

# Quantifying Uncertainty in Baseline Projections of CO<sub>2</sub> Emissions for South Africa

Activity 1 Report: Global Energy Commodity Prices  
and SA Population

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**ERC**

ENERGY RESEARCH CENTRE  
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**FIRM**

Facilitating  
Implementation and  
Readiness for  
Mitigation

## Introduction

Projections of global energy commodity prices and the projections of South African population samples were obtained from a third party, which in our opinion would be better placed to generate the required sample data than we could do.

## Global Energy Commodity Prices

Samples for global energy commodities (coal, oil and gas) price projections are obtained from a global trade and economic model run and maintained by CIRED ([www.CIRED.com](http://www.CIRED.com)), called Imaclim-R (Rozenberg et al. 2010; Waisman et al. 2012). The advantage of using a dataset from such a model is that the auto- and cross- correlations in prices of the different commodities are captured well.

Two different sets of samples are provided for two scenarios of international mitigation:

1. Little/no international mitigation
2. Ambitious international mitigation

The two sets of samples were generated in the context of another project [ rozenberg2014building ] for 108 "baseline" samples and 108 "mitigation" samples. The alternative samples were obtained by combining alternative assumptions on parameters values representing technologies availability, energy efficiency, evolutions in lifestyles, labour productivity growth, etc.

The "mitigation" samples correspond to a constraint on emissions trajectory leading to global emissions of the "baseline" divided by 2 by 2050.

The original indexed values, shown in Figure 1 and Figure 2 for the baseline and mitigation scenarios. The green lines shows the means, the blue lines the 25<sup>th</sup> and 75<sup>th</sup> quartiles and the red lines the min and max values.

The original values were scaled by the 2010 value, then compared to IEA's World Energy Outlook 2013 projections (adjusted to 2010 \$), and then slightly adjusted such that the means would more closely match IEA. The adjusted projections are shown in Figure 3 and Figure 4. The IEA projections are shown as a red dotted line. The Base scenario samples are compared and adjusted to the "Current Policies" Scenario of the IEA. The Mitigation scenario samples are compared and adjusted to the "450" scenario of the IEA.

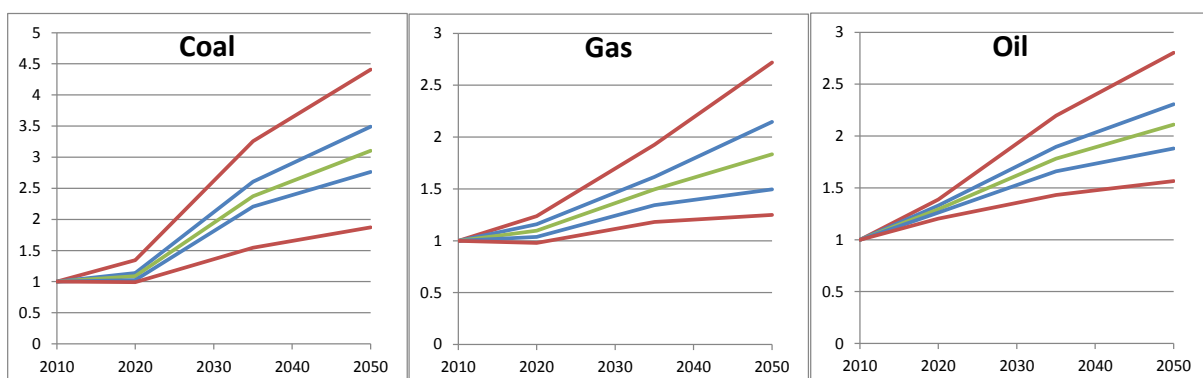


Figure 1 Original data for baseline scenario

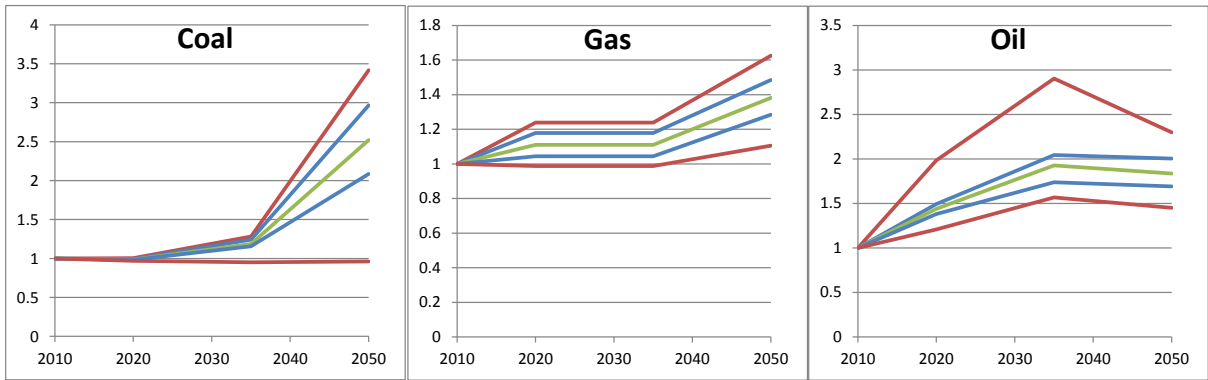


Figure 2 Original data for the mitigation scenario

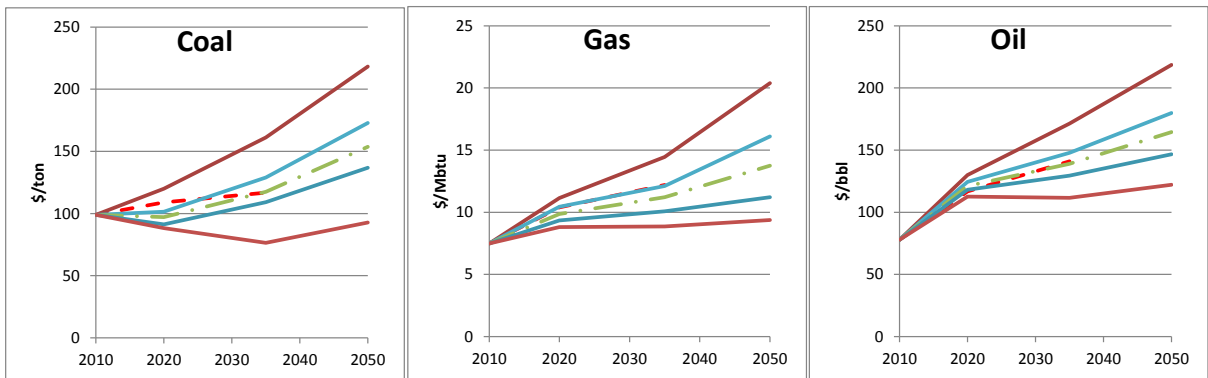


Figure 3 Scaled and Adjusted data for the baseline scenario, and the IEA current Policies Scenario

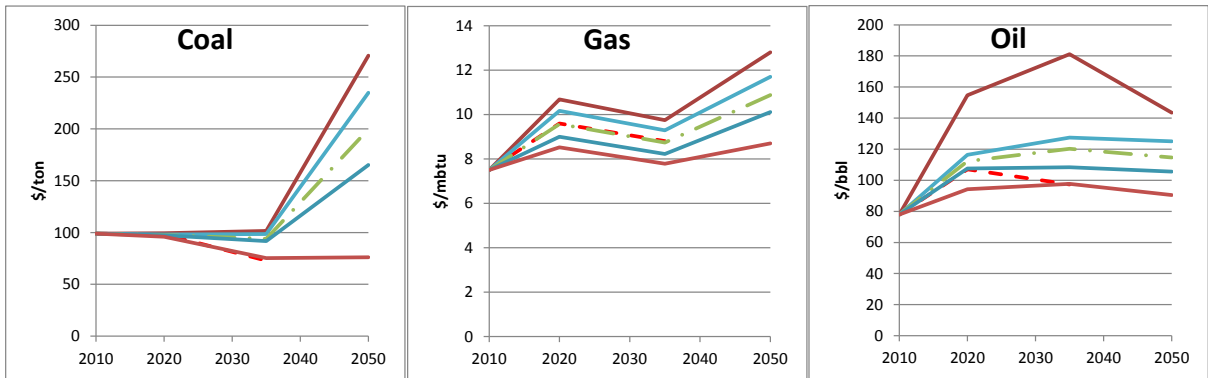


Figure 4 Scaled and Adjusted data for the mitigation scenario, and the IEA 450 Scenario

## Projections of the South African Population

A Bayesian probabilistic projection model developed specifically for UN forecasts is used for sample projections of the South African population. In the South African case, special allowances must be made for high HIV prevalence. These and other developments are described in

Figure 5 shows the 1000 samples that were obtained (in black). The mean is shown in green and the 80%th and 95%th confidence intervals are shown in blue and red, respectively.

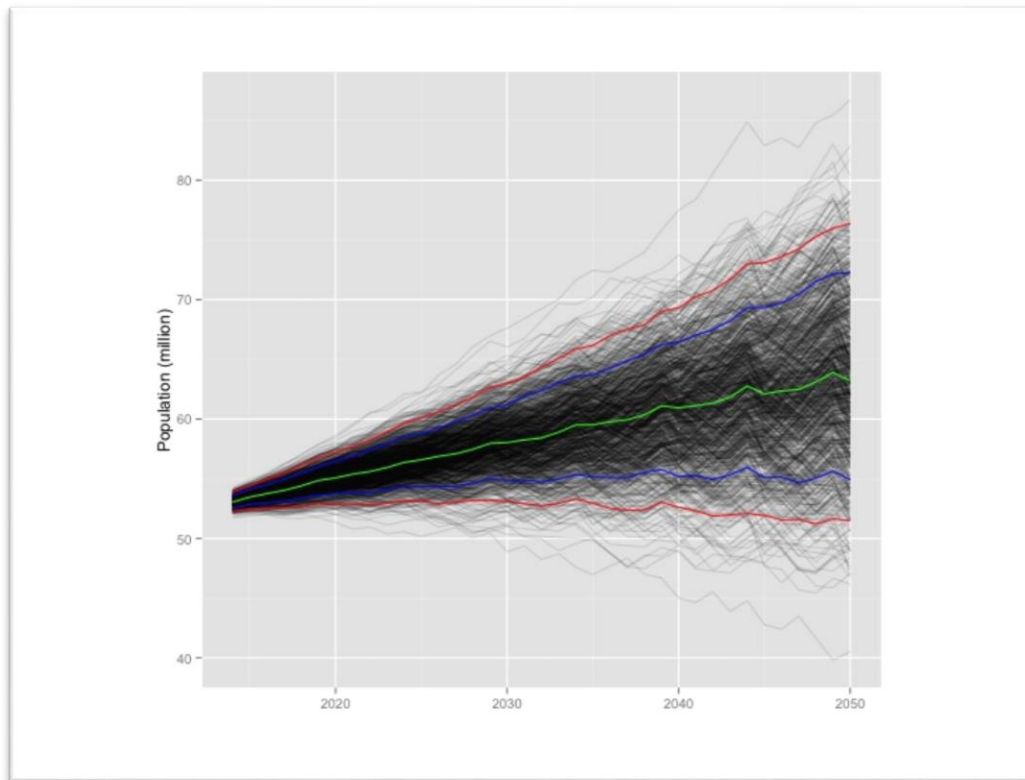


Figure 5 Bayesian probabilistic projection of population of South Africa