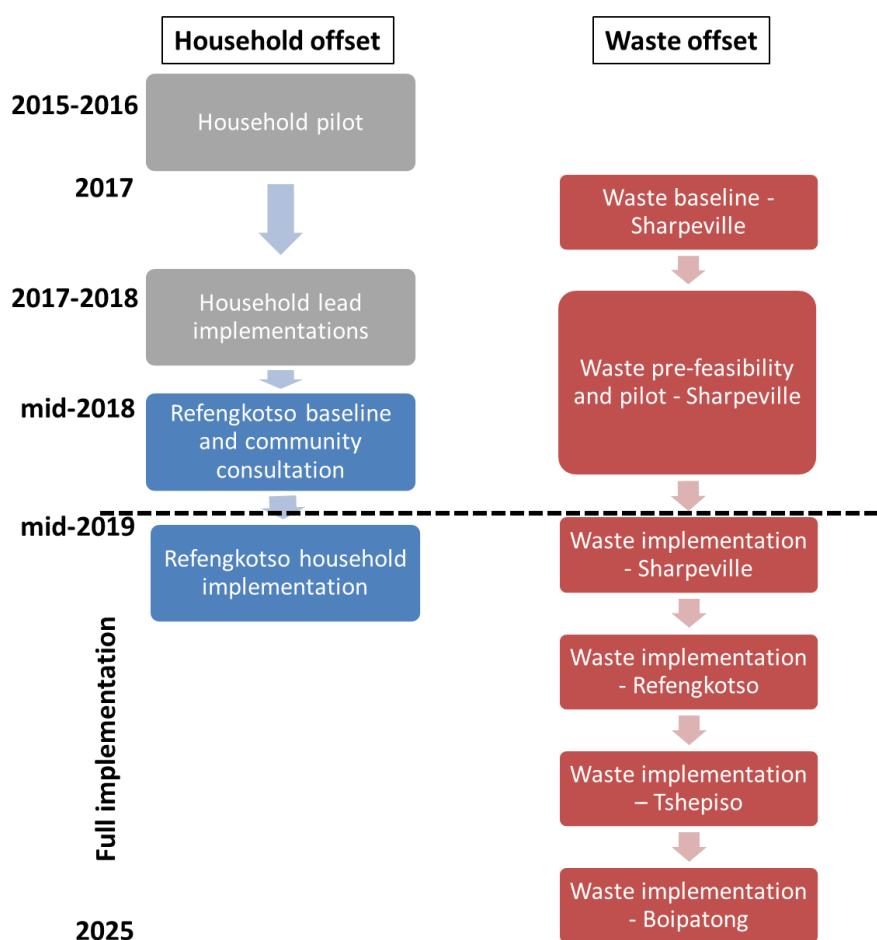
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### 6.3 TIMELINE FOR IMPLEMENTATION

This offset plan covers the period from April 2017 to March 2025 (Figure 11). The proposed schedule allows for phased implementation, so that the learnings of each roll-out can influence the design and improve the next roll-out.

This schedule depends on budget being made available. Should there be delays in the allocation of funding to this project, it will translate directly into a delay in this schedule. This schedule also depends on approval from the relevant authorities. Work can only commence once approval from the authorities has been received. Should approval be delayed, or should significant changes be required to this plan, the roll-out of offsets will be delayed.



**Figure 11: Preliminary schedule for the roll-out of the air quality offsets for Lethabo. This schedule will be refined after community engagements and the scope of interventions for each community decided on. The timelines are dependent on procurement processes and budget allocation.**

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## 6.4 WASTE PRE-FEASIBILITY AND PILOT

Waste burning has been identified as a significant local source of emissions based on anecdotal evidence, initial observations in Sharpeville and on limited calculations (Fisher and Sanchez, 2013). Eskom has no experience in addressing emissions from waste burning emissions, and thus proposes first to conduct a pre-feasibility study to identify potential measures that could be introduced to reduce waste burning (for example through improving waste collection, increasing recycling and changing household behaviour). The most promising measures identified will then be tested in a pilot project to be conducted in Sharpeville. The outcome of this pilot project will inform the plan for the wider implementation of the waste offset.

Key questions to be answered during the waste pre-feasibility and pilot studies include:

- Why is waste burnt?
- Who burns the waste?
- Where is waste burnt?
- What type of waste is burnt?

## 7. RISK MITIGATION

Risks and unintended consequences of air quality offsets, and the way in which Eskom proposes to mitigate these risks, are as follows:

**Table 5: Risks of air quality offsets and proposed mitigation**

Risk	Risk rating	Mitigation already in place	Planned mitigation
<b>Funding constraints:</b> Funds have been allocated for offsets implementation but they may be cut	Medium	Funding requirements for the MYPD3 tariff period (until April 2018) have been limited by only having the large-scale roll-out after 2018	Funding will be requested through Eskom's Multi-Year Price Determination 4 (MYPD4) tariff application.
<b>Objections from communities</b> which are not included in the offsets implementation	Medium	An objective process has been used to select communities. Also, offsets will not be implemented in a section of a community only. In-depth community consultation will only occur after authority approval of the plan and allocation of budget.	Most communities in the vicinity of power stations will eventually receive an offset implementation
<b>Unreliable supply of electricity</b> will leave communities without an energy source at times.	Medium		It will be investigated whether a back-up energy source is required.
<b>Safety:</b> Electric wiring in many houses is unsafe. Injuries may be caused by electric heaters or stoves.	Low	-	The project team will ensure the wiring is safe after installation of the electric heater and stove. Members of the local community will be trained in safe operations of the new appliances prior to the installations.  Health and safety requirements of Eskom's procurement process will be adhered to.

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## **8. WAY FORWARD**

There needs to be regular engagement between Eskom and the authorities so that the offsets implementation proceeds according to everyone's satisfaction, and that learnings are incorporated into the more refined plans. We propose that this takes the following form:

- Annual updates of this Air Quality Offsets Implementation Plan for Lethabo Power Station. This document is the first such update
- Annual progress reports. See the annual progress report also submitted in March 2017.
- Bi-annual (twice a year) meetings between Eskom and the authorities. A meeting was held in September 2016 and another will be held in April 2017.
- Submission of a Project Design Document for the Sharpeville offsets roll-out by 31 December 2018.

## **9. CONCLUSION**

The air quality offsets regime being developed by DEA provides a practical and realistic way of improving air quality in communities. Despite the economic constraints faced by South Africa in general and Eskom in particular, the offset plan described in this document illustrates that improvement of community environmental parameters are achievable within the context of limited national resources and competing national imperatives.

Although the offset plan is ambitious in scope and reach, the phased approach ensures a higher probability of achieving the desired outcomes, which include

- acting responsibly with and towards affected communities
- demonstrably improving community experienced air quality in a cost-effective manner
- meeting air quality license conditions

The planned solution adapts to local conditions and immediate context through community consultation and ongoing development. However, the ultimate goal is national and long term in nature: the aim is to focus the available national resources to achieve a sustained improvement in quality of life for current and future citizens of South Africa.

**CONTROLLED DISCLOSURE**

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**CONTROLLED DISCLOSURE**

Scorgie, Y., Burger L.W., Annegarn, H.J., 2004b: Socio-economic Impact of Air Pollution Reduction Measures – Part 3 Report: Quantification of Environmental Benefits Associated with Fuel Use Interventions, Report compiled on behalf of NEDLAC, NEDLAC, Rosebank.

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## 11. APPENDIX A: SATELLITE IMAGES OF AREAS SELECTED FOR OFFSET INTERVENTIONS

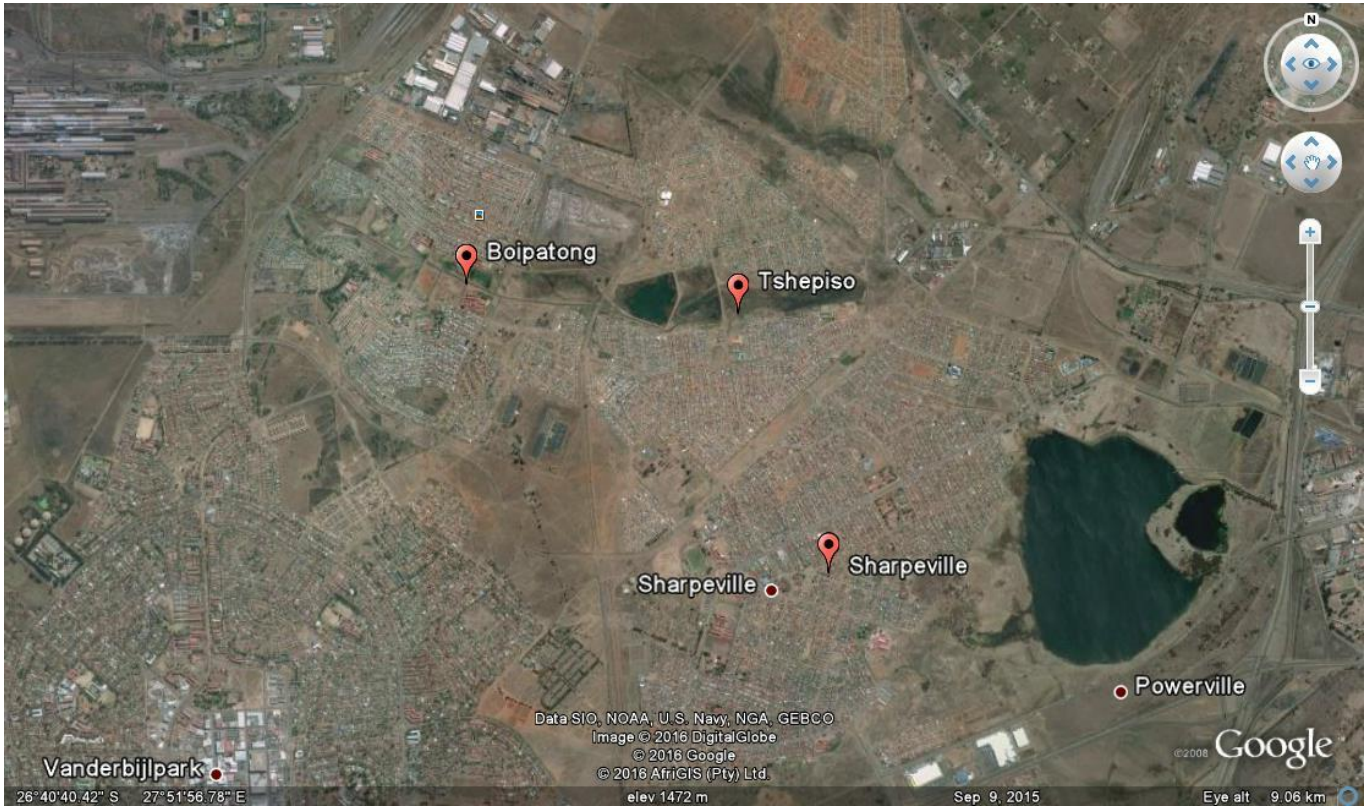
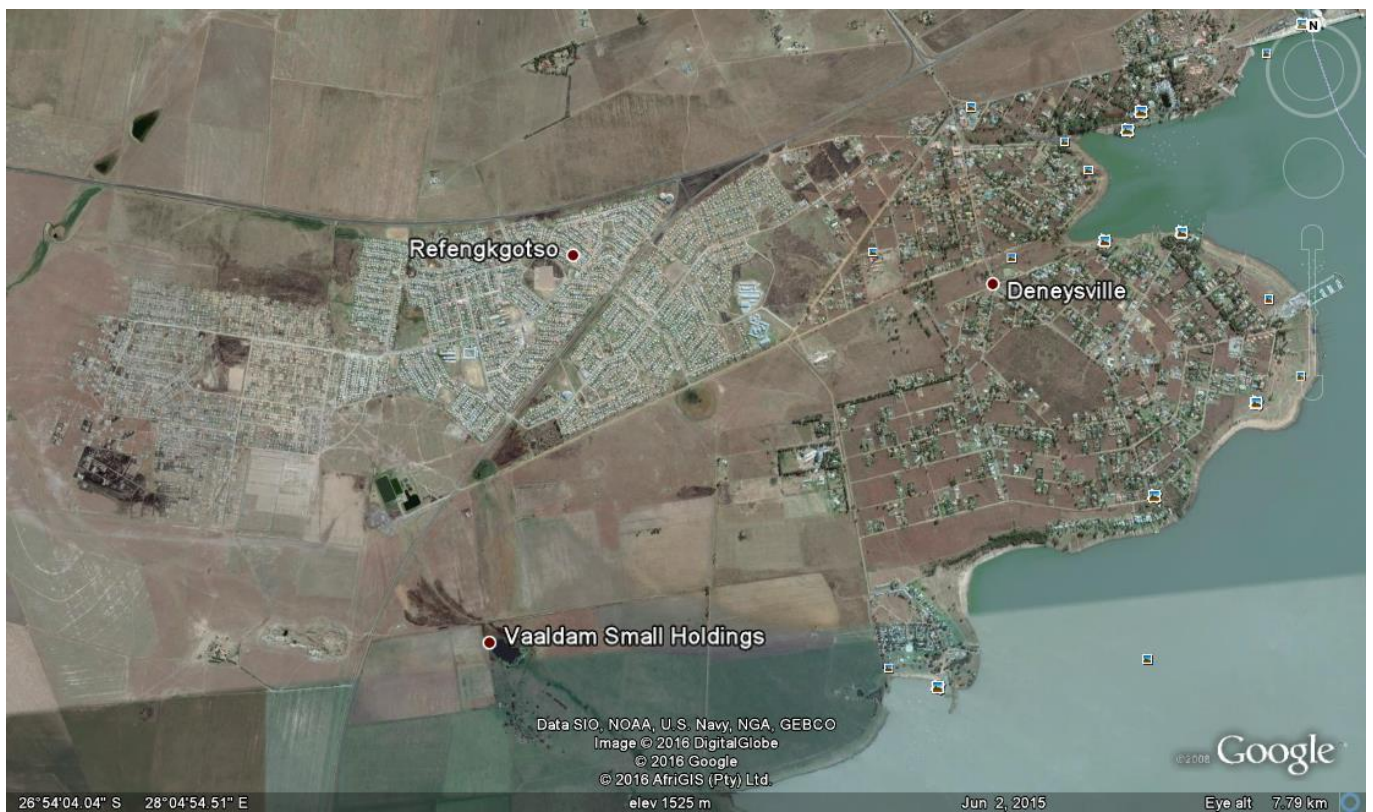


Figure 12: Sharpeville, Tshepiso and Boipatong

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**Figure 13: Refengkotso (and neighbouring Deneysville, on the Vaal Dam)**

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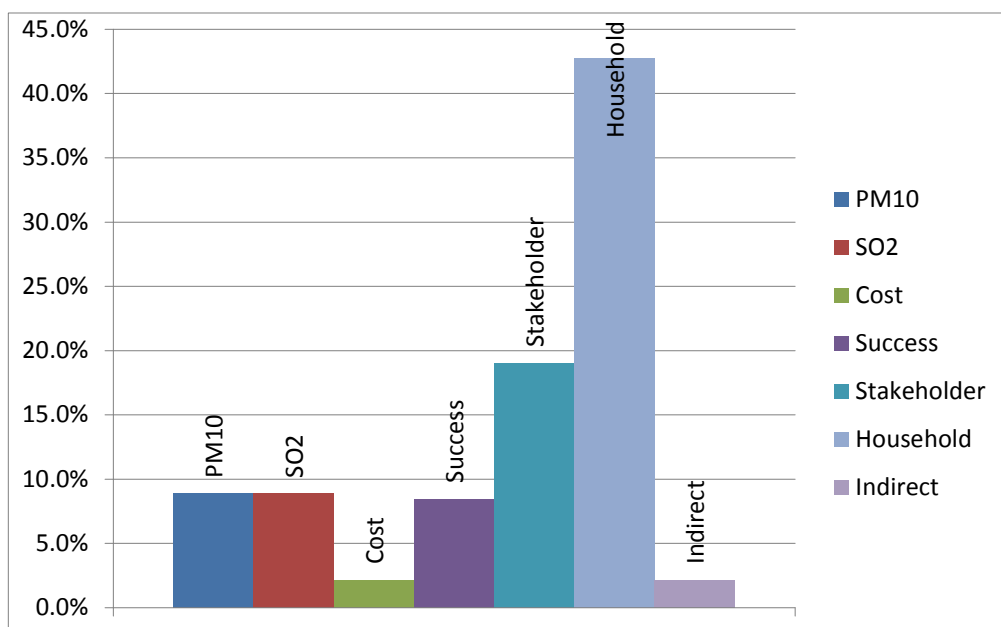


## 12. APPENDIX B: SUMMARY OF THE HOUSEHOLD EMISSION OFFSET PRE-FEASIBILITY STUDY

Eskom's exploration of air quality offsets started with a pre-feasibility study conducted by EScience Associates and the Nova Institute in 2013. The objective of this study was to determine the most feasible interventions to offset tall stack emissions from Eskom's power stations by reducing household emissions. Household interventions were selected based on the numerous scientific studies that show that in South Africa the main cause of harmful health effects due to poor air quality is the domestic burning of solid fuels.

An exhaustive list of household interventions was brainstormed, and kick-out criteria were then applied to reduce the list for detailed evaluation. The shortened list of interventions was then evaluated according to the following weighted criteria (Figure 14):

- Reduced human exposure to ambient PM<sub>10</sub>
- Reduced human exposure to ambient SO<sub>2</sub>
- Implementation cost attractiveness of intervention
- Success probability of intervention
- Government and Eskom Board acceptance of intervention
- Sustainability of intervention
- Household acceptance of intervention
- Indirect impact of implementation (long and short term)



**Figure 14: Weighting of the criteria used to evaluate the proposed offset interventions**

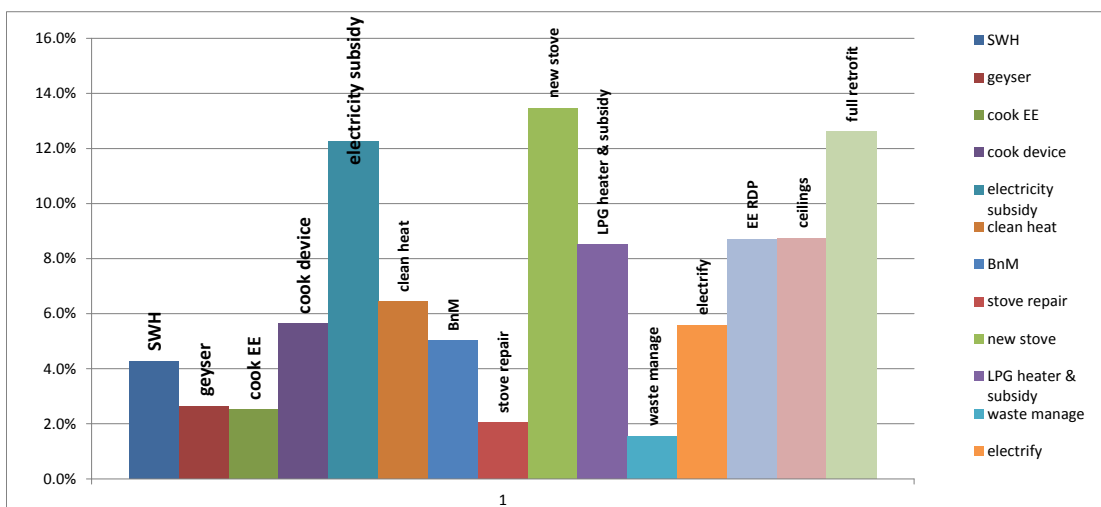
Households are considered to be the most important stakeholder, and their acceptance was identified as the most important criterion that would determine the success of the offset projects, followed by acceptance by licencing authorities and the Eskom Board.

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The interventions recommended for further study, based on applying the weighted criteria (results in Figure 15) are:

- Retrofit full suite of thermal shell insulation (ceilings and three walls), draft proofing and Trombe wall on all existing subsidy houses [Full retrofit]
- Install ceilings in all formal houses [Ceilings]
- Optimise house size, shell insulation, ventilation, orientation and solar heat absorption for new subsidy houses and social housing [EE RDP]
- Replace coal / wood stove with multi-purpose, high quality, low emission stove [New stove]
- Electricity subsidy
- Gas subsidy with equipment [LPG subsidy & heater]



**Figure 15: Result of applying the evaluation criteria (relative weighting on the y-axis)**

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### 13. APPENDIX C: SUMMARY OF THE AIR QUALITY OFFSETS PILOT STUDY IN KWAZAMOKUHLE

Following on from the pre-feasibility study, the next step in Eskom's air quality offsets journey was an air quality offsets pilot project, which was conducted in KwaZamokuhle (3 km from Hendrina town, Mpumalanga) from mid-2014 to end 2015. The project team was comprised of experts from the North-West University, the Nova Institute, the Council for Scientific and Industrial Research, EScience Associates and Prime Africa Consulting.

The most promising interventions identified in the pre-feasibility study were implemented at 120 formal houses: ceilings were installed at 60 of the houses, and the remaining 60 houses were fitted with a ceiling, insulation on three walls, and the north-facing wall was painted black and a Trombe wall was constructed to trap and store additional energy from the sun. Each of these houses was then either given an electricity subsidy for the winter months, or their coal stoves were swapped for a low emission stove, or their coal stoves were swapped for an LPG heater, stove and gas cylinder.

Prior to the roll-out of the interventions, a baseline assessment was conducted, including detailed surveys of most households in KwaZamokuhle and ambient air quality monitoring. In-depth community consultation was conducted both to inform the design of the interventions (we learnt that the community required the low emission stoves to be big enough to hold at least three pots, and the stove needs to be sturdy because there are often small children around, for example), and to educate the participating households on how to light low emission fires in the new stoves, how to cook with LPG, and how to use LPG safely, for example. Forty eight members of the local community were recruited and trained to conduct the surveys and implement the interventions.

Much was learnt about the energy use patterns, health and economic status of the community, and there were many practical learnings as to how the interventions can be improved (for example, moisture in the roofs stained the ceilings, so the ceilings need to be water resistant). Some of the most significant findings of the pilot study, which have informed Eskom's large-scale offsets implementation plan, are:

- 65% of households in KwaZamokuhle use coal. KwaZamokuhle and other similar communities in Mpumalanga thus have great potential for offsetting.
- Domestic coal burning is a significant source of pollution for KwaZamokuhle. A comparison between the ambient air quality in KwaZamokuhle and Hendrina, which is 3 km away and influenced by the same regional sources but does not have domestic burning, showed that PM10 and PM2.5 levels in KwaZamokuhle are between 2 and 5 times higher than in Hendrina during the early morning and evening (when households light fires). Average PM concentrations are twice as high in KwaZamokuhle than in Hendrina. A reduction in domestic coal burning thus should result in a noticeable improvement in ambient air quality.
- Participation rates in the pilot project were high. Of the qualifying households who were approached to participate in the roll-out, 66% agreed to accept a ceiling and low emission stove, 88% agreed to accept a full insulation retrofit and low emission stove, 83% agreed to accept a ceiling and LPG appliances, and 87% accepted a full insulation retrofit and LPG appliances.

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- Ceilings were the intervention received most positively by the residents. Not only do they improve the appearance of the houses, they also raise the minimum indoor temperature in winter by 4°C on average and keep houses warmer for 2-3 hours longer at night.
- Permanent uptake of the interventions was high. 100% of the ceiling and LPG households, 98% of the full retrofit and LPG households, 98% of the ceiling and low emission stove households, and 95% of the full retrofit and low emission stove households chose to keep their new stoves, rather than getting back their original stoves.
- The electricity subsidy did not bring about a shift from coal to electricity.
- Approximately 30% of dwellings in KwaZamokhule are informal, and of these 90% use solid fuel for heating and cooking. An intervention which shifts inhabitants of informal houses away from solid fuel use will need to be found.
- Around 25% of households burn their waste, further contributing to the poor air quality, in spite of municipal waste removal services in parts of KwaZamokuhle.
- The participatory approach, which involves communication and consultation with the community and also recruitment and training of project staff from the local community, was very successful.

More information on the pilot project can be found in the paper presented by Langerman *et al.* at the National Association of Clean Air Conference in 2015.

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#### **14. APPENDIX D: ATTENDANCE REGISTER AND MINUTES OF PUBLIC MEETING HELD AT LETHABO POWER STATION ON 19 APRIL 2016**

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## General Attendance Register

Template Identifier	240-54043932	Rev	4
Effective Date	15 October 2014		
Next Review Date	October 2017		

Name of Meeting/Workshop:	Public participation meeting for Lethabo's Air Quality Offsets Implementation Plan
Date:	19 April 2016
Venue:	Lethabo Power Station

### 1. APOLOGIES

Name	Business Unit/Area

**\*Note:** The cell phone number is preferred to be captured as contact number for use during an emergency evacuation as the attendance register will be used to track attendees.

### Disclosure Classification (e.g. Public)

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## 2. IN ATTENDANCE

Name	Surname	Business Unit/Area/ Affiliation	Contact Number (preferable cell phone number)*	Signature
1. Terisha Rampersad		Lethabo Power Station	083287 3136	<i>Rampersad</i>
2. Tumi	Rametse	WCT	083549 7326	<i>[Signature]</i>
3. KRISTY	LANGERMAN	ESKOM	083 704 2543	<i>KR Langeman</i>
4. PAUL	LEMPE	STSO	082 205 0342	<i>[Signature]</i>
5. CMELEDI	TSHEHLA	SAWS	012 367 6076	<i>[Signature]</i>
6. ANDRIES	MANS	SAFRIPOL	016 9704222	<i>[Signature]</i>
7. Wally	Klingenberg	"	083 604 3537	<i>[Signature]</i>
8. STEPHEN	MAPHIKE	LEIHLA LA AFRICA	083 867 9701	<i>[Signature]</i>
9. Jacobo	Mothoung	LEIHLA LA AFRICA	083 4040 476	<i>[Signature]</i>
10. TANKISO L	NNETE	Leihlo la Afrika	0727492339	<i>[Signature]</i>
11. Attie v Niekerk	v Niekerk	Nova	082676 1073	<i>[Signature]</i>
12. Hendrik	Smiel	Nova	079 8283439	<i>[Signature]</i>

Disclosure Classification (e.g. Public)

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# General Attendance Register

Template Identifier

240-54043932

Rev

4

Effective Date

15 October 2014

Next Review Date

October 2017

Name	Surname	Affiliation	Cell Number	Signature
13. HAZEL	SECCOTHE	NATREF	0734285722	
14. AM	HEARN	IAD	0825742901	
15. Sizé Rani	RANI	Engelen Municipie	0834146907	
16. Sello John	JuBeBa	ANC	0746425823	
17. ABRAHAM	PHATHLA	VERI-GREEN	0628640015	
18. Itumeleng	Ketana	Veri-Green	0843034054	
19. Bianca	Weneche	Eskom	0797454089	
20. Melhi	Hariram	Eskom	0836371820	
21. Syl Vanna	Wilson	Eskom	0733012236	
22. Moshewa	Matimolane	Eskom	0884676947	
23. Motalepula	DLAMINI	Eskom / DM	0731799831	
24.				
25.				
26.				
27.				
28.				

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**Air Quality Offsets implementation plan: Lethabo Power Station  
Public Meeting**

Document Identifier	240-54076329	Rev	5
Document Type	Template		
Next Review Date	February 2018		
Effective Date	20 February 2015		
Record Identifier: ENV16 – L072			

Date:	Time:	Venue:
19 April 2016	10:00-12:15	Lethabo Visitor's Centre
Details of team members:		
Name	Responsibility in meeting/ Affiliation	Initials
Kristy Langerman	Eskom - Presenter	KL
Tumi Rametse	EkoInfo - Facilitator	TR
Motshewa Matimolane	Eskom - Presenter	MM
Motlalepula Dlamini	Eskom - Support	MD
Terisha Rampersadh	Eskom - Safety	TRa
Bianca Wernecke	Eskom - Secretariat	BW
Melini Hariram	Eskom - Support	MH
Sylvanna Wilson	Eskom - Support	SW

**Note:** The full attendance register for the meeting is attached as an appendix to this document. A total of 23 attendees were present at the meeting. Attendees have been referred to by their initials in the below text.

Item	Description
1.	<b>Opening, Welcome and Apologies</b>  The facilitator (TR) welcomed everyone present at the meeting and declared the meeting officially opened.
2.	<b>Safety, Environment and Emergency Evacuation Procedure</b>  TRa presented the evacuation route to be followed in the event of an emergency evacuation.

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**Air Quality Offsets implementation plan: Lethabo Power Station  
Public Meeting**

Document Identifier	240-54076329	Rev	5
Document Type	Template		
Next Review Date	February 2018		
Effective Date	20 February 2015		
Record Identifier: ENV16 – L072			

Item	Description
3.	<b>Adoption of Agenda</b>  The agenda was accepted without any changes.
4.	<b>Declaration of Conflict of Interest</b>  No conflict of interest was declared.
5.	<b>Introduction of EKOInfo and Eskom Teams</b>  KL welcomed the attendees and expressed gratitude for their attendance.  The teams involved in the organisation of the meeting were introduced and a background of why the Air Quality Offset Plan is necessary was briefly provided.
6.	<b>Purpose of the meeting</b>  This meeting represented a repeat of Lethabo Power Station's first Public Meeting for Eskom's Air Quality Offset Implementation Plan which was held in Sedibeng in March 2016. The Licensing Authorities requested that another meeting be held in Fezile Dabi.  A round of introductions followed.  TR set the house rules of the meeting:  <ol style="list-style-type: none"><li>1. Each attendee received a number upon registration for the meeting. This number served as reference for minute purposes</li><li>2. Lethabo's Air Quality Offset Plan was the main mandate of the meeting and topics that veered off too much from this topic</li></ol>

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**Air Quality Offsets implementation plan: Lethabo Power Station  
Public Meeting**

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Document Type	Template		
Next Review Date	February 2018		
Effective Date	20 February 2015		
Record Identifier	ENV16 – L072		

Item	Description
	would not be discussed in this forum.
7.	<p><b>Air Quality expectations from the attendees</b></p> <p>TR asked a few members of the audience for their reasons for attending the meeting:</p> <p>AH raised a concern that he was not aware of the fact that this meeting was a repeat session of the meeting that took place in Sedibeng. Furthermore he stated that expectations of the I&amp;APs have been put in writing and have been submitted to the consultants. AH's main concern is how the affected communities will be able to identify with the offsets. There is too much ambiguity in the draft plans. VEJA is not happy with the public participation process that Eskom is taking. AH was of the opinion that this meeting was a continuation of the process, instead this was just a repeat.</p> <p>HS mentioned that she was disappointed with the attendance of the meeting. HS's main reason for attending the meeting was to listen and learn from the comments of the community members.</p> <p>KL quickly mentioned here that Sasol is undertaking a similar project, but that it is ahead of Eskom in the process.</p> <p>HS stated interested in learning about what issues are identified during the meeting and what is brought forward from the public.</p> <p>SW joined the meeting to learn and listen to the discussions</p>
8.	<p><b>Draft Air Quality offset Implementation Plan Presentations</b></p> <p><b>1<sup>st</sup> presentation – MM</b></p> <p>A brief introduction was given by MM on Eskom and Air Quality.</p>

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	<p>It was explained that abatement technology needs to be installed at the power stations to help Eskom achieve stricter emission limits. Eskom is looking into alternative energy sources: renewable and nuclear options. This will be evident in the IRP for RSA.</p> <p>Air Quality compliance at a station level requires long term solutions that cannot be implemented overnight to address Eskom's impact on air quality.</p> <p>Air Quality Offsets are a means to improve ambient air quality in low income communities that are the most vulnerable and exposed to poor air quality in the short term.</p> <p>Eskom defines Air Quality Offsets according to the definition provided by DEA in the recently published Air Quality Offset Guidelines.</p> <p>Key things to discuss at the meeting: What air quality offset options can Eskom consider?</p> <p>Examples of opportunities for offsets in the following sources:</p> <ul style="list-style-type: none"><li>• Waste burning</li><li>• Unpaved roads</li><li>• Coal burning in households for space heating and cooking activities</li></ul> <p>Offsets are a legal requirement as per Lethabo's Atmospheric Emission License, issued under NEM: AQA. .</p> <p>Eskom was required to submit an Air Quality offset plan by 31 March 2016. Draft plans for all stations were submitted on 31 March 2016. The final plans will be submitted by 30 April 2016. There is still time to accommodate comments from the interested and affected parties (I&amp;APs). I&amp;APs will be notified when the final plans have been submitted and the plans will be made available to the I&amp;APs upon request.</p> <p>Eskom realises that the offset plans are high level, but acknowledges that they are a work in progress. It is the purpose of public meetings to ensure the ideas that Eskom is putting forward are being challenged and enhanced. Baseline assessments in selected communities will need to</p>

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	<p>be undertaken as a next step. Thereafter Eskom hopes to develop a project design document to inform the large scale roll out.</p> <p>Eskom does not want to do harm in trying to do a good thing.</p> <p>Eskom wished to emphasise that air quality offsets are not corporate social investment (CSI) projects. They are meant to address and improve poor ambient air quality at a community level. Positive spin-offs might be CSI oriented and this needs to be enhanced (job creation in local communities, improving health, dealing with energy poverty, cost effective ways to achieve air quality improvements).</p> <p>Eskom's Air Quality Offset journey started in 2012 with a pre-feasibility study. Thereafter a pilot study in KwaZamokuhle was initiated to test interventions believed to be most effective at reducing ambient air pollution in low income communities. Currently the next step of the journey is to finalise large scale roll out plans for the interventions that were deemed most successful in the pilot study.</p> <p>Eskom is focusing on solid fuel burning in Mpumalanga, but is aware that this will not necessarily work communities around Lethabo Power Station and in the Vaal.</p> <p>The next phase is to receive approval of the plans from the authorities and to then go into the communities and to engage with them directly about the projects.</p> <p><b>2<sup>nd</sup> presentation - KL</b></p> <p>"The Eskom offsets journey"</p> <p>Destination= cleaner air. No one has walked this path before.</p> <p>Eskom knows that it is crucial to talk to and to include communities on this journey! However, Eskom can't consult with anyone on concrete plans without knowing which settlements to go to. Eskom cannot make promises until it knows what interventions exactly will work and will be approved by the authorities.</p>

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	<p>Offsets must be rolled out in a phased manner. This means that Eskom needs to implement something on a small scale, learn from the implementation and improve its strategy before it is rolled out at a larger scale. Eskom started small scale in KwaZamokuhle, Mpumalanga. Eskom now plans on rolling out the successful pilot to the whole community to sort out issues of scale. Only thereafter can Eskom roll projects out to a whole community.</p> <p>It is important that Eskom starts at a baseline level so that the existing problems around air quality can be identified. Once interventions have been implemented, monitoring will be conducted to determine whether or not the interventions are successful and sustainable.</p> <p>In the Vaal Priority Area there are numerous little problems that cumulatively make up the air quality issue: household level burning, waste burning, emissions from unpaved roads.</p> <p>Eskom's air quality offset approach for Lethabo is planned to be multifaceted:</p> <ul style="list-style-type: none"><li>• Some interventions will work to reduce coal burning</li><li>• The bigger initiative will address waste burning</li><li>• All interventions must be coupled with on the ground education and awareness programmes</li></ul> <p>Eskom is proposing a nine year "working" project. It is important to keep track of emerging technologies (e.g. solar might work in a few years' time) so that these new technologies are considered as new intervention types as the project progresses.</p> <p>Eskom introduced the concept of what criteria will be used to select areas in which the offsets will be implemented:</p> <ul style="list-style-type: none"><li>• Areas are prioritised based on the impact of emissions from the power station (in order to achieve the objective of 'counterbalancing the adverse environmental impacts of atmospheric emissions').</li><li>• Only areas where there is (probably) non-compliance with ambient air quality standards are considered.</li><li>• Only areas where opportunities for improving ambient air quality through offsetting exist, are considered (i.e. areas where there are local</li></ul>

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	<p>sources of emissions which significantly impact ambient air quality and can be addressed through offsets).</p> <p>Once the area in which Lethabo's pilot study will take place is selected, Eskom still needs to understand what the main contributing factors to poor air quality in the area are. Thereafter proposed and selected interventions must be piloted. Once it is evident which interventions work, these can be rolled out on a larger scale.</p> <p>Eskom plans to commence this process next year, once contracts have been put in place.</p> <p>Note: Formal inputs into the draft offset plans can still be made by I&amp;APs. Comments onto each phase of the plan are also welcome. The public has many opportunities to influence the project plans at various levels of detail and the public will be notified of every opportunity to comment.</p>
9.	<p><b>Open floor - Comments from the floor:</b></p> <p>TR emphasized how this meeting represents an opportunity to input into the offset plan.</p> <p>AH asked for clarity in the following matters:</p> <p>AH assumed that the legal framework under which the public participation process for the air quality offset falls is NEMA. It was his concern that Eskom's public participation process is not following legal requirements, but rather what is deemed "suitable" by Eskom. This project should be a collaborative effort and communities should also have a say in what is considered "suitable" public consultation. Eskom is not the only party involved in this project.</p> <p>KL responded by stating that Eskom has followed the air quality offset guidelines from DEA which do not prescribe "EIA style" public consultation. KL also emphasized that Eskom considers public consultation and input into these plans to be a vital part of the project's success. Emphasis was also placed on the fact that the next round of public consultation efforts will be much more thorough and rigorous in nature.</p> <p>Another point that AH wanted to bring across strongly, is that the air quality offsets should NOT under any circumstances replace the power</p>

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	<p>stations' need to comply with legislated limits. Offsets do not replace compliance!</p> <p>KL assured AH that offsets are merely one component Eskom is currently looking into to achieve air quality improvement in the short term. Power stations are embarking on numerous projects to directly address their stack emissions to ensure compliance to the Minimum Emission Standards.</p> <p>AH enquired about the day on which the final plan will be available.</p> <p>KL responded by stating that the final plans will be submitted to the authorities on the 30 April 2016 and that they will be made available to I&amp;APs upon request for comment. The final plan is not expected to look very different to the draft plans that went out to the public. It is anticipated that the plan will be updated on a regular basis going forward to incorporate lessons learnt and to include input from stakeholders.</p> <p>Input into the waste pilot study will be valuable! There will be separate public participation meetings to discuss the waste pilot study in the Vaal.</p> <p>AH asked whether implementation will only occur in an area once the chosen communities have been consulted properly.</p> <p>KL confirmed that this would be the case.</p> <p>KL added that Sharpeville will most likely be the pilot area for the waste intervention. The communities will be able to comment thoroughly on that plan. Eskom still needs to set the baseline for the waste study.</p> <p>Ah enquired about what the involvement of the community would be in the pilot study.</p> <p>KL answered by saying that in KwaZamokuhle, the community's opinions were voiced in a formal forum (local stakeholder reference group meeting). KwaZamokuhle was approached by Eskom with targeted ideas for intervention options. Eskom does not have concrete plans for Sharpeville yet. As such, input from the communities into design and interventions are necessary and desired.</p> <p>AH stated that communities are concerned that the concepts used for the KwaZamokuhle pilot study cannot be fitted to suit a pilot in the Vaal,</p>

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	<p>as the area is very different to that of Mpumalanga, with its own socio-economic dynamics.</p> <p>KL assured AH that Eskom is well aware of the fact that each community is unique and that each region will require its own pilot. There is no “one size fits all” approach.</p> <p>AH wanted to know what the community’s involvement is in choosing the areas for the offsets will be.</p> <p>MM responded by saying that all stakeholders need to agree that the process of area selection is not a democratic process per se. There have to be rigorous scientific methodologies in place which are defensible. Once all parties have agreed on the selection criteria, then the methodology can be applied uniformly. Eskom acknowledges that it is not an easy and “pretty” solution.</p> <p>AH mentioned that there will be communities that will be left out and this is an aspect that Eskom needs to be cognizant of. Offsets should apply to as wide a community base as possible. Offsets cannot only target selected parts of a community and not others. AH stated that if Eskom follows a fair consultative approach in which all parties agree upon rigorous selection criteria, this approach is supported.</p> <p>JM mentioned that in 2006/7 integrated waste management was introduced into the area. The plan has not been affected yet, but it is in the pipeline. People in low income communities do not understand the concept of how waste disposal can contribute to air pollution. The communities understand the movement of waste, but that is it. Waste has a value chain. Capacity is being reached at waste sites. Emissions and leachates stem from such sites. It must be noted that energy can be harvested from the leachate at waste sites. Waste management is now in the IDP for the area. The municipality is there to facilitate waste management and to listen to the waste problem at hand. It is very possible to create an industry around waste management / waste sorting/ recycling. These issues should not be politicized.</p> <p>TR acknowledged these statements by saying that there are elements Eskom should look into.</p> <p>HS said that it was a pity that Fezile Dabi was not present at the meeting. HS further asked why Eskom plans on implementing offsets in Sedibeng as well as in Fezile Dabi.</p> <p>KL responded by saying that Eskom had met up with Fezile Dabi and that it was agreed with the authorities that Lethabo’s emissions cross</p>

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	<p>municipal boundaries and also affects people in Sedibeng. Also, Sedibeng is a more populous area compared to Fezile Dabi. Eskom proposes that a household level – and waste offset intervention is introduced in Refenkgotso in Fezile Dabi.</p> <p>HS wanted to know what Lethabo is doing to reduce its emissions.</p> <p>KL explained that Lethabo plans to reduce its particulate matter emissions through a number of upgrades in the next 5-7 years on all 6 units:</p> <ol style="list-style-type: none"><li>1. The insulation of high frequency transformers, which was piloted on unit 3, increases the performance of electrostatic precipitators which are an abatement technology installed to reduce particulate emissions. This will be introduced on all 6 units.</li><li>2. Ammonia injection into flue gas is another option that is being looked into at the site.</li><li>3. Dust handling plant upgrades will be taking place, as a large contributor to poor electrostatic precipitator performance is the filling up of dust hoppers due to dysfunctional dust handling plants</li><li>4. Lethabo currently experiences problems with an unreliable SO<sub>3</sub> plant. This plant will be upgraded</li></ol> <p>SR introduced himself as a ward counselor from ward 14 (squatter camp “leap year”) in Sharpeville. He made mention of a programme that has been in place since 2015 to address emissions stemming from low level burning activities in households, particularly emissions related to cooking activities at a household level. The programme was formally launched on 17 March 2016. He passed on to AP.</p> <p>AP introduced himself as part of “Veri-Green”, a green solutions company which provides clean cooking solutions to households in low income communities around the Vaal. He stated that Veri-Green is in communication with the Gauteng Air Quality Directorate. The company is looking at a way to provide offset solutions for Eskom, Sasol and the likes in the Sedibeng area. The product marketed by the company is a methanol based stove with a “wonderbag” to keep food hot. The company is particularly interested in the acceptability of the product at a community level. For the pilot project 200 stoves were distributed. The stove is easy to operate, is efficient and does not emit smoke or bad odors into the indoor environment. The project additionally promotes an educational campaign which aims to teach emission counting systems at a technical college to local community members (Carbon footprint analysis etc.). Veri-Green wants to empower local communities and create local businesses. Up to now the intervention has been well accepted by the community. The DEA (Vumile Senene) was present at the official launch</p>

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	<p>of the project.</p> <p>Veri-Green provides the alcohol (Methanol) in specific containers (liquid cannot spill from these containers and so safety is not an issue). It costs a household R 15.00 to exchange in a central point of the settlement.</p> <p>AH wanted to know how long one unit / cylinder will typically last a household.</p> <p>AP said that it typically lasts 3 days in an informal context, in a household without electricity.</p> <p>AP emphasized that free basic alternative energy is available to many, but is not being accessed by community members.</p> <p>PL from Sasol gave some advice by saying that it is important to go into the communities themselves during community consultation to get input.</p> <p>KL responded by acknowledging the importance of consulting with stakeholders in the communities and by saying that Eskom wants to make sure Sasol and Eskom do not cover the same areas. Eskom also wants to learn from Sasol's lessons, as they are much further in the process.</p> <p>AvN asked whether the wonderbag (hot box) is popular.</p> <p>AP responded by saying that most houses frequently cook samp and pap and tripe and soup, this is what the wonderbag is good for. It is well accepted.</p> <p>AH asked whether the wonderbag is re-usable.</p> <p>AP stated that the wonderbag is re-usable. He added that the Methanol stove and the wonderbag combination beats the price of paraffin hands-down.</p> <p>Veri-Green plans to set up one "cooperative" per ward. Each stove owner needs to be registered for free alternative electricity. The stove is the</p>

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	<p>property of the cooperative. If someone moves out of the community, the stove goes back to the cooperative to be recirculated.</p> <p>CT asked whether there is monitoring that is taking place at the moment in the identified areas.</p> <p>KL explained that DEA has an ambient air quality monitoring station in Sharpeville and that it has been identified that poor air quality is a major concern in the area. Ideally Eskom wants one station in each selected intervention area and then one monitoring station adjacent to the area that can be used for baseline assessments. This data will be made publically available on SAAQIS system.</p>
10.	<p><b>Conclusion</b></p> <p>KL asked whether there were any final questions.</p> <p>There were no additional comments or questions.</p> <p>KL thanked everyone for attending and for providing valuable input. It was considered a very helpful meeting! The way forward was described:</p> <p>All I&amp;APs were encouraged to formally submit any comments to the draft plans. Formal written comments will be incorporated into the final plans before they are submitted to the authorities. I&amp;APs will be able to engage a lot more extensively in the next phases. The I&amp;AP database will be notified of the final plan submission on 30 April 2016. Any comments on the final plan, which will be made available to the public upon request, should be submitted directly to Eskom and the authorities. Eskom will ensure that contact details to this effect will be made available upon notification of the plan submission (this includes contact details for Eskom's air quality offset team, Lethabo Power Station and the DEA).</p> <p>TR closed the meeting by thanking everyone for attendance and valuable input.</p>

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11.	<b>Adjournment</b>  TR declared the meeting adjourned at 12:15 after no additional comments or issues were raised.

**Minutes submitted by:** Bianca Wernecke

**Minutes approved:** \_\_\_\_\_

Chairman

Date

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