

# CAN A LOW CARBON PATH BENEFIT THE POOR?

LIZIWE McDAID

The Green Connection, liziwe@mweb.co.za

## INTRODUCTION

This paper provides an overview of how the poor households might be affected by a transition towards a low carbon economy. Household energy use of the poor played a minimal role in creating large amounts of carbon emissions and contributing to climate change. Yet, it is indisputable that it is the poor and vulnerable of the world, particularly Africa, who will be disproportionately affected by climate change. While South Africa boasts an electrification rate of almost 80%, large numbers of households have been disconnected because of their inability to pay for electricity usage, and many households are still dependent on paraffin or fuel wood for a large proportion of their energy.

The poor are burdened by social challenges such as access to clean water, health services, and employment. However, the aspirations of South Africans are towards a consumerist lifestyle. This paper postulates that it will not be possible to address climate change without addressing the consumer lifestyles of the rich and the aspirations of the majority of South Africans to reach these levels. In order for all South Africans to enjoy the lifestyle of the rich would result in unsustainable increases in emissions levels.

The current LTMS “required by science” best renewable energy scenario continues to include nuclear generated electricity, despite civil society opposition to its extremely high financial and toxic waste costs. Many poor households are largely dependent on social grants for survival and despite continuing increases in social grants, it is unlikely that they will be able to match predicted tariff increases in energy services. In fact electricity disconnections indicate that poor households’ buying power has decreased, and that the poor are becoming poorer.

Electricity has been promoted as the modern energy service for South Africa. However, for the poor, electricity services are increasingly out of reach. The adoption of the LTMS by cabinet in 2008 indicates a serious commitment to a low carbon economy. However, the choices proposed by the LTMS rely on the expansion of nuclear generation, further impoverishing the poor through escalating electricity tariffs. While South Africa is reluctant to commit to reductions in emissions as it believes this will hamper economic development, as a lead player in the G77 its failure to do so may jeopardise the success of international negotiations in Copenhagen. Further, the failure of Copenhagen and delays in addressing climate change will impact severely on Africa and South Africa, and our failure to reduce emissions will rebound on us.

Climate change has been posed as a risk that will further undermine the chances of reaching the Millennium Development Goals (MDGs); for example, increasing electricity tariffs ripple through the economy as goods and services become increasingly expensive with knock-on impacts on education etc. This paper explores how South Africa might implement a developmental path that rapidly moves the rich households towards a low carbon, renewable energy lifestyle, something that poor households can aspire too. Such an approach would

potentially create at least 25% more jobs than exist in the coal industry, and would include measures to ensure that the poor receive increased energy security and resilience to climate change, while opening up potential livelihood opportunities.

The paper points to the risks of continuing with the current energy institutional system and highlights the importance of an integrated approach to climate change. For South Africa, adapting to climate change is an opportunity to build resilience and improve energy security, providing that adaptation strategies are implemented as a matter of urgency.

This paper provides us with a snapshot of how we are using our planetary resources by looking at life through the energy lens; and in so doing, it provides an idea of energy services available to the “poor”, examines the implications of our energy aspirations, and then sketches the possible future where “rich” might take on a different meaning. As we are taught from a young age, our actions have consequences, some good, some bad; but good and bad are value judgements, and with the emerging challenges of climate change are forcing us to rethink our aspirations and lifestyles.

## **MOBILITY AT WHAT COST?**

Let us take the simple example of the motor car. From humble beginnings in about 1862, when a Mr Etienne Lenoir reportedly drove the first internal combustion engine down the streets of Paris (Bottorff n.d.), the car became a symbol of freedom and prosperity - providing mobility to millions of people worldwide, conveniently and quickly.

Global sales for cars worldwide are about 66 million units a year and China is expected to produce about 11 million cars and light commercial vehicles in 2009, overtaking the USA who anticipates a decrease resulting in only about 10 million vehicle sales (Venter 2009). South Africa’s entire domestic new vehicle market will be around 380 000 units this year. Can this be bad? Is this not something for all citizens of the world to aspire to, to own a car? In a recent press furore over the millions of taxpayers rands being spent on expensive cars for cabinet ministers, ANC youth league leader, Julius Malema is quoted as stating that as long as there is no law against it, there is no problem (The Star 2009a). Minister Blade Nzimande’s departmental officials justified the purchase of a R1,1million vehicle as a “necessity” (The Star 2009b), and although President Zuma cautioned against such purchases, he did so due to the “economic crunch”, rather than questioning the underlying values and aspirations of his cabinet (The Star 2009c). Yet, our addiction to owning our own fossil driven vehicle contributes to climate change. South Africa’s road transport related emissions currently account for 15% of our carbon emissions (Zipplies & du Plooy 2008).

Apart from climate change, is there any other environmental impact of our fossil addition? Villagers of the Nigerian Delta live with the emissions and fumes from the oil pipes that run through their villages, and pollute their water, destroying fishing livelihoods. If we look at the energy issues of the Nigerian Delta, the solution to their health and air pollution issues, to provide them with a better quality of life and increased sustainable livelihoods would come at an economic cost to the oil barons and the Nigerian GDP - a price that Nigeria and the world that demands oil for their cars appears unwilling to pay!

Closer to home, in the South Durban Basin, the South Durban Community Environmental Alliance (SDCEA) has spent 14 years actively involved in campaigns to force the refineries

to clean up their air pollution.<sup>1</sup> By reducing our reliance on fossil fuels, shifting to public transport, and switching to clean renewable sources of energy, we might be able to make a difference to the people of the Nigerian Delta and South Durban, and be part of the climate change solution. But are we prepared to change and adapt our lifestyles?

I have chosen to use transport as an example in the introductory part of this paper. I have done so deliberately as it has not received as much attention in the popular commentary on climate change (despite contributing 14% to global emissions)<sup>2</sup> and yet, I believe it is one of the areas that offers real solutions that benefit all citizens equitably.

## HOUSEHOLDS AND ENERGY POVERTY

It is understood that we have a divided global society and that in South Africa there is an ever increasing gap between the rich and the poor. According to the 2007/2008 Human Development Index (Conradie 2008), the richest 20% take 62,2% of the income and expenditure cake while the poorest 20% only use 3,5%. In South Africa, an upper income household consumes an average of 1000 kWh per month (Zipplies & du Plooy 2008), while a poor household may be dependent on the allocation of 50 kWh of free basic electricity (FBE) if they have access to electricity at all (Anneke 2009). If we examine the energy burden for the rural poor it would equate to a household with an income of R20 000 spending R4 000 on electricity each month (CURES energy poverty report (Sugrue 2009)).

Let us look at an hypothetical city dweller, Grace, who lives in an RDP house with her three children, her brother, his two children, their mother and a backyard family of three - a total of 11 people. In 2006 their average monthly electricity bill was R400. Grace and her brother are unemployed and the household income is their mother's pension and R100 a month rent from the backyard dwellers (Dugard 2009). If we look at Grace in 2009, almost 40% of her income would be spent on electricity. Clearly with the costs of food, taxi fares and airtime, this would not be feasible. Having a prepaid meter, Grace will not incur debt for using more electricity than she can afford but as she cannot afford R400 worth of electricity each month, she cannot rely on electricity for the entire month, and once the prepaid electricity runs out, Grace is forced to rely on paraffin or coal. Towards the end of the month, such a household may go without energy at all (Dugard 2009). In the Karoo, there are poor households that collect pieces of broken tyre off the N1 highway and burn them in an effort to keep themselves and their families provided with warmth and food (Gus Pickard pers. comm.).

Under these circumstances, it is understandable that resistance to attempts to regulate electricity usage through measures such as prepaid meters has grown. Civil society organisations such as the Soweto Electricity Crisis Committee and others have bypassed the meters, in order to bring electricity to desperate households, and in one instance, frustration led to the destruction of R13 million worth of prepaid meters by residents (van Heusden 2008).

With no option but prepaid meters, households like Grace's are forced to use less electricity than they need for daily living. Practices such as only reading during daylight hours, heating very little water to bathe, refrigerators turned off with implications for food quality and the

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<sup>1</sup> <http://www.bucketbrigade.net/article.php?id=220>

<sup>2</sup> [http://en.wikipedia.org/wiki/Greenhouse\\_gas](http://en.wikipedia.org/wiki/Greenhouse_gas)

substitution of wood or paraffin for space heating are used (van Heusden 2008). Obviously, the social consequences are negative - children cannot study at night, there is a risk of diseases from rotting food and the use of paraffin or wood indoors increases the risk of breathing related diseases.

Clearly, poor households do not have access to enough energy. Figure 1 shows the amount of energy used by different sectors of the economy, and shows that households, both rich and poor, consume about 16% of energy (Dobbins 2006). Residential electricity use is not the major contributor to climate change as it makes up a smaller portion of electricity use. Nevertheless, government policies and human aspirations imply that residential electricity use should grow in the future.

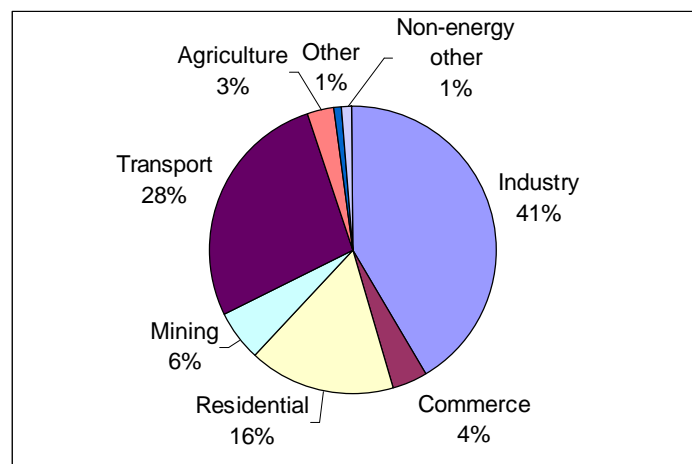


Figure 1 This shows the amount of energy used by different sectors of the South African economy (Dobbins 2006).

The government national electrification programme raised the electrification rate to 80% by 2007. This still leaves about 2,5 million households, mainly poor rural households, without access to electricity. However, access to electricity does not equate to *use* of electricity as electricity usage is dependent on disposable income. With high unemployment, the electrification figures have to be seen in the context of 2 million disconnections that have taken place due to an inability to pay (Sugrue 2009).

We have touched on some of the socio-economic issues associated with poverty in South Africa, but we have zoomed in on energy usage only. But we cannot separate energy from other aspects of our lives. What other challenges do poor households currently face?

The urban poor are often settled on marginal land, either prone to flooding (Cape Flats), or close to mine dumps (Gauteng) or industrial complexes (South Durban) and this exposes them to an added stress. These families have little cash. In poor households, cooking can account for 90% of household energy use. The challenge of finding fuel for cooking or space heating can result in the women walking many kilometres in order to find firewood. The use of inefficient, smoky stoves and the reliance on biomass contribute to ill-health and personal safety problems as well as to potential destruction of sensitive ecosystems. The role of women in the household energy sector, particularly poor households must be noted. Women are responsible for collecting wood and other biomass, for buying paraffin, and are responsible for the provision of services such as cooking, cleaning, space heating and

childcare, all of which need energy (Anneke 2009). Women are exposed to indoor polluting smoke through cooking. It is estimated that this was responsible for 2,7% of global disease burden in 2000. Future projected deaths for sub-Saharan Africa are 1,8 million children and 1,7 million adult women between 2000 and 2030 (Commission on Climate Change and Development 2009).

Diarrhoea is a constant problem if you have no access to clean drinking water. If you cannot afford to use scarce fuel wood or expensive paraffin in order to boil water, it is likely that you will be forced to drink dirty polluted water. Getting medical attention is difficult. This was highlighted in a recent press article about a grandmother who was sent from clinic to clinic and whose grandchild, Unabantu Mali, was found dead on her back.<sup>3</sup> The case of the young man, Douglas Skhumbuso Mhlongo, who killed himself because he was abused by a home affairs official bears testimony to the stresses that poor people are burdened with.<sup>4</sup>

In the cases referred to above, in the descriptions of the stresses that people face, poverty is related to a lack of services. In an ideal world, a household might reasonably expect clean drinkable water, energy services to enable them to meet their household needs, transport that safely and efficiently takes them to reach help if needed, and to reach school, work and entertainment; and if something goes wrong, a level of bureaucratic competence that provides a solution. If our system is stable, we will be better prepared to withstand shocks.

## **WHAT HAPPENS IF YOU ADD CLIMATE CHANGE INTO THE LIVES OF THE POOR?**

Worldwide, the occurrence and magnitude of what are currently the 30 year maximum values for wet, dry and hot extremes are projected to substantially increase for much of the world. "Heat waves and drought in the Mediterranean showed a potential 2 700 percent and 800 percent increase in occurrence, respectively, and extreme rainfall in Southeast Asia was projected to potentially increase by 900 percent" (Differbaugh 2009).<sup>5</sup>

Food prices could rise due to reduced crop yields because of droughts, etc. This may benefit rural agricultural workers and farmers to some extent as food prices rise. However, the urban poor will be most negatively impacted<sup>6</sup> – stretching fixed income to meet rising food costs. Growing seasons are likely to be shortened, and some marginal agricultural areas are likely to be unable to produce. There is a high confidence that crop yields could fall by 50% by 2020 and net income from farming could be reduced by 2100 with the resultant negative implications for food security (Boko *et al.* 2007). Climate change will also increase water stress. With one in four people in Africa currently experiencing water stress, by 2050 three times as many people could be affected (Boko *et al.* 2007). Fishing is also likely to be affected with coastal and upwelling related fisheries likely to decrease by 50 - 60%.

Health risks are also predicted to increase. Malaria is now found in areas where it had never been documented and meningitis and cholera have also been linked to changes in climatic conditions. For example, a recent study found that the variation in 85% of meningitis cases in the first two weeks of February was linked to wind speeds (Boko *et al.* 2007). In 2003, 1,2

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<sup>3</sup> <http://www.capeargus.co.za/index.php?fArticleId=4957670>

<sup>4</sup> <http://www.mg.co.za/article/2009-08-30-dlaminizuma-lashes-home-affairs-dept-following-suicide>

<sup>5</sup> <http://www.sciencedaily.com/releases/2009/08/090820082101.htm>

<sup>6</sup> <http://www.sciencedaily.com/releases/2009/08/090820082101.htm>

million people died of HIV/AIDS and 12 million children lost one or both parents to the disease. Conflict in African states may be exacerbated by lack of environmental resources and it is predicted that climate change may lead to increased levels of conflict, particularly with regard to, for example, water scarcity (Boko *et al.* 2007).

The fourth assessment report of the IPCC admits that very few studies have been carried out looking at the implications of climate change on energy use in Africa. The possible impacts on tourism have also not been well studied, but impacts on wildlife resources and biodiversity are likely to impact on tourism, as much of South African tourism is dependent on natural features. One example is the predicted climate change related impacts on the Namaqualand area where the flora of the region attract international and national visitors each year. Climate change predictions could result in the disappearance of the seasonal flowering plants, with the resulting negative impact on tourism (Green Connection 2007).

Climate change can also result in “short term shock migrants”. Owing to an increase in short term disasters such as floods, storms, hurricanes, increasing numbers of people may be forced to migrate, potentially placing a strain on infrastructure in places they migrate to. New settlements may arise, with migrants needing to find new livelihoods, again placing a strain on infrastructure requirements (Boko *et al.* 2007).

The failure to implement measures like improved storm water drainage and raised roadways could mean that investment in housing and infrastructure would be wasted as it is overwhelmed by rising seawaters and a changing environment. The impacts of climate change are likely to further undermine the achievement of the Millennium Development Goals and adaptation and adaptive measures are therefore key to improving the lives of Africans, particularly poor and vulnerable Africans (Boko *et al.* 2007).

The ability to improve disaster responses, both to short term disasters such as heat waves and floods as well as the response to droughts is vital. For example, Hurricane Katrina that hit New Orleans in 2005 resulted in 1 300 deaths and grabbed press headlines. In 2003, in France, 52 000 people died due to heat related stress. In the first twenty days of August, 14 000 people died. The health authorities battled to cope – what would happen in a country already poorly capacitated in these services?<sup>7</sup> Who will be affected? In the African context, the poor, the elderly, children and the vulnerable are likely to be most impacted.

Extreme weather events are predicted to increase in number and severity as the climate changes. While isolated extreme weather events are not attributed to climate change, the heat waves in Europe of 2003 and the impacts of Hurricane Katrina in 2005 show that it is the poor, even in wealthy countries, who are most affected by extreme weather events (Commission on Climate Change and Development 2009). This is the local reality of climate change – the poorest cannot withstand climate change.

## **GOVERNMENT RESPONSE – THE LTMS AND OTHER CLIMATE CHANGE RESPONSES**

In 2006 the SA government commissioned a study to look at how South Africa could mitigate its emissions, as part of its commitment to addressing climate change. The report

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<sup>7</sup> [http://www.earth-policy.org/index.php?/plan\\_b\\_updates/2006/update56](http://www.earth-policy.org/index.php?/plan_b_updates/2006/update56)

released in October 2007 acknowledged that South Africa was responsible for 1% of climate change emissions due to a historical investment in energy intensive industries.

The IPCC says that climate change emissions must reduce by 60-80% below 1990 but South Africa claims that because it is a developing country, it does not have to reduce its emissions proportionally but rather along the lines of common but differentiated responsibilities. The LTMS proposes a 30-40% emissions reduction below 2003 by 2050 (Scenario-building-team 2007). This is called the “required by science” scenario. In order to achieve this, the LTMS proposes a shift away from fossil fuels towards renewables, and nuclear. In order to get such emissions reductions started, a scenario called “start now” is proposed. While this scenario suggests that household welfare could rise by 3,5% it also suggests that potentially poor households may be negatively impacted - an “unintended consequence”. However, the LTMS also puts forward two further strategic steps, “scale up” that sees electricity generation up to 50% by renewables and nuclear each by 2050; and a “use the market” step that incentivises renewables, solar water heaters and biofuels, and implementing an escalating carbon tax (Scenario-building-team 2007). With all these steps in place, emissions will still not reach the target and an additional step “reaching for the goal” is put forward. This step proposes interventions such as residents being able to feed electricity into the grid, but claims that further research and development is necessary building on existing R&D government initiatives. Strategic option 4 starts to reflect on the implications of an integrated approach that includes a shift to public transport, greening initiatives, localised food production and other systemic shifts that might address the change in lifestyle required to effectively mitigate and adapt to climate change.

Civil Society such as the energy caucus, religious groups, and economic justice groupings have all rejected nuclear energy as part of the future for South Africa (SAFCEI 2009; CANE 2009).<sup>8</sup> Subsequent to the release and adoption of the LTMS by cabinet in 2008, various reports (Banks & Schaffler 2006; Marquard *et al.* 2007, Holmes *et al.* 2008) have been produced that support the theory that a combination of renewable energy and energy efficiency will enable us to provide for our energy needs at lower financial costs than the trajectory put forward by Eskom – approximately 50% nuclear and 50% coal (Eskom 2006). Much of the civil society opposition to nuclear energy stems from perceived environmental health and safety concerns, the long term toxic waste implications, and opposition to imposing a burden on future generations as immoral, as well as the significant financial risks (SAFCEI 2009).

South Africa has adopted a climate change response framework that will see a climate change policy produced after a consultative process proposed to run from September 2009 until end 2010.<sup>9</sup> The Climate Change summit held in March 2009 debated a number of issues and agreed that certain policy issues were a priority including “placing the climate change response in the context of equity, sustainable development and poverty eradication” and “building climate resilience at a local level, including prioritisation of energy access for the poor” (DEAT 2009).<sup>10</sup>

The South Africa government’s electrification policy assumes that all households will be electrified and the implication is that grid based electricity would be used to supply the entire

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<sup>8</sup> <http://www.cane.org.za/>

<sup>9</sup> [www.ccs summit2009-03-01\\_climate\\_change\\_policy\\_summit\\_framework\\_rev7\\_.pdf](http://www.ccs summit2009-03-01_climate_change_policy_summit_framework_rev7_.pdf)

<sup>10</sup>

[http://www.ccs summit2009.co.za/Downloads/Media/2009.03.06\\_Climate\\_Change\\_Summit\\_2009\\_Statement.pdf](http://www.ccs summit2009.co.za/Downloads/Media/2009.03.06_Climate_Change_Summit_2009_Statement.pdf)

household needs. An example of the use for this electricity in middle income electrified households is shown in Figure 2 below.

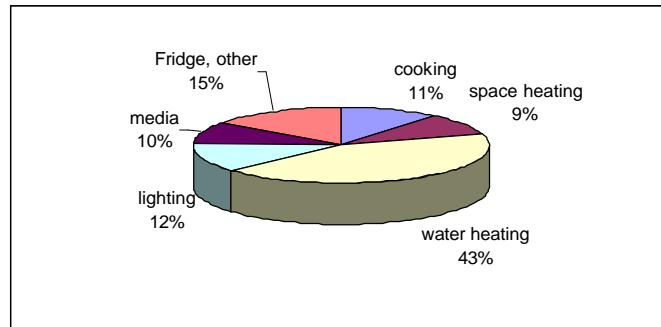


Figure 2 Energy use in middle income households in Cape Town ( Dobbins 2006).

### HOW DOES ACCESS TO ELECTRICITY BENEFIT THE POOR?

Clearly, access to electricity enables communications such as televisions, cellphone chargers etc. However, if electricity replaces paraffin, women feel an element of social upliftment, with their clothes no longer smelling of paraffin. Electricity saves time and effort – no cleaning of blackened pots, and ironing is easier. Clearly, electricity price increases impact on disposable income and some households are dependent solely on the free basic 50 kWh per month. Access to lighting enables home study in the evenings. A study carried out in Bangladesh reported that 90% of recently electrified households showed improvement in children’s study(Commission on Climate Change and Development 2009). It is also possible for commercial activity to continue after dark and enables television and other communication, and increases personal security. Being able to run lights for two or three hours a night leads to a feeling of greater safety and comfort, particularly in crime-ridden areas (Anneke 2009).

Figures 3 and 4 below show the energy use for poor households comparing consumption patterns of houses with and without electricity.

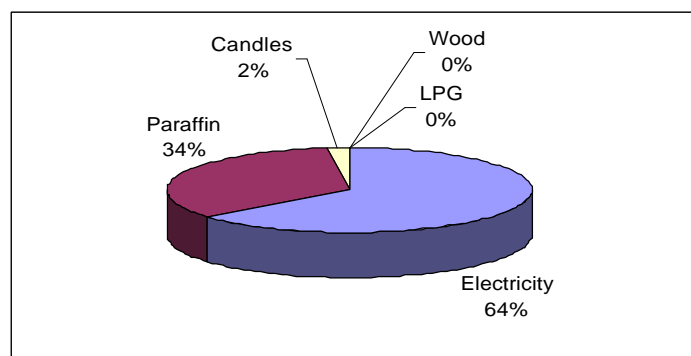


Figure 3 Cape Town low income electrified household energy consumption (Dobbins 2006).

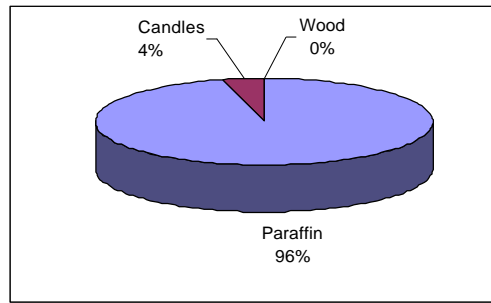


Figure 4 Cape Town low income non-electrified household energy consumption (Dobbins 2006).

If we look at the low income households, those that are electrified are replacing paraffin with electricity - about 64% of their energy needs are now met with electricity. This data does not indicate if electrified households use less energy in total because of budget constraints, or how their quality of life is affected as discussed in the previous paragraph.

Even in areas where physical safety is not an issue, rural women may have to travel many kilometres each day in order to collect sufficient wood for a few days cooking. After expending such an amount of energy in order to gather your fuel, you are unlikely to have the energy left to design and cook a three course dinner. However, if you no longer have to expend physical energy to gather the fuel, your energy usage for cooking may change.

Economic neo-liberal thinking maintains that “a rising tide lifts all boats” (President Kennedy quoted in Conradie 2008). This would mean that we do not need to take from the rich to give to the poor and our focus should simply be on producing more low carbon electricity and hopefully the economic growth through the nuclear and renewable supply growth would improve everyone’s lives. A typical middle class household consumes about 1000 kWh per month or about 12 000 kWh per year (Ziplies & du Plooy 2008). If we assume a continuation of our high energy use life-style, then each poor household will grow to use 12 000 kWh per year. If we take the poorest 20% of our population whose current share of income and expenditure is 3,5% (Conradie 2008), we can estimate that 1,9 million additional households will use at least 12 000 kWh of electricity per year. If we assume that this growth trajectory fits with the “business as usual” scenario of the LTMS, this clearly is going to be challenging.

What happens if we follow the LTMS path of adding large amounts of nuclear energy to the energy supply mix? In 2005, nuclear reactor construction costs for the Olkiluoto reactor in Finland were given as between \$2 300/kW, equivalent to R18,4 million per MW. Today, the estimated costs are around \$4 000/kW, equivalent to R32 million per MW. The project is 3 years behind schedule, and experts predict that costs will rise still further (Schneider *et al.* 2009). In 2008, credit ratings agencies such as Standard and Poor, and Moody’s put forward a construction cost for nuclear plants of \$5 000 - \$8 000/kW, equivalent to R64 million per MW.

According to some energy activists, LTMS can be seen as a pro-clean energy strategy but not a pro-poor strategy (Sugrue 2009). Nuclear energy is included as part of the LTMS, yet nuclear energy is only “clean” in terms of having a similar carbon footprint to wind energy. When we look at the financial risks associated with nuclear energy it is clear that electricity derived from nuclear energy will result in increasing electricity tariffs, which will be passed

on to consumers. Even if pro-poor tariff structures are used, and poor households are exempt from such electricity increases, the goods and services that they consume will experience the brunt of electricity price increases, and will pass on the cost of this burden to their customers. So a low carbon path based on electricity generated by nuclear energy will further impoverish the poor, forcing them to reduce their use of electricity and to rely on paraffin and wood.

With Eskom's consistently seeking tariff increases in order to fund its new build coal fired programme (currently predicted to be \$1 500 /kW)<sup>11</sup>, the impact on electricity tariffs under nuclear build and its implications for the cost of food and other goods would be significant. The energy burden that poor households face today can be calculated as equivalent to a household with an income of R20 000 a month having to pay R4 000 for electricity (Sugrue 2009). Imagine if the electricity tariffs had to rise to cover a 300% increase in construction costs over a period of four years. Such imaginings have been substantiated by recent press reports indicating that the Eskom tariffs could potentially rise between 300% and 670% over the next 5 years.<sup>12</sup>

## THE IMPACT OF RISING PRICES ON THE POOR

NERSA has granted Eskom an effective 34% increase this year (Institute for Security Studies 2009), and this has been passed on to household electricity consumers. However, if we examine the electricity tariffs for the lowest users in both rural and urban settings (Table 1), we see that the cost of electricity has not increased to the same degree. So the poor have been protected to some extent from the high tariff increases. However, poor rural households are paying extraordinary high tariffs compared to their urban counterparts.

	Household electricity rural Rc/kWh <sup>13</sup>	Household electricity urban <sup>14</sup> Rc/kWh	Petrol price	Social old age/disability grant/mnth <sup>15</sup>	Child support grant/mnth <sup>16</sup>
2003	R0.92 <sup>17</sup>	R0.407 <sup>18</sup>	R3.81	R700	R160
2009	R1.136	R0.539	R7.82	R1010	R240
% change	23%	32,4%	105%	44%	50%

Table 1. Showing how energy related prices for households have increased between 2003

<sup>11</sup>

[http://books.google.co.za/books?id=IBCJNmVWWMQC&pg=PA36&lpg=PA36&dq=coal+electricity+construction+costs+south+africa&source=bl&ots=giOdzD1-6V&sig=hXjokXZmQ-qEILN1ShDF5-Lu\\_hI&hl=en&ei=6XS3SpiQAomoNo-SvdoO&sa=X&oi=book\\_result&ct=result&resnum=1#v=onepage&q=coal%20electricity%20construction%20costs%20south%20africa&f=false](http://books.google.co.za/books?id=IBCJNmVWWMQC&pg=PA36&lpg=PA36&dq=coal+electricity+construction+costs+south+africa&source=bl&ots=giOdzD1-6V&sig=hXjokXZmQ-qEILN1ShDF5-Lu_hI&hl=en&ei=6XS3SpiQAomoNo-SvdoO&sa=X&oi=book_result&ct=result&resnum=1#v=onepage&q=coal%20electricity%20construction%20costs%20south%20africa&f=false)

<sup>12</sup> <http://www.sowetan.co.za/article.aspx?id=1076461>

<sup>13</sup> Eskom tariff landrate 1,2,3

<sup>14</sup> Cape Town domestic low tariff

<sup>15</sup> Data from budget speeches 2003 (Manual, Trevor Manual budget speech 2003, 2003) and 2006 (Manual, Trevor Manual budget speech, 2009)

<sup>16</sup> Data from budget speeches 2003 (Manual, Trevor Manual budget speech 2003, 2003) and 2006 (Manual, Trevor Manual budget speech, 2009)

<sup>17</sup> Eskom tariff landrate 1,2,3

<sup>18</sup> 2002 R0.382 cents/kWh

and 2009, compared to the increases in social grants over the same period.

Nevertheless, as discussed earlier, even with these “lesser” tariff increases, the poor are unable to continue to use electricity and are being disconnected. Faced with even higher increases due to supply choices of nuclear, electricity will become even more inaccessible. Electricity is an input cost for industry and business and as electricity prices rise, food and other goods will rise in price, effectively adding to food security risks; and it is the poor and vulnerable that will be hardest hit.

The World Bank is now intending to loan money to South Africa for Eskom’s new build. Below is an indication of the costs of this new build:

- Costs of New Build • Changing Figures
- 2004 : 87 billion ZAR (five year)
- 2005 : 150 billion ZAR (five year)
- 2007 : 244,5 billion ZAR (no time frame)
- 2009 : 385 billion ZAR (not all costs) (nearly half of all Treasury’s infrastructure spending).

To ensure that the money is found for this, there is an ongoing struggle between Eskom, NERSA and society at large as Eskom tries to increase tariffs by as much as 90%. This year we are sitting with a 31,3% increase finally agreed (Institute for Security Studies 2009). Electricity tariffs should reflect the costs (including external environmental and health costs) of producing electricity. South Africa has a law that states that the polluter pays, yet electricity consumers are paying the penalties associated with carbon polluting electricity generation.

In July 2009, cabinet introduced an environmental levy as a realisation that the electricity generation associated with coal produces environmental pollution. The assumption behind such a penalty is that the utility would be incentivised to avoid the tax by shifting to cleaner generation technologies. However, this benefit has been totally undermined through the regulator (NERSA) allowing Eskom to pass on the environmental levy on to its customers.

In a landscape where customers have a choice as to where to buy their electricity, this might make sense as customers may then choose to buy electricity from a “green source”. But in South Africa, there is no other option but to buy from Eskom, either directly, or via a municipality. Customers are being punished and are unable to avoid punishment by making a different choice. The utility has no incentive to change as the environment levy imposes no cost to Eskom, it simply passes on the tax to its customers who are forced to pay higher tariffs because they have no choice, and it continues business as usual. The rising tide may be lifting some boats but Grace’s boat has foundered with eleven passengers unable to swim.

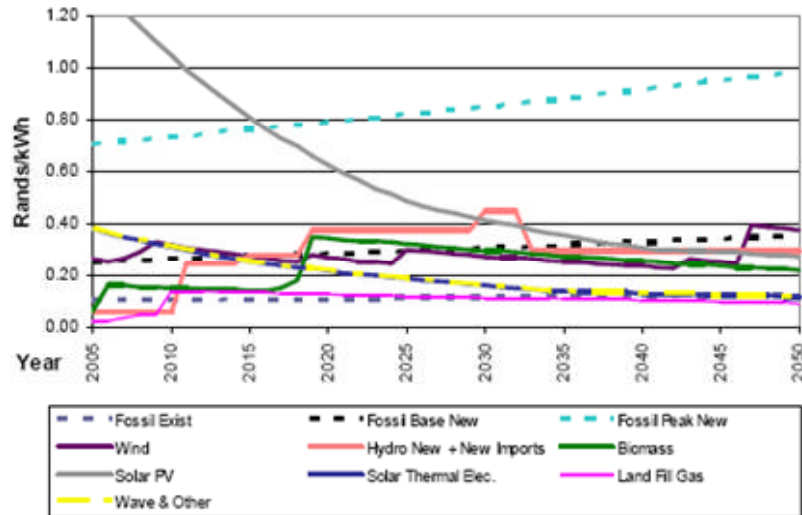
Calls for a basic income grant to address soaring costs of living and dropping employment rates have been resisted by government yet Table 1 shows that government has consistently raised the social grants over the last 6 years. However, is this logical government spending?

Government is being asked to provide funding to Eskom to enable it to keep the lights on, through low interest loans. NERSA approves continuing electricity price increases in order for Eskom to recover its costs and pay government back! However, Eskom passes through its costs to its consumers. These consumers are unable to meet their electricity costs and appeal for increased social grant spending in order to afford electricity. In effect, Government is

being asked to fund a never ending spiral of increasing costs.



## Production Costs



Source: Banks D and Schäffler J (2006)

Figure 5 This shows how the production costs of various electricity generation options may change over time (Banks & Schaeffler 2006.).

But no-one in Government is questioning the choices that Eskom is making in its energy generation calculations and various studies have argued that electricity provision overall would be cheaper if Eskom were to implement a combination of energy savings and renewable energy (Holmes *et al.* 2008; Sustainable Energy Africa 2007; McDaid 2008; Marquard *et al.* 2007). Figure 5 shows how renewable energy costs are likely to decline over time while extractive industries such as fossil and nuclear will increase.

Logically, therefore, adopting such a path would lead to decreased necessity for large government loans to Eskom, and to reduced electricity tariff increase requests. The poor may be better able to afford electricity and treasury would not be asked to increase social grants for energy reasons.

Returning to the transport sector, to add to the electricity burden – while government grants rose between 44% and 50% over the past 6 years, the petrol price more than doubled from R3.81 per litre in 2003 to R7.82 in September 2009. With the economy's dependence on petrol and diesel for transporting goods and providing services, it is clear that poor household income is likely to stretch increasingly thin.

### ASPIRING TO SOMETHING DIFFERENT

Can we do something different? Traditional economists measure wealth and success solely in terms of Gross Domestic Product (GDP), which measures only economic activity. This system regards industry that creates pollution and business that cleans up the pollution as

equally valuable. Yet one degrades the environment and imposes a burden on livelihoods and health, while the other has a positive impact on people and the planet. Are there alternative ways to measure success?

The human development index includes education and adult literacy in the equation and reflects the addition of social aspects of economic development. In 2006 some innovative thinkers came up with the happiness index. Contrary to popular belief the happiness index is not a measure of happiness of a country's people but combines social, and ecological footprinting into economic development. *"The HPI is based on general utilitarian principles — that most people want to live long and fulfilling lives, and the country which is doing the best is the one that allows its citizens to do so, whilst avoiding infringing on the opportunity of future people and people in other countries to do the same"* (Happy\_Planet\_Index 2009).

It has been criticised for its failure to take into account labour and human rights, its subjective approach, and its dependence on mathematical regression due to lack of survey data. But it demonstrates a trend in measurement – that "wealth" may not be the sum total of material possessions. For instance, Costa Rica, Cuba and Brazil rank in the top ten for the 2009 index, while South Africa ranks 118th, close to USA at 114th.<sup>19</sup>

What would happen if we decided that the transport related energy target in this ideal world is for each household to have one car? In 2001, there were 787 644 cars on the roads of Cape Town and by 2003 this number had increased to 810 967, with predictions of similar increases in future (City of Cape Town 2005). The 2008/09 infrastructure build for upgrading roads in Cape Town is significant but if we postulate an ever increasing growth in traffic, it will clearly not be adequate to keep traffic flowing. Can we not upgrade the roads again? Houses will need to be demolished in order to build extra lanes, pieces of the mountain will need to be blasted away, there will be aesthetic impacts, large areas of Cape Town will be hardened as road surface, this will affect the capacity of the ground to absorb water, potentially leading to increased flooding at times of rainstorms. Even if we use electric cars, we may reduce our carbon footprint but expand our use of other ecological resources in an unsustainable way.

In other words, it is not possible to isolate one part of our environment and examine it with blinkers on – we need an integrated approach that looks at the system as a whole. Such an approach cannot look at energy use in isolation but needs to look at the implications for other aspects of our lives and the environment we are part of. We need to think differently – we might need to understand how we can meet our need for mobility without each having to own a car.

In 2006, then President Thabo Mbeki gave a speech that shed some light on our aspirations. "Because the white minority was the dominant social force in our country, it entrenched in society ... the deep-seated understanding that personal wealth constituted the only true measure of individual and social success." He then postulated that many South Africans accept that to escape from poverty "at all costs get rich". In terms of democracy and freedom, Thabo Mbeki suggests that the meaning of freedom is now defined not "by the intangible gift of liberty, but by the designer labels on the clothes we wear, the cars we drive ... many in our society, having absorbed the value system of the capitalist market, have come to the conclusion that, for them, personal success and fulfilment means personal enrichment

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<sup>19</sup> [http://en.wikipedia.org/wiki/Happy\\_Planet\\_Index](http://en.wikipedia.org/wiki/Happy_Planet_Index)

at all costs, and the most theatrical and striking public display of that wealth” (Mbeki 2006).

If we want to work towards a low carbon society that has been globally acknowledged as a goal to ensure human survival, we need to understand the limits to growth, and the lifestyle that such a target encompasses. We cannot address climate change without addressing consumerism, and consumers are reluctant to change their lifestyles. In order for international negotiations to succeed, national governments have to be convinced that it is in their interests to change. Political leaders have not shown much political will to date, and it is possible that unless we can lay out our future lifestyle in an easily understandable manner that demonstrates that all can have a comfortable lifestyle, political leaders will easily fall into the idea that their political popularity may be severely compromised by any suggestion of cutting back on their lavish life-styles. In fact, the solutions may be simple and not necessarily cost very much more to implement, but they require political will.

## **TRANSITION TO A LOW CARBON SMART ECONOMY**

Professor James Blignaut (2005) addressed this issue in a challenge to the current generations. Acknowledging that technical alternative solutions exist, he stated that “more important than that, is the question whether the country has the willingness to change to these alternatives? Does the political will exist to change?” (Blignaut 2005).

“This is not a question that could or should be answered by considering short-term financial or economic indicators, but by strong strategic decision-making. As it was a strategic decision in the 1950s and beyond to develop South Africa’s industrial economy (ESKOM, SASOL, YSKOR, KRYGKOR, SOEKOR, etc.) to mitigate and safeguard the economy against the possible effects of sanctions and to gain economic supremacy in Africa, so it has to be a strategic decision to offset the effects of carbon and to become climate neutral. One cannot compare the economic and financial prospects of a fledgling renewable energy sector with that of an established industrial sector that was developed with huge government buy-in, intellectual support and financial assistance. It would be like comparing cherries with lemons.” (Blignaut 2005)<sup>20</sup>

What would this strategic direction look like? The LTMS “reaching for the goal” gives some ideas on which to build but is the first to acknowledge that there is no silver bullet. Some ideas include tough energy efficiency measures, scaling up renewable energy, investigation into biofuels potential, scaling up hydrogen and electric cars, carbon capture and storage, and social awareness.

There are systemic changes that need to be policy driven by government, in its role as a developmental state. Part of these choices include strong communication campaigns to persuade South Africans to switch their lifestyles towards a smart economy. Typical energy services for a household include space heating and cooling, water heating, cooking, lighting and telecommunications and entertainment. Dish washing and clothes washing might be regarded as separate services, given the complexity of washing machines. Heating water is certainly one aspect but there is an added need for the motion associated with cleaning clothes and the spin cycle (replacing the manual clothes wringing). Advanced energy

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<sup>20</sup> <http://www.vryeafrikaan.co.za/lees.php?id=407>

services could include the swimming pool pump, the electric security system and eventually the jacuzzi!

These energy services are met by a variety of different energy sources currently. However, government policy identifies electricity as the preferred energy source and both the RDP and subsequent policy documents set targets that aim to electrify all South African households. The demand for electricity is equivalent to the demand for a car - it is a position based on the perception that all the underlying needs can be met if we have sufficient accessible affordable electricity. It is proposed that we adopt a two phase approach.

### Phase 1: Emission reduction

For poor households, energy services must be upgraded. Grid electricity for urban households (potentially small decentralised grids using renewables) for lighting, fuel efficient stoves to reduce health burdens, improve use of wood/paraffin. Middle income households need to switch to a smarter lifestyle and be incentivised to do so through solar home systems for lighting and telecommunications, the introduction of solar stoves, fuel efficient stoves and hot boxes for cooking, and solar water heaters with gas backups for hot water. The installation of biogas digestors addresses sewage services and provides gas that can be used for cooking or water heating. At a systemic level, carbon taxes ramped up very quickly for private vehicles as well as increasing parking tariffs in cities, license fees for cars, etc will provide increasing revenue that should then be used to upgrade the public transport system – focusing on electric taxis, rail transport, and rapid bus transport in areas where there is no rail infrastructure. It must be emphasised that safe, affordable public transport must be provided BEFORE the use of private vehicles is disincentivised. Failure to do so frustrates the public as they are penalised without having any viable alternative. Phase 1 also needs to implement scaled up energy efficiency for industry, implement building standards that mandate passive design, energy efficiency and renewable energy. For example, the 4<sup>th</sup> Assessment Report of the IPCC looked at the savings in emissions if we build energy efficient buildings. In 2004, buildings were responsible for one third of the carbon emissions globally (including electricity contributions) yet according to Professor Diana Urge-Vorsatz, lead author of the 4<sup>th</sup> Assessment Report, 30% of these carbon emissions could be saved by 2020, and the operational energy emissions of new buildings could be cut by 80% “often at no or little extra cost” (Urge-Vorsatz 2008). For grid electricity, measures such as the REFIT and associated institutional arrangements must be accelerated in order to be on track for the “reaching for the goal” target emissions reductions.

### Phase 2: Integrating the poor into a low carbon smart economy

Phase 1 focuses on putting systems in place to ensure long term sustainable development for South Africa while ensuring that poor households are protected from any unforeseen shocks. The success of Phase 1 depends on the shifting of aspirations of the rich through communication campaigns, incentives for clean energy and energy efficiency and the penalising of fossil fuels. Phase 2 then provides similar incentives to encourage poor households to reach their aspirations following a life-style that is now the norm in middle income households. Critical to Phases 1 and 2 are adaptation measures to ensure climate change does not further degrade the lives of the poor. Planning regulations must ensure that high risk areas prone to flooding, severe storms etc, are not used for housing and other

infrastructure. Industrial and trade policies need to incentivise green industry that focuses on job creation while agricultural policy must ensure that food security is not compromised in the face of the climate change impacts outlined above. Disaster management services need to be upgraded and expanded to include many local fire fighters and first-aid volunteers that can be mobilised to assist disaster management.

## PHASE 1 IN ACTION

In the short to medium term, electricity prices in South Africa are predicted to rise, and indications are that fossil fuelled transport costs will continue on their ever increasing spiral, with a knock-on impact on goods and services such as taxi fares and food. Climate change predictions indicate increasing stresses and potentially a loss of income due to a reduction in agricultural yield. For those that live directly off the land, crop failures mean less food, whereas for those that are based in the cash economy, food scarcity means rising food prices and less income to spare for energy services such as grid based electricity.

However, increasing temperatures due to climate change also provide opportunities. Solar cookers use the heat of the sun to cook food and the use of energy efficient stoves (for those relying on biomass fuelled stoves) and the use of a hotbox can also reduce cooking time considerably. The Rocket stove is one example of how a fuel efficient stove can reduce wood collection, leaving time for other productive activities. In a cooking test in a tea factory in Mulanje in Malawi, an open fire used 170 kg of wood to cook 100 litres of staple maize meal, whereas the fuel efficient stove used 17 kg to do the same cooking (Roth 2007). Solar energy can also be used to purify water. The IPCC Climate Change 4<sup>th</sup> Assessment Report clearly indicates an increase in diseases, increasing temperatures allowing pathogens to flourish. Globally every day 6 000 children die due to the lack of safe drinking water. In a study conducted in India, plastic bottles were placed in sunlight and the various bacteria were killed by the UV light of the sun. The study showed a sharp decline in the number of diarrhoea cases (average reduction of 73%) after villages used plastic bottles to purify their water (Arisanti 2007).

As cooking and space heating are the largest consumers of electricity in middle income households, providing those energy services for free to poor households would enable their future aspirations to be met without needing to pay ever increasing electricity tariffs. However, while the operating costs of appliances discussed above are minimal, with almost zero fuel costs; the capital costs are perceived to be beyond reach. Financing schemes that allow households to lay-by a portion of their income each month until they have saved up for the appliance, are already in use in society and homeowners have some knowledge of the system.

Hot boxes, solar cookers, solar photovoltaic systems and solar water heaters can be manufactured locally, thereby creating livelihoods and encouraging entrepreneurs. Local production reduces transport costs and reduces input costs, reduces the overall costs of the product, making it financially affordable to the target market.

**Ethiopia** is piloting a unique food safety net to climate proof their rural poor. The Productive Safety Net Programme (PSNP) targets people facing predictable food insecurity and offers guaranteed employment for 5 days a month in return for transfers of cash. They have also attempted to build resilience of the small holder farmer to climate shocks by building

community assets through public work works such as construction of schools, health post and feeder roads, potable water development; small scale irrigation and natural resource conservation (Green Connection 2007).

Strong communication strategies are needed to accompany renewable energy interventions. Such communication must involve both government and non-government stakeholders and should communicate a common message focusing on energy services for a smarter sustainable low carbon future. One example of how this might be achieved is given below.

In 2008, the Climate Change Communication Project was initiated. The aim of the project was to raise awareness about climate change in areas of the Northern and Western Cape that were predicted to be hardest hit by climate change and to provide some ideas of how communities might adapt. The focus of the project was on energy provision, and the project evaluation estimated that approximately 3 000 people in 8 different priority areas received information through this outreach. In 2009, two of the areas that had received some climate change awareness became part of a second phase of the project, choosing a couple of technological interventions that would save them energy and adapt to climate change, and potentially could create small green businesses. The project envisages a system of knowledge exchange, piloting of technologies in communities, supported by business skills. Such an approach could potentially mitigate some of the negative impacts of climate change and could provide sustainable livelihoods and potential local economic development in areas predicted to be hardest hit by climate change (Green Connection 2009).

## **THE POTENTIAL OF GREEN JOBS**

Part of a response to climate change and specifically a low carbon economy is to determine whether economic benefits will accrue to the poor. While the approach of this paper is to examine how poor and vulnerable communities can become increasingly self reliant in terms of meeting their own energy needs, an important aspect of self reliance is that capacity is built within communities to maintain and operate, build and distribute alternative energy interventions.

The international climate change and sustainable development speak uses the term “green jobs”. What do we mean by green jobs? A 2008 study looking at employment in a low carbon world defined “green jobs” as follows, “as work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contributes substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials, and water consumption through high efficiency strategies; de-carbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution” (Worldwatch Institute 2008).

A 2006 survey conservatively estimated that worldwide the number of jobs in the wind, solar photovoltaics, and solar thermal industries to be 300 000, 170 000 and 624 000 respectively (Worldwatch Institute 2008). Another growth industry is the energy efficiency sector, particularly focused on buildings. A US estimate is that to “green” the USA and European building sector could create 2,5 million jobs, reducing carbon emissions 75% by 2030. In South Africa, AGAMA energy undertook a study to determine how many jobs could be created in South Africa through investment in renewable energy technology. Figure 6 below

provides a comparison between different energy sectors.



## Jobs for Africa

Comparison of Generation Technologies: Gross Direct Jobs

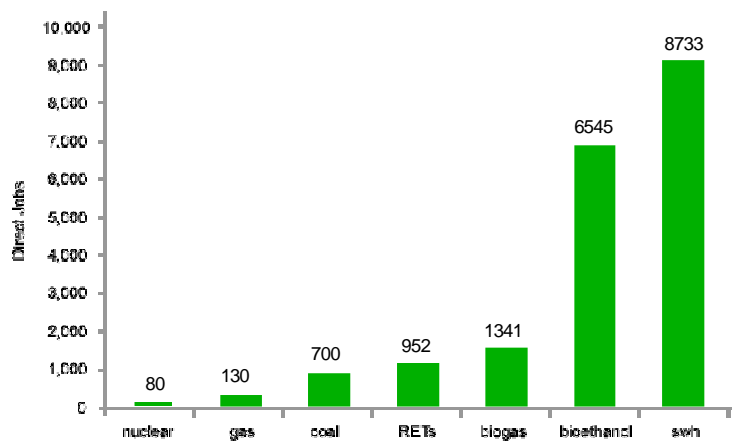


Figure 6 This demonstrates the potential of green energy jobs in South Africa, with the data drawn from a 2003 study by AGAMA energy (AGAMA 2003).

It is important to note that renewable electricity generation technologies can provide 25% more jobs than the coal industry, and that does not include solar water heaters or biofuel related industries. It is therefore clear that if we wish to implement the government imperative of job creation, then investment in renewable energy must be prioritised. Recent press reports appear to indicate that government departments such as Trade and Industry are willing to engage and intend to include green jobs in its revised industrial policy and action plan to be adopted in January 2010 (Creamer Engineering News 23 September 2009).

### ROLE OF INTERNATIONAL NEGOTIATIONS

South Africa and the rest of Africa are identified as one of the regions worst affected by climate change. The only way to prevent such negative impacts is to persuade the big polluters of the world to stop polluting and move to a low carbon economy, and to do so quickly. However, as a country responsible for 1% of carbon emissions, South Africa is more likely to persuade the big polluters to agree to rapid binding emission cuts if it can show willingness to take action as well.

Failure to commit to any emissions is likely to lead to failure at Copenhagen, with subsequent hardship for the poor, who in addition to the socio-economic stresses in their lives now have to adapt to climate change. Success at Copenhagen could result from South Africa's willingness to cut its own emissions. Demanding financial reparations, while justifiable morally, is unlikely to be productive unless South Africa shows willing to move away from a coal and oil based economy.

It is of concern that according to recent press reports, the South African Minister of Water and Environment Affairs was quoted as stating that South Africa was going to New York to look for money and that an earlier cabinet statement reiterated its support for continuing and expanding coal generated electricity in order to meet economic growth objectives, and stating that South Africa would not agree to any emission reduction targets (Davies 2009).<sup>21</sup>

However, it also seems that Africa is organising in order to ensure that any global climate deal will be favourable to African citizens and it is hopeful to see that according to Africa's common position paper, the continent wants financial support (estimated at \$300 billion) and technology transfer from the West to address the mitigation and adaptation impacts of climate change. It is heartening to see that Ethiopian Prime Minister Meles Zenawi (leader of the African delegation) stated that "We will never accept any global deal that does not limit global warming to the minimum and avoidable level, no matter what level of compensation and assistance is promised to us".<sup>22</sup>

Civil society has been advocating for strong commitment to rapid carbon emission reductions and supporting government's stance on the need for financial support from developed countries to assist with the transition to a low carbon economy. It appears that an opportunity exists for civil society to convince government international delegations that economic prosperity can be achieved without fossil and nuclear expansion. This breakthrough may be the difference between success and failure at Copenhagen in December 2009.

## **IS THERE ANOTHER WAY OF USING INTERNATIONAL FINANCE?**

Traditional approaches to disaster management often mean that government must officially declare a disaster and thereafter relief will follow, whether in the form of cash or food or other relief. For small farmers, such an approach might mean that they are forced to sell the tractor or other assets in order to survive, thereby compromising their ability to continue farming after the disaster.

Some innovative insurance schemes are linked to environmental factors, for example, in Ethiopia, if the rainfall drops below a certain average, insurance payouts for crop losses are paid out, used to provide food to replace drought related crop losses (Commission on Climate Change and Development 2009). A fund that is financed by developed countries along the lines of the polluter pays, and that the poor do not contribute to, but are recipients of cash where such payouts are triggered by environmental indicators such as floods or droughts, would be more equitable in their implementation than the current model.

Access to modern energy services is crucial to the development of the modern economy but it has proved difficult to find evidence that strong economic growth can be decoupled from energy demand (Commission on Climate Change and Development 2009). The Commission on Climate Change and Development (2009) therefore raises the issue of the use of Overseas Development Aid (ODA) funds for adaptation and recommends that mechanisms be put in place that would enable the ODA mechanism to be used to channel adaptation funds.

An instinctive reaction to this might be that this appears to be undermining the climate

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<sup>21</sup> Richard Davies, Cape Town, South Africa - Sep 10 2009 12:41

<http://www.mg.co.za/article/2009-09-10-unrealistic-for-sa-to-set-emission-targets>

<sup>22</sup> Source: <http://www.nation.co.ke/News/africa/-/1066/652268/-/item/1/-/1gjgnyz/-/index.html>  
<<http://www.nation.co.ke/News/africa/-/1066/652268/-/item/1/-/1gjgnyz/-/index.html>>

change finance transfers to developing countries and appears to let rich countries off the climate change hook, by allowing them to “get away with” providing less finance. The report acknowledges this concern but points out that such ODA machinery has delivered expertise and finance in a useful manner and it may be more efficient to use that expertise to address climate change, reducing duplication of coordinating mechanisms than if climate change adaptation funds and ODA are administered separately. The report advocates a transparent approach to tracking the finance to ensure that rich countries do pay their climate debt over and above the ODA fund (Commission on Climate Change and Development 2009). This appears to be a pragmatic approach to moving finances to where they are needed without the need to set up another set of costly accounting mechanisms.

Hypothetically, ODA might be provided to local cities for housing for poor people. Is it sensible that such funding be spent on building low cost housing developments in a flood prone area of the city, and that once extreme weather events lead to the destruction of the housing, that the hypothetical country then applies again for adaptation funds to move the affected families to new housing further from the flood plain? Does it not make sense that all ODA should be interrogated to ensure that it is used in a way that complements climate change adaptation?

A rural example might be the use of ODA to provide finance to small farmers for irrigation infrastructure such as irrigation dams, only to find that the rainfall decreases significantly due to climate change, and the dam is no longer useful. If we look at South Africa, 65% of the country receives less than 500 mm per year. Looking north, we already see that the evaporative losses of the Aswan dam is equivalent to 11% of reservoir capacity, while the impact of drought in Zimbabwe in 1992 resulted in electricity generation in the Kariba dam dropping 42% (Winkler 2007).

## **TRANSITION TO A CLEANER, ENERGETIC WORLD**

This paper had attempted to show that even if we could generate 100% of our electricity from renewable energy it would still be wasteful to continue to use it in the inefficient way that we do now. As technology advances, it may be possible that smaller centralised systems could provide electricity based energy services to local areas, but how do we get from here to there?

Human behaviour is once again the stumbling block. Renewable energy has been rolled out by Eskom in South Africa as a poor alternative to grid based electricity. 33 000 solar home systems that use solar photovoltaic systems, have been installed. While in general householders are happy to have some energy, they would like to see increased amounts of electricity (Sugrue 2009). This leads to the perception that solar energy is a lesser type of energy, only suitable for the poor and once a household’s economic circumstances improve, they expect “grid electricity”.

Poor South Africans who work in rich households aspire to the lifestyle of the rich. The solution to climate change in South Africa is not dependent on technological advancement. Sufficiently useful technology exists. The solution lies in a communication strategy that promotes renewable energy as the only solution for the future, a communication strategy that regards conventional energy inefficient household appliances as old-fashioned and “uncool” so that wealth and status are derived from the amount of renewable energy you use, rather than the size of your swimming pool or car. If South Africa can put the strength of human

aspirations that took us peacefully from apartheid past into our democracy, we can build on initiatives such as the LTMS and the RDP, and become a world leader that shows other nations the path to sustainable development – a better life for all.

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