Down to Zero

The politics of just transition

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Cover: A coal conveyor and silo on fire at Eskom's Majuba power station, 18 December 2019. Picture Twitter / Chris Yelland.

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Acronyms

AEMFC	African Exploration, Mining and Finance Corporation
AQMP	Air Quality Management Plan
BEE	Black economic empowerment
BLIPP	Base Load Independent Power Producer
BRPs	Business Rescue Practitioners
°C	Degrees Celsius
CCS	Carbon capture and storage
CEO	Chief Executive Officer
CER	Centre for Environmental Rights
CO_2	Carbon dioxide
CoP	Conference of the Parties (to the UNFCCC)
Cosatu	Congress of South African Trade Unions
CV	Curriculum Vitae
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources (Currently DMRE as Energy is added)
DoE	Department of Energy (Currently part of DMRE)
DPE	Department of Public Enterprises
DWS	Department of Water and Sanitation
EOR	Enhanced oil recovery
FGD	Flue gas desulphurisation
GHG	Greenhouse gas
Gt	Billion tonnes
HELE	High efficiency low emission
HPA	Highveld Priority Area
HIV / AIDS	Human immunodeficiency virus / acquired immune deficiency syndrome
IDC	Industrial Development Corporation
ILO	International Labour Organisation
IEA	International Energy Agency
IEP	Integrated Energy Plan

IGCC	Integrated Gasification Combined Cycle
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IPCC SR1.5	IPCC's Special Report on 1.5°C
IPCC SRL	IPCC's Special Report on Climate Change and Land
IPCC SROC	IPCC Special Report on the Ocean and Cryosphere in a Changing Climate
IPP	Independent Power Producer
IRP	Integrated Resource Plan
ITUC	International Trade Union Council
LTAS	Long-term adaptation scenarios
MCSA	Minerals Council of South Africa (formerly Chamber of Mines)
MEC	Minerals energy complex
MES	Minimum emission standards
MW	Megawatt
MWh	Megawatt hour
NDC	Nationally Determined Contribution
NDP	National Development Plan
NUM	National Union of Mineworkers
NUMSA	National Union of Metalworkers of South Africa
OEM	Original equipment manufacturer
PPM	Parts per million
PIC	Public Investment Corporation
RDP	Reconstruction and Development Plan
REDZ	Renewable energy development zone
REIPP(P)	Renewable Energy Independent Producer (Programme)
SLP	Social and labour plan
SO2	Sulphur dioxide
SST	Sea surface temperature
SWOP	Society Work and Politics Institute
TB	Tuberculosis
TUED	Trade Unions for Energy Democracy
UCG	Underground coal gasification
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organisation

Foreword

According to the Chinese Zodiac, 2019 was the year of the pig. For environmental justice campaigners, workers, unions, politicians and the community people living in the plume and poverty that dirty energy dumps on us, it could also be seen as the year of the just transition. Not that it was delivered, but rather that it became a central talking point from the United Nations to the streets of Mpumalanga, where coal defines life.

This we must take as a victory. If it were not for community people, workers, unions and environmental justice organisations remaining vigilant, this debate would not be on the table. We even got a just transition into our Integrated Resource Plan – although Minister Gwede Mantashe appears to be using the just transition as a brake on renewables – but government is not pursuing it with urgency.

Making just transition happen in reality is going to be difficult, and especially so because it will require a deep, honest and meaningful discussion between community and labour, as our engagements and experience in undertaking this report has highlighted. Today international governments, our own government through the National Planning Commission and various departments, NGOs of varying persuasions, funders and even private corporations all invoke the just transition. And many of these actors are crowding into Mpumalanga to get in on what they anticipate will be the action. But we must remember that whatever happens will depend on the "transformative potential" that "will only come into the process if it is brought in by the community and by labour, hopefully working together", and should not just be attempted to be delivered from above, or blue printed from elsewhere.

This coming together of community, labour movements, people's organisations and progressive NGOs is what we have to strive for, before we seek to engage

with government, corporates and the 'elite' – for they are planning on the just transition being another money spinner for capital via their false solutions and fallacy of green growth, clean coal, geo-engineering and gas as the transition energy We can only challenge these Trojan horses together.

That Eskom is in trouble and is crumbling around us is no longer news. Their flagship white elephants Medupi and Kusile are failing, and they have dragged the country to the verge of bankruptcy. Walking through the streets of Pullens Hope, there is no hope left. People are desperate. Workers' talk about how Eskom's 50-year-old coal-fired Hendrina power station is collapsing, and is being scavenged for spare parts rather than being repaired, is alarming. Alarming, considering that up until 2012 it was receiving plaudits for its operations. However, the end has come brutally fast, especially for the workers who are about to lose all they have because government and Eskom did not want to see the writing on the wall. What is even more brutal is when the flagship Kusile plant is also being used as a quasi-salvage operation, as parts are stripped from one unit to repair other units.

groundWork has always spoken about the need for society to change. We have always called for a just transition in one form or the other. But in 2005 we started formulating our vision for a just transition and linked renewables with movement struggles. This is the basis of this report. It seeks to understand that politic, and how one can make it happen.

From the early years of the noughties decade, we have called for a system that will deliver environmental justice, where people will receive reasonable remuneration for engaging in productive and creative livelihoods; where the work they do is not demeaning or exploitative but is safe, rewarding and secure; where communities enjoy decent levels of affordable basic services and infrastructure to be enjoyed by all in society as a basic human right and not only by 'consumers' who can afford them; where individuals and families are able to access, at minimum, the basic goods of human life, starting with the most basic levels of goods like nutritious food and safe and comfortable accommodation; and where people live and work in environments that secure

health and are clean and are nurtured by the very way in which people live and work.

The first decade of democracy was an interesting time. There were those who listened to us in a period of more open democracy. These were older politicians who had fought for decades in the struggle and were serving as the guardians of an early democracy and wanted a real consultative and engaging democracy. We were allowed to attend parliamentary meetings and call a spade a spade. We were allowed to attend committee meetings in metros and municipalities. We received minutes of committee meetings and agendas for the week, and through this we could engage local government and stop bad projects. However, since the noughties, there has been a systematic closing of democratic spaces and practice, and democracy has vanished or at best become bureaucratised and through this legalised. The voices of those living in poverty cannot be heard except through the process of legal action – dependent on resourced NGOs – or through taking to the streets. The real democracy that falls between these spaces is no longer, and this is part of the transition that we need to strive for. We need an open democracy, where we can build a just transition for all to enjoy.

For a just transition to be successful, we need to understand the lives lived on a daily basis by the majority of South Africans living in poverty, despite the promises of a better life in 1994. It is critical for politicians, union bosses and NGO people to, through regular engagements of accountability, go back to places of struggle and to be reminded of their mandate and that democracy has not delivered to all. The anti-apartheid struggle was about equality and equity, but since 1994 inequality has increased.

A just transition has no blueprint. It is not one process. It is not one plan. In nature, diversity is critical – a diversity that supports the collective Mother Earth. Our survival as humans depends upon this. We need a 'world of many worlds' that allows us to support each other, rather than feed off each other as in the present system, where those who accumulate wealth do so at the expense of the poor. We need diversity that supports rather than destroys. We must accept the Xolobeni and Fuleni communities' right to say no to mining.

Foreword

It is going to be a difficult next decade as we strive to reduce greenhouse gas emissions down to zero and build just transitions. I hope that this groundWork report informs and strengthens the activities towards this and the process of building hope and building a change for those who most need it.

Bobby Peek

Director of groundWork

Introduction

All previous groundWork Reports, since the first one in 2002, have ended with a call for a just transition although not necessarily by that name. As the slogan has it, we have called for "system change, not climate change" or, put another way, we have looked for "deep transformation of the way the world works" largely driven by the movements of those the system makes poor. At the same time, we have tried to keep it real, to recognise the power of the forces of repression but also the instability of power and the necessity of people's movements, as in this conclusion from the 2005 groundWork Report, *Oil in Africa*.

> Throughout this report, we have described those elite interests and powers who benefit from, and have the power to determine, the way the world and its politics works. But we have also insisted that that elite power to determine is neither stable nor inevitable and that it is always and everywhere contested and renegotiated. The real possibility that alternative energy sources, technologies, and applications might be taken up by the masses of the poor in a project that they define and drive, lies in connecting the promise of renewables with movements struggling for deep transformation of the way the world works. And even if these social and environmental justice movements do not succeed against the enormous power of the current regimes, and the descent into a post-fossil-fuel (and post-US empire) era of uncertainty and collapse continues, then the spaces of self-reliance and local democracy created through such struggles will emerge as the only viable basis for re-building a new world.

The instability of global capital, leading up to the 2008 crash, was already evident in 2005 but, almost immediately following the crash, the power to displace the costs of an elite crisis onto the poor was put on display. Trillions of dollars were pumped into the banks and global stock markets to restore investor confidence while millions of people were turned out onto the streets.

In South Africa, a million people lost their jobs. China kept the show on the road with massive spending on infrastructure – building airports, railways and whole cities that are still mostly empty – and so created another brief boom in commodities such as coal and iron ore. The global economy has not come out from the shadow of 2008 and now, at the dawn of a new decade, it is again at the edge of a crash.

The consequences of capital crashing and burning are nothing compared to the consequences of what capitalism's fossil fuel driven economy is doing to the earth. At the year's end, millions of people across southern Africa are short of food and water for themselves and for their stock as unprecedented drought has scorched the region, bringing it to the brink of famine.[1] And, at the dawn of the new decade, Australia is burning across five million hectare and the air is thick with smoke – all the way across to New Zealand where glaciers are turning brown, which causes them to absorb more heat and melt faster. Eighteen people are dead so far, thousands are being evacuated and millions are choking on the smoke.[2] It will get worse.

This report opens with a review of the climate crisis: where we are now on a path to disaster; what is causing climate change, together with ecological destruction at every scale; and what should be done to step away onto another path. We then look at what millions of people are already experiencing as climate disaster, focusing on southern and South Africa. Whatever is done, this too will get worse but there may still be time enough to avoid the very worst.

1 Tiara Walters, *Climate crisis tears through southern Africa with at least nine million facing acute food insecurity*, Daily Maverick, 6 December 2019.

2 Michael Mann, *Australia, your country is burning – dangerous climate change is here with you now*, The Guardian, 2 January 2020; Eleanor Ainge Roy, *New Zealand glaciers turn brown from Australian bushfires' smoke, ash and dust*, The Guardian, 2 January 2020.

This is both about why we need a just transition and the consequences of no transition.

A transition, just or not, does not stop climate change in its tracks. There is a considerable lag effect. So we are now facing the consequences of what was emitted up to 10 or 20 years ago. Chapter 2 looks at what we must anticipate – the scientific projections for climate impacts in southern Africa. We then consider the state of the ecological and social systems that will have to deal with these impacts in South Africa. The ecological systems are seriously eroded while various systems for social provision are on the edge of collapse: the water management system is broken; the power system represents a national hazard; the food system is highly unequal and serves poor food to poor people, leaving millions malnourished and hungry; human settlements are in a state of disrepair and municipal services are collapsing, particularly in poor areas; and the faltering health sector has barely begun to get to grips with what fossil fuel pollution and climate change mean for health. All these sectors will be put under ever more stress as the climate grows more hostile.

The Destruction of the Highveld, the 2016/17 groundWork Report, concluded with a section on just transition informed by workers, some of whom had just been made redundant from Highveld Steel and Vanchem, as well as by community people who experience mining and polluting industries as an assault. It noted the origin of the concept in the unions and gave a broad framing of the debate, following Jackie Cock's [2016] distinction between a narrow defence of jobs and a (worker) movement for systems change. A similar distinction is made by Sean Sweeny and John Treat [2018], between a 'worker focused' transition and a societal shift. Both look for systems change but warn that immediate worker interests must be addressed in the process. Sweeny and Treat go on to argue that the 'social dialogue' approach taken by the established unions cannot go beyond the narrow focus on jobs as it already accepts the "current arrangements of power, ownership and profit" [3]. A tentatively named 'social power' approach does not dispense with dialogue but goes beyond it to challenge capitalist relations.

We take our perspective from fenceline communities who may be working class but are mostly not working. For them, a just transition starts from a different place because their immediate interest is in closing polluting plants or in blocking new mines that would destroy their land and livelihoods. Where the coal economy is established, they may share the interests of the workers as an expression of solidarity for people who are their neighbours and part of the community. There is also a material interest in so far as the wage income circulates locally [Cock 2019]. Where new or expanding mines dispossess people, it is experienced as an invasion and people see the mine owners pitting workers against them and so creating division. Workers, on the other hand, also get polluted and the environmental justice movement has long been concerned with the coerced nature of work. Coercion started with dispossession, under colonial and apartheid rule, designed to force people into the mines and factories, but is now driven by the depth of poverty and unemployment produced by what is still an extractive economy – extracting minerals from the earth, extracting wealth from the country – a mining colony. And this economy still requires new rounds of dispossession. Hence, in common with Cosatu's 2011 climate policy, the environmental justice movement calls for a just transition for all.

Chapter 3 recalls the Million Climate Jobs campaign as a joint initiative of the labour and climate justice movements. It is also an instance of 'concrete utopian thinking' and intended to create a vision for responding both to the climate crisis and the crisis of unemployment, backed with solid research on the employment potential of doing the work needed to address climate change. We then outline the history of the dialogue of the labour and environmental justice movements and their responses to a formal just transition process organised by the National Planning Commission. Finally, we report on the engagement of community environmental justice organisations with the concept of a just transition.

Eskom is the biggest polluter on the continent and has long been the focus of critical attention in the groundWork Reports. In 2007, we looked at the first loadshedding in the Western Cape and anticipated the national loadshedding that followed in 2008. The utility has since been increasingly at the centre of

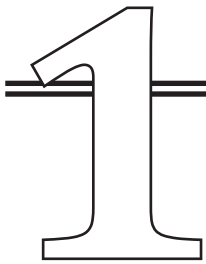
national attention, particularly since it was implicated in the scandals attending the presidency of Jacob Zuma. The groundWork Reports have argued that it is not just Eskom that is failing, but that the minerals energy complex (MEC) that has shaped South Africa's development for over a century is cracking up. Chapter 4 gives a brief account of Eskom's place in the MEC and then looks at post-apartheid policy and planning, focusing particularly on the successive integrated resource plans (IRPs) as a path into the increasingly vituperative politics of decline. Chapter 5 tells a parallel story of the coal industry in retreat but looking for a new frontier in the Waterberg, a dubious cause as described in the 2018 groundWork Report. We then look at the jobs that are on the line in the mines and in Eskom. Amongst other things, we emphasise the continuation of labour migrancy and touch on the impacts of the neo-liberal labour regime on settlement and unsettlement on the Highveld.

Chapter 6 gives a close up view of the decline, of a chaotic and unplanned transition out of coal, as it is experienced around Arnot and Hendrina, two of the six power stations slated for decommissioning before 2030. The first part looks at how a group of workers has been abandoned and documents the effort to forge green-red links on the ground – between trade unions, workers, communities and environmental justice activists. The second part is concerned with the fate of the Eskom villages – Pullens Hope next to Hendrina and Rietkuil next to Arnot – left in the shadow of massive toxic legacies constituted by the power station ash dumps. The chapter concludes with observations about the nature of the real and unplanned transition out of coal now under way.

The conclusion presents an urgent if incomplete agenda for 2020 – a to do list composed of issues that the environmental justice movement needs to tackle immediately, as well as those that will take longer to work out, but require our attention now.

Finally, the title of this report implies two senses of down to zero: first, fossil fuel emissions need to be reduced to zero shortly; and second, in the words of an eminent group of climate scientists, the "time left to prevent tipping could already have shrunk towards zero, whereas the reaction time to achieve net zero emissions is 30 years at best" [Lenton et al, 2019]. 'Tipping' here refers

to the onset of runaway climate change. In short, the climate crisis is upon us and without immediate and determined action an effective response will soon be beyond us. Down to Zero is also, of course, the title of a fine song by Joan Armatrading about heartbreak.



Climate Crisis

> Capitalism is not compatible with addressing climate change. It requires never ending economic growth for its survival. Growth has brought unprecedented wealth to the owners of capital, prosperity to the world's middle classes and untold misery to the majority of people, particularly in the global South. Capitalism plunders the resources of the earth and of the people. It is the driving force behind ecological disruption on all scales from the local to the global. Climate change is the ultimate symptom of this renting of the earth system.
>
> The nation states brought into being by capitalism and imperialism find their legitimacy in their management of growth. They have therefore proposed a series of false solutions that protect the economy but not the climate. These false solutions, rooted in the logic of capitalist markets, have been made the subject of negotiation in the United Nations Framework Convention on Climate Change. The world's people can no longer have faith in this process. Unless the people drive a process of rapid change in the economic and political system, they face escalating damages as the earth is rendered uninhabitable.
>
> *groundWork Position Paper on Climate and Energy Justice, 2011.*

The climate crisis is growing in intensity with each passing year. This chapter opens with a look at where we are now on a path to disaster. It looks at what is causing climate change, together with ecological destruction at every scale, and indicates what needs to be done to step away onto another path. Time is a critical element, however, and it is not certain that there is any time left. What is certain is that each year without urgent action will drive up the scale

of future disaster. For millions of people around the world, the disaster is here. We focus on southern Africa and then on South Africa. Climate disaster is never only about extreme weather. In many cases the immediate crisis is caused by bad politics and the aggressive logic of extractive capitalism. In South Africa, government's steadfast refusal of responsibility is a striking symptom of neo-liberal governance in a peripheral economy.

Path to disaster

The Paris Agreement of 2015 commits all countries to cooperate in limiting global warming to "well below 2°C above pre-industrial levels" and to "pursue efforts" to limit it to 1.5°C as "this would significantly reduce the risks and impacts of climate change" [UNFCCC 2015]. There were two major flaws to this objective. First, 2°C is a recipe for disaster as James Hansen, one of the world's foremost climate scientists, has repeatedly warned [Hansen et al 2008 & 2015]. This view has been confirmed by a slate of recent reports from official scientific bodies: the Intergovernmental Panel on Climate Change (IPCC), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), the World Meteorological Organisation (WMO) and the UN Environment Programme (UNEP) amongst others. We report on that below.

Second, the Paris Agreement has no mechanism linking the temperature target to global greenhouse gas (GHG) emissions. It is a 'pledge and review' agreement which relies on each country deciding its own 'nationally determined contribution' (NDC). If all countries actually honour their pledges, and there is nothing to hold them to it, their combined emissions will result in global heating of 4°C. The pledges are supposed to be tightened up every five years but, again, there is no obligation. Hansen called it a 'fraud'. Other scientists were a little more polite but pointed to the apparent reliance on

'negative emissions' – the notional future capacity to suck massive amounts of carbon from the atmosphere – in the second half of the century.[3]

In September 2019, The United Nations General Secretary held a special climate summit and went "far beyond the usual diplomatic niceties" to get national leaders to give real commitments for bigger emission reductions. But "the response from major polluters was virtually non-existent".[4] In terms of the Paris Agreement, the next round of pledges is due in 2020. We can expect them to fall well short of what is needed.

The agreement also aims to strengthen "the ability to adapt to the adverse impacts of climate change" and to make "finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development". These aims imply solidarity between nations, particularly between rich and poor, which is scarcely evident. And the agreement specifically avoids recognising the climate debt between the major polluters and those who, being poor, are most vulnerable to climate impacts but have done little to cause them.

Carbon concentration

In May 2019, the concentration of carbon dioxide (CO_2) in the atmosphere topped 415 parts per million (ppm). This is the annual high point for CO_2 concentrations, just before plants put on new life in the northern spring and draw CO_2 from the atmosphere. The average concentration for 2018 was 407.8 ppm and the 2019 average will likely rise to over 410, according to the World

3 Oliver Milman, *James Hansen, father of climate change awareness, calls Paris talks 'a fraud'*, The Guardian, 12 December 2015; Kim Nicholas, *Top scientists weigh in on current draft of Paris climate agreement*, International Council for Science, 11 December 2015 at https://roadtoparis. info/category/science/.

The leading idea for removing carbon from the atmosphere is to burn trees, on a stupendous scale, in power stations fitted with carbon capture and storage (CCS). The carbon absorbed by the growing tree is thus captured and removed into a geological storage. The question of how much land is needed to grow the trees is not asked. The question of whose land will be appropriated is not asked. The question of whether CCS will work at the scale required is not asked. This is not so much science fiction as a scientific fairy tale.

4 Nick Mabey, *After failure in New York, we must reshape the politics of climate change*, Climate Home News, 24 September 2019, at https://www. climatechangenews. com/2019/09/24/failure-new-york-must-remake-politics-climate-change/

Meteorological Organisation [WMO 2019]. This contrasts with earth's normal operating system which, over the last million years, has oscillated between 180 ppm during ice ages and 280 ppm during temperate periods.

Concentrations were last stabilised at around 400 ppm in the Pliocene period between five and three million years ago. The global average temperature was then up to 4°C hotter than now and the seas were 20 metres higher. Trees were growing in some parts of Antarctica where temperatures were 20°C warmer than now.[5] One key difference now is that CO_2 concentrations are not stabilised. They are still rising and rising faster than in any previous epoch. The rate of increase is also rising, from about 1.4 ppm per year in the 1980s to over 2 ppm per year now.

Hansen et al [2008] argue that a 'safe' concentration is no more than 350 ppm and reducing the CO_2 concentration to this level should be the aim of a global response to climate change, rather than the 2°C temperature target.

Emissions and budgets

CO_2 emissions from burning fossil fuels are also still rising. Emissions reached 37 billion tonnes (Gt CO_2) a year in 2018 and "there is still no sign of a peak in global emissions", according to the Global Carbon Project [in WMO 2019]. In the last five years, the oil burn has increased by 1.5% per year and the gas burn by 2.6% per year Emissions from coal "were thought to have peaked in 2013". Coal burning declined in the next three years but rebounded with a sharp increase in 2017. Coal still has the largest share of emissions at 40% (14.7 Gt CO_2), followed by oil at 35% (12.8 Gt) and gas at 21% (7.6 Gt). Emissions from cement kilns accounts for the remaining 4% (1.5 Gt). In addition to emissions from fossil fuels, 5 or 6 Gt CO_2 are emitted each year from industrial agriculture and deforestation, bringing annual emissions to about 42 Gt CO_2.

Carbon 'budgets' are calculations of how much more CO_2 can be emitted without crossing a particular temperature limit. These budgets do not take account of natural feedback loops – the earth's response to warming which

5 Damian Carrington, Last time CO_2 levels were this high, there were trees at the South Pole, The Guardian, 3 April 2019.

adds yet more heat – or the highly uncertain reductions of emissions from other GHGs such as methane [see below].

In the groundWork Report 2017, we cited Rahmsdorf and Levermann's budget for a 66% chance – a two in three chance – of staying below 2˚C. They put it in the range of 150 to 1050 Gt CO_2 from 2017 and forever after. The lower limit will be crossed by 2021. They observe, "Even the CO_2 budget corresponding to the mid-point of this uncertainty range, 600 Gt CO_2, is equivalent to only 15 years of current emissions" [2017: 4].

They emphasise that, if emissions do not peak before 2020 and then decline sharply, it will not be possible to meet any credible 2˚C budget. Any later and the decline will be too steep to manage. Therefore, action to sharply reduce carbon emissions now is more important than a remote target such as zero by 2050. This logic must apply to all countries as well as the world as a whole.

In October 2018, the International Panel on Climate Change (IPCC) published its Special Report on 1.5°C [IPCC SR1.5 2018]. It gives a budget of 580 Gt, starting in January 2018, for a 50% chance – one in two – of staying below 1.5˚C and 420 Gt for a 66% chance. By January 2020, these budgets will be down to 496 Gt for the half chance and 336 Gt for the two in three chance [C1.3].[6] At current rates of emissions, these budgets will be bust in 12 years and eight years respectively. All emissions after that will go deeper into the red.

The Special Report finds that by 2030 CO_2 emissions must be reduced by 45% against 2010 levels – in other words, to about 20 Gt a year for any chance of staying below 1.5˚C [C1]. Like Rahmsdorf and Levermann, the report emphasises the need for immediate action to reduce emissions. We should recall, however, that several deadlines for peak emissions have already been missed. The IPCC's Fourth Assessment Report said that emissions should peak between the years 2000 and 2015 for a 'best estimate' temperature increase of 2 to 2.4˚C [2007: AR4 Table SPM 6].

6 References are to paragraphs in the approved summary for policy makers (SPM).

The SR1.5 budgets are more optimistic than those given in the IPCC's Fifth Assessment Report (AR5) in 2013 as revisions in methodologies have increased "the remaining carbon budget [by] about 300 $GtCO_2$ compared to AR5" [2018: ft nt 14]. That increase, however, may well be reversed in the Sixth Assessment Report, due out in 2021, because the latest climate models are showing smaller budgets and higher temperatures than in previous reports.[7]

CO_2 is the most important GHG because there is a lot of it and it lasts a very long time in the atmosphere. The next most important are methane (CH_4) and nitrous oxide (N_2O). These are more potent but less abundant GHGs than CO_2. Global emissions of all GHGs are measured in carbon dioxide equivalents (CO_2e). Emissions reached 53 Gt CO_2e in 2017 and are still rising, according to the United Nations Environment Programme [in WMO 2019]. The possibility of coming in under 1.5°C also requires a steep reduction in these gases.

Sulphur dioxide (SO_2) pollution, on the other hand, forms silvery aerosols which reflect heat back into space and so has a cooling effect. But this really only masks the degree of heating. SO_2 stays in the atmosphere for a very short time – a matter of days – so the earth warms rapidly as the SO_2 pollution is reduced along with the masking effect.

Cooling from sulphur aerosols has, up to now, been more or less equivalent to heating from the combination of non-carbon GHGs plus black carbon aerosols (fine soot). So scientists have tended to assume that aerosols and non-carbon GHGs cancel each other out, leaving them to keep the focus on CO_2. But this assumption holds only if reductions in SO_2 – which are essential for people's health and to prevent further acid fallout onto soil and water – are accompanied by reductions in these other GHGs. To the contrary, however, methane emissions and concentrations in the atmosphere have been rising rapidly in recent years. Leaks from oil and gas production, notably from gas flare failure and fracking, are the most significant sources of this increase.[8]

7 Marlowe Hood, *Earth warming more quickly than thought, new climate models show*, 17 September 2019, at https://phys. org/news/2019-09-earth-quickly-climate. html

8 Naureen Malik, *Snuffed-Out Flares Are Biggest Methane Offender, Satellites Show*, Bloomberg, 25 September 2019.

Ready to burn

The coal, oil and gas from 'developed reserves' – that is, working mines and wells – contains about 942 Gt CO_2, not including other GHGs, as calculated by Oil Change International [2016: 19]. To it must be added another 162 Gt of committed emissions from existing cement kilns and an estimated 21 Gt from land use change, such as forest destruction, to bring the total to 1 125 Gt. This is higher even than the 1 050 Gt at the top of Rahmstorf and Levermann's range for a 2°C budget. And it is more than three times the IPCC's budget for a two in three chance of limiting warming to under 1.5°C.

Hence, it is not just fossil fuel reserves – the stuff that the corporations have booked as ready for development at current prices – amounting to about 2 600 Gt CO_2 that must be abandoned. For a ghost's chance of avoiding 2°C, let alone 1.5°, exploration must stop, new developments must be cancelled and a significant proportion of working mines and wells – together with power stations and refineries – must be closed ahead of schedule. In short, the entire fossil fuel industry should now be working towards closure. Instead, the industry and its allies in the US Republican Party have supported a campaign of obstruction and misinformation since the 1970s.[9]

Temperatures and impacts

Global average temperatures lag behind the rise in CO_2 levels but are also rising fast and driving rapid climate change. Warming is now at over 1.1°C above the 1850-1900 average.[10] This is already dangerous climate change: people are experiencing extreme heat, drought, hurricanes and floods. July 2019 was the hottest month ever recorded. Temperature records were smashed in the Arctic, in Europe and in Australia. Drought seared south east Asia, south western Africa and central America. Floods inundated large areas of west Africa and east Africa, Iran, the Australian north east, and the north American mid-west and great lakes regions. Cyclones flattened and flooded parts of Mozambique and India, virtually wiped out the Bahamas and lashed Japan.

9 Dana Nuccitelli, *The GOP and Big Oil can't escape blame for climate change*, The Guardian, 6 August 2018.
10 If pre-industrial is taken to be 1750, as used to be the case, warming is now at 1.3°C.

Wildfires burnt with unprecedented ferocity in the Arctic, where fires are rare, and in Australia. And the forests burnt across the tropics, in the Congo, south east Asia and the Amazon. Many tropical fires were lit on purpose to clear the land for commercial farming – beef in the Amazon and palm oil in Indonesia – and to force indigenous people out of their territories. Extreme weather resulted in 22 million people being displaced in 2019. And 820 million people suffered hunger.[11]

The impacts at 1.5°C will be much more severe, particularly for the poorest half of the world's people, and the impacts at 2°C exponentially more severe, as shown by the IPCC SR1.5. This reflects the "accelerating risk" that accompanies each 0.1°C of additional heat [Hoegh-Guldberg et al 2019]. The collapse of agriculture is already threatened in some regions – notably in Africa, including the Western Cape – and the collapse of global fisheries from ocean warming, acidification and plastic pollution, as well as industrial over-fishing, is in process.

In July 2018, leading climate scientists warned of "the risk that self-reinforcing feedbacks could push the Earth System toward a planetary threshold that, if crossed, could prevent stabilisation of the climate at intermediate temperature rises and cause continued warming on a 'Hothouse Earth' pathway even as human emissions are reduced" [Steffen et al 2018]. They emphasise that cascading feedbacks – where crossing one tipping point sets off the next – may be triggered at between 1.5° and 2°C warming above pre-industrial temperatures. This is runaway climate change leading to unliveable 'hothouse earth' conditions.

This message was repeated with even greater urgency in November 2019 just ahead of the climate negotiations in Madrid:

> In our view, the evidence from tipping points alone suggests that we are in a state of planetary emergency: both the risk and urgency of the situation are acute. … We argue that the intervention time left to prevent tipping could already have shrunk towards zero, whereas the

11 World Meteorological Organisation, Provisional statement on the State of the Global Climate in 2019.

> reaction time to achieve net zero emissions is 30 years at best. … The stability and resilience of our planet is in peril. International action – not just words – must reflect this. [Lenton et al 2019: 595]

Change the system

The IPCC SR1.5 warns:

> Pathways limiting global warming to 1.5°C with no or limited overshoot would require rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems (high confidence). [C2]

Moreover, "Such changes facilitate the pursuit of climate-resilient development pathways that achieve ambitious mitigation and adaptation in conjunction with poverty eradication and efforts to reduce inequalities (high confidence)" [D6]. On the one hand, it observes that global warming is likely to increase poverty and inequality [B5.1], a point also made by the South African government's draft National Climate Change Adaptation Strategy (NCCAS) [DEA 2019; 4], but on the other hand, "social justice and equity are core aspects of climate-resilient development pathways that aim to limit global warming to 1.5°C …" [D6.1].

In short, creating a more equal society – including through redistributive measures [D4.5] – is necessary for both mitigation and adaptation. The Lancet Commission on Health and Climate Change similarly argues that "tackling climate change could be the greatest global health *opportunity* of the 21st century"[12] [our emphasis]. Phasing out fossil fuels would not only remove a heavy burden on people's health but would also begin the process of detoxing and restoring ecological systems necessary to adaptation. Healthy people and healthy eco-systems are needed for adaptation.

12 Nick Watts et al, 2015. Health and climate change: policy responses to protect public health, The Lancet Commissions. Published online June 23, 2015 http://dx. doi. org/10.1016/S0140-6736(15)60854-6

Restoring earth

Restoring the earth is as much about mitigation as adaptation. From 1750 to 2011, burning fossil fuels released 1 340 Gt CO_2 into the atmosphere. "Deforestation and other land use change" – that is, industrialised logging, agriculture and plantations – put another 660 Gt CO_2 into the air [IPCC 2013: 7]. Restoring earth would result in a large portion of this "above ground" carbon being reabsorbed. This is confirmed by the IPCC's special report on Climate Change and Land (SRL), published in August 2019, which says: "Sustainable land management … can also contribute to mitigation and adaptation. Reducing and reversing land degradation, at scales from individual farms to entire watersheds, can provide cost effective, immediate, and long-term benefits to communities … with co-benefits for adaptation and mitigation" [IPCC 2019a: B5]. Sustainable land management includes practices such as agroecology based on restoring the carbon content – and hence, the fertility – of soils and the restoration of forests, wetlands and other ecosystems. Further, land based mitigation is *required* to meet either the 1.5 or 2°C targets [B7].

To the contrary, however, natural ecosystems are being destroyed and biodiversity is still in decline so areas that should absorb (or sink) carbon are not doing so or the process is reversed and they are actually emitting carbon. Good soil, for example, holds lots of carbon which is lost when the soil is eroded or depleted by intensive fertiliser use. And about 4.8 Gt CO_2 a year is lost through tropical deforestation. The Amazon is the world's largest rainforest and a massive land based sink, but the combination of deforestation and climate change is driving it across a tipping point that will convert it to a dry savannah with the loss of hundreds of billions of tonnes of CO_2. Since the 1970s, 17% of the forest has been destroyed. Various estimates put the tipping point at between 20% and 40% loss of forest cover [Lenton et al 2019].

Limits to adaptation

The IPCC SRL warns that sustainable land management may be overwhelmed by the impacts of climate change and the carbon stored in soils and forests may again be lost to the atmosphere. In some cases, the "limits to adaptation" are

already exceeded. That includes the melting of permafrost in Arctic regions. These frozen peat lands contain very large amounts of carbon dioxide and methane, which is already beginning to leak out with the melt. In some cases the release of methane is so violent that it leaves massive craters. This is one of the 'self-reinforcing feedbacks' that will lead to runaway climate change if urgent action is not taken now.

It is linked to another feedback. Arctic sea ice is rapidly shrinking and thinning. Ice reflects heat away from the earth. When it melts, it exposes the dark sea which absorbs heat. In summer, the ice is now half gone and the warming sea heats the land well beyond the shore and so accelerates the melting of permafrost. Ice sheets on land in Greenland and the Antarctic are also melting as are the ice caps and glaciers on mountain tops around the world. This ice is melting into the sea at about 650 billion tonnes a year and is now the major cause of sea level rise [IPCC 2019b: A1, A3]. This year, the Arctic heatwave resulted in record melting on sea and land during July. Massive wildfires burned across Alaska in the US and Siberia in Russia. The sooty fallout from the fires darkened the ice and so accelerated the rate of melting.

Marco Tedesco, a climate scientist at Columbia University, observed, "It looks like the worst case scenario put forward by the IPCC could be an underestimate because we are seeing ice melting now that we expected 30 to 40 years from now. It's alarming because it's very fast-paced and the consequences are hard to predict."[13]

The IPCC's worst case scenario is now for 1.1 metre sea level rise by 2100 with several metres more to follow in the next centuries [SR OCC 2019b: B3]. In contrast, Hansen et al argue that, in the absence of stringent mitigation, "multi-metre" sea level rise is possible in this century [2015: 40]. However high the seas rise, it will be compounded by 'king' tides and storm surges at particular locations. The IPCC reports that 'extreme sea level events' that previously occurred once in a hundred years will occur annually at most locations by 2100 and by 2050 in many coastal megacities. That includes Durban and Cape

13 Oliver Milman, *Alaska records warmest month ever in July with coastline barren of sea ice*, The Guardian, 8 August 2019.

Town [2019b: figure SPM.4]. On 1 September 2019, Hurricane Dorian struck the Bahamas with winds gusting over 300 km/h, torrential rain and a storm surge of over seven metres. Most of the territory was inundated and almost all the 70 000 people lost their homes, at least 50 were killed and over 1 300 were still missing in late September. At an oil terminal on Grand Bahama, the lids were ripped off 25 million litre tanks and an unknown quantity of oil spilled into the flood waters and now saturates the land around.[14] Hansen et al [2015] show evidence of massive storms striking the Bahamas in the Eemian period about 130 000 years ago when the earth was just a little hotter than now. The really big storms are still to come.

Tearing the web of life

Climate change is but one aspect of a global environmental crisis threatening economies and people's livelihoods. The ruin of land, fresh water and the oceans makes people and their environments more vulnerable to climate change. Environmental 'services' are now in jeopardy in many areas, including in South Africa. As the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) puts it, "The biosphere, upon which humanity as a whole depends, is being altered to an unparalleled degree across all spatial scales. Biodiversity – the diversity within species, between species and of ecosystems – is declining faster than at any time in human history" [2019: A]. Something like a million species of plants and animals face extinction as the web of life is ripped apart.

That includes agricultural crops, fruits and animals, and the loss of biodiversity erodes the resilience of local food systems. In our view, this is not merely a consequence of big corporations dominating all points in an increasingly global food system, but an intentional corporate strategy to enable ownership of genetically defined varieties. And while "food production today is sufficient to satisfy global needs, approximately 11 per cent of the world's population is

14 Oliver Laughland, 'We have no food or water': Hurricane Dorian survivors feel abandoned, The Guardian, 7 September 2019; and https://en. wikipedia. org/wiki/Hurricane_Dorian accessed 26 September 2019.

undernourished …" [IPBES 2019: A2]. Pests and pathogens, on the other hand, are proliferating and moving into new areas.

IPBES identifies five "main drivers of change in nature": the conversion of ever more land with forests, wetlands and grasslands taken for agriculture, mining, infrastructure and urban expansion; the over exploitation of animals and plants – notably over-fishing at sea and logging in the forests; climate change, with the impacts on all other ecosystems growing ever more significant; the pollution of air, water and soil by industry, mining, industrial agriculture, sewage, plastic and consumer wastes; and the mass transport of invasive species into local habitats.

The underlying causes, according to IPBES, are the growth in population, economic production and consumption, materials use and trade. It observes highly "unequal access to material goods" consequent on unequal power relations between social actors [B.4]. Economic policies have favoured economic expansion over environment but the proceeds of growth are unequally distributed. It recommends amongst other things that policies for sustainability must reduce total consumption and waste, address inequality and ensure inclusive decision making [D.3]. And it concludes that "global financial and economic systems … [must] steer away from the current limited paradigm of economic growth" [D.10]. This is a very unusual conclusion for a document produced within the international system and approved by governments. IPBES, however, appears not to recognise the implications of their conclusions for a capitalist economy for which growth is an absolute requirement.

Growth wastes the people

'Eco-modernisation' – also known as 'green growth' or even 'green new deal' – relies on magical thinking, as Jason Hickel puts it. This is because growth requires the use of ever more natural resources (including fish, livestock, forests, metals, minerals and fossil fuels) and this is breaching several planetary ecological boundaries in addition to the climate. While "a sustainable level of resource use is about 50 billion metric tonnes [of everything] per year",

present use is 70 billion tonnes and, assuming global growth of 3% a year *and* the universal adoption of the most efficient resource use, will rise to over 90 billion tonnes by 2050.[15] We should note that the renewables economy is very resource intensive, particularly in its use of metals. So while a transition from fossil fuels to renewable is an essential response to climate change – as well as being the cheaper option – it must be accompanied by an overall reduction in energy use.

The underlying point, however, goes to the lie that is at the heart of modernising development – that economic growth is about 'lifting' people out of poverty. As IPBES notes, material goods are unequally distributed. Something over 80% are consumed by the richest 20% of the population. At the very top end of consumption, 2 043 dollar billionaires consume on a monumental scale – with private jets, private yachts and multiple homes around the world. This, of course, is all to the benefit of GDP growth which added about $3 trillion in 2017. But the richest 1% of people took 82% (about $2.3 trillion) of that additional income while the bottom half of humanity got none of it, reports Oxfam [2018]. The billionaires alone took $762 billion (SAR10.6 trillion), around $373 hundred million each on average [2018: 10]. This is likely to be an underestimate as the rich are notorious for concealing their income and evading tax [48].

They are also doing their own profoundly perverse adaptation, buying up places to isolate themselves from the social and/or ecological breakdown that they have helped make. The most extreme destination is Mars, an improbable fantasy that is igniting a plutocratic space race. Here on Earth, the more extreme locations include refurbished atomic bunkers or farming estates in areas the rich think safe, but they also include variations on gated communities, the enclaves of wealth that are already a familiar part of urban and rural landscapes. All come with armed security. Underlying the escapism

15 Jason Hickel, Blog, *The magical thinking of ecomodernism*, 4 April 2018; and *Why growth can't be green*, Foreign Policy, 12 September 2018.

of the rich is a profound unease at the extreme levels of inequality created by the policies that they have promoted for the last fifty years.[16]

Beyond 'consumers', the institutions of state and capital devour material on an even larger scale: for grandiose rich city developments with corporate towers of glass and steel, business and diplomatic travel, infrastructure and energy and for advertising conspicuous consumption. Government consumption includes socially necessary spending such as for schools and hospitals and water and sanitation infrastructure. It also includes the materiel of destruction. Global military spending in 2018 was over US$1.8 trillion, of which the US alone spent $650 billion.[17] Not counting the energy embodied in materials – that is, the energy used to produce ships, planes, tanks and buildings – the US military uses more energy and emits more greenhouse gases than any other single institution in the world.

Governments and corporations fund the infrastructure of extraction and waste – the mines and oil and gas wells and pipelines, the coal railway lines, the ports and ever bigger ships, the factories, shopping malls and, finally, the vast waste dumps and incinerators. As we observed in 2009:

> Behind each product on the shop shelf lies the 'value chain' of production which is shadowed by a vast chain of waste and destruction. This shadow leaves a deep toxic stain that spreads through air, water and land across the face of the earth and across time into a poisoned future. [gWR 2009: 79]

In America, 99% of those products are trashed within six months of purchase and the rest of the world is not far behind. This is not merely incidental. Following World War II, corporate leaders concluded that "we need things consumed, burnt up, replaced and discarded at an ever accelerating rate" to

16 Christopher McMichael, Survivalism of the rich, New Frame, 7 February 2019; Evan Osnos, Doomsday Prep for the Super-Rich, The New Yorker, 30 January 2017; Douglas Rushkoff, Survival of the Richest, in Clare Farrell, Alison Green, Sam Knights and William Skeaping eds., This is not a Drill, Extinction Rebellion Handbook, Penguin, 2019

17 The Stockholm International Peace Research Institute: https://www. sipri. org/media/press-release/2019/world-military-expenditure-grows-18-trillion-2018 posted on 29 April 2019.

absorb the product of ever growing productive capacity.[18] Profit depended on growth and growth depended on waste and they intentionally shaped the consumer society to that end.

For every bin of consumer waste, there are another 70 bins of waste from extraction and production. The imperial colonies were always about cheap extraction founded on the people's dispossession, coerced labour and the slow violence of what Ken Saro Wiwa called ecocide [Nixon 2011]. Following the war, the US appropriated the imperial mantle and developed new ways of maintaining the extractive relationship as the colonies took independence, notably through rule by proxies, coercion by debt and unequal exchange through the rigged rules of trade. The big industrial transnational corporations then controlled the flow of materials from the Third World to their factories in the North.

With the neo-liberal restructuring of production from the 1980s, production was disassembled and relocated for cheap labour and cost-free pollution. Global production networks located the dirty end of the production chain in the global South, giving the North the appearance of clean production. This is an uneven process but, schematically, what has emerged is a triangular ordering of the global economy. Raw materials extracted from Africa and Latin America are taken to the Asian factory to produce goods consumed in the North. This flow of resources is largely managed by Northern transnational corporations that also take most of the profits. Growing inequality globally and in most countries is accompanied by growing concentration of ownership and control. Much of what is made in China is made under supervision by the transnational corporations that own the brand and associated intellectual property rights. Heavy pollution in China has as much to do with cost cutting imposed by Northern lead firms as with cowboy development in the wild East. But power is not only about direct control of production. 'The market' – meaning global capital – works through network power and is effectively shaped by just 147 corporations, most of them in the financial sector [see Vitali et al 2011].

18 Retail analyst Victor Lebow quoted by Annie Leonard, The story of stuff, at https://storyofstuff. org/

This system has not recovered from the financial meltdown on Wall Street in 2008. Indeed, the accelerated concentration of economic power is itself a symptom of the crisis as corporations fight for position in volatile markets. The aggressive and erratic policies of US President Donald Trump are also symptomatic, an incoherent articulation of the splintered interests of American capital. Meanwhile, the central banks are still pursuing policies that inflate 'asset prices' – stock market shares and property – to sustain capital. As discussed in the 2014 groundWork Report, they conjured up trillions of dollars blowing bubbles to contain the crisis created by the bubble economy of Ponzi capitalism. In contrast, nine years after it was established, the Green Climate Fund (GCF) "created to support developing countries in responding to climate change", and one of two entities responsible for the operation of the financial transfer mechanism of the UNFCCC, has a mere $5.2 billion in committed funding.[19]

Dangerous climate change in Southern Africa

Drought

"Sub-Saharan Africa has experienced the dramatic consequences of climate extremes becoming more frequent and more intense over the past decades", according to the IPCC SR1.5.[20] In southern Africa, it is hotter and droughts are more frequent and getting longer, particularly in the western part. In 2019, drought affected southern Angola, Namibia, Botswana and the western areas of Zambia and Zimbabwe, large parts of South Africa and even Lesotho, which is normally wet. The drought in the Zambezi basin has reduced the flow of water into the Kariba Dam, forcing a reduction in power supply from the dam. In Lesotho, the Katse Dam, at the centre of the cross watershed transfers to South Africa's Vaal Dam and the Gauteng region, is virtually empty. The

19 https://www. greenclimate. fund/home at 7 October 2019.

20 Chapter 3: Impacts of 1.5ºC global warming on natural and human systems, p.36 ff.

country scarcely recovered from the previous 2014-16 drought before facing the next one.[21]

The drought has also reduced the harvest and millions of people across the region and most countries are facing food shortages and/or rising prices. Water sources are drying up and women are walking further from home to fetch and carry it. The water they do find is often muddied or polluted. Zimbabwe is reported to be facing famine on an unprecedented scale. Previously, food shortages have affected rural areas but, according to the World Food Programme, three million urban people are now at risk along with over five million rural people. The taps have run dry in Bulawayo, the second city, and in half of the capital Harare where two out of its four supply dams are empty. In both cities, the water systems are breaking down and there is no money to fix them. Moreover, in Harare the remaining water supply dams are polluted by sewage and mining wastes from upstream settlements. This substantially increases the cost of treating the water – for which there is little money.[22]

Zimbabwe's failing systems are the result of bad politics and economic collapse as well as drought. And the bad politics were not only home grown with President Robert Mugabe's authoritarian rule. In the 1990s, the government was lauded by the International Monetary Fund (IMF) and World Bank for implementing a structural adjustment programme [Bond 2007]. The recessionary effects of the programme – reducing the value of wages, throwing many out of work, eroding state services and corroding the infrastructure – sparked widespread resistance, which was met with escalating repression. The economy collapsed while the elite, particularly those linked to the military,

21 Nomahlubi Jordaan, *Dry Katse Dam highlights need to conserve water in Gauteng, but don't panic, says department*, Times Live, 13 September 2019; https://reliefweb. int/report/lesotho/lesotho-drought-situation-update-02-8-october-2019; Sipho Kings, *High and dry: South African drought leaves Lesotho parched*, Climate Change News, 6 October 2016.

22 Sophie Mbugua, *Two million in Zimbabwe's capital have no water as city turns off taps*, Climate Change News, 15 July 2019; Bloomberg, *Worst-ever famine threatens Zimbabwe as economy collapses*, 20 September 2019, Bloomberg, *A water crisis is making things even worse in Zimbabwe*, Engineering News, 13 September 2019;

See also https://reliefweb. int/report/zimbabwe/unicef-zimbabwe-multi-hazard-situation-report-quarter-1-2019; https://reliefweb. int/report/zambia/giews-country-brief-zambia-15-april-2019;

looted the remains and undermined economic reforms instituted by a short lived coalition government.

The army removed Mugabe from power in November 2017 and installed Emmerson Mnangagwa who went on to win rigged elections in August 2018. The country is effectively broke and, in May 2019, it called in the IMF. It is now managing its economy under the tutelage of an IMF 'staff monitored programme'. The programme requires a large cut to government budgets and pro-market reforms agreeable to foreign capital as well as privatisation of state owned enterprises. In particular, Zimbabwe must repay its debts to the International Finance Institutions – the World Bank, the African Development Bank and the European Investment Bank – as a requirement for readmission to the 'international community'. The IMF says that risks to the programme are high, notably from "two external shocks" – the drought and the damage done by Cyclone Idai.[23]

Flood

Idai wracked Malawi, Mozambique and Zimbabwe in March this year. It started as a tropical depression that brought devastating floods to Malawi and Mozambique's Zambezi valley. Four days of heavy rain in early March left over 100 people dead and 300 000 without proper shelter as their homes were either damaged or destroyed. The storm system then moved out to sea where it sucked up energy from the warm waters of the Mozambique Channel and became Cyclone Idai. It moved south and west to make landfall at Beira and then drove directly inland across Mozambique and into the Chimanimani mountains of Zimbabwe. It whipped up winds of 200 km/h and dumped 600 mm rain in places. It virtually destroyed the city of Beira. All told, Idai affected three million people, leaving over a thousand dead with some two thousand more missing.

Just six weeks later, Cyclone Kenneth landed on northern Mozambique driving winds up to 230 km/h. It flattened Ibo Island as it made landfall north of

23 IMF Country Report, Zimbabwe Staff-Monitored Program—Press Release and Staff Report, May 2019; Ndamu Sandu, *IMF approves Zim's economic reform plan*, Business Times (Harare), 31 May 2019

Pemba. Some 30 000 people evacuated their homes in response to a call by the Mozambican authorities but more than 50 died. It caused less damage than Idai only because the area is less populated and people were given some warning.

Kenneth is the most powerful cyclone recorded on Africa's east coast and it struck further north than any cyclone to date. This is also the first time that two cyclones have driven into the east African coast in a single season. Barely a week after Kenneth, a third and even more powerful cyclone formed in the Indian Ocean and tracked northwards to Bangladesh and Indian Bengal. A million people were evacuated to higher ground but about 90 died. Jennifer Fitchett, a geographer at Wits University, comments:[24]

> These high intensity storms have been tied to the very warm sea surface temperatures in the Indian Ocean. Temperatures of 30°C are occurring more often and over longer periods of time … The South Indian Ocean is warming rapidly. This means that regions that previously experienced the temperatures of 26.5°C that facilitated tropical cyclone formation are now experiencing temperatures as warm as 30-32°C. Simultaneously, regions further from the equator which didn't previously have sufficiently warm water for tropical cyclone formation, with sea surface temperatures of 24-26°C are more regularly experiencing the threshold temperature. This increases the range in which these storms occur, making storms like tropical cyclone Dineo, which made landfall in February 2017 in southern Mozambique, more common.

The immediate physical damage from wind and rain is followed by longer term damage. Hundreds of thousands of people's homes have been lost or seriously damaged. Almost every building in Beira lost its roof. Roads, electricity lines, water pipes and sewers were damaged or destroyed. Flood water was filled with shit, rubbish and drowned animals. These conditions give rise to cholera. International aid agencies moved in fast and inoculated some 900 000 people

24 Jennifer Fitchett, Why the Indian Ocean is spawning strong and deadly tropical cyclones. The Conversation, 8 May 2019.

but there were still between 6 000 and 8 000 cases recorded in Beira.[25] Malaria follows cholera as the next major health threat. Mosquitoes breed fast in the water pools left by the flood and people's defences – nets and screens – are destroyed along with their houses. UNICEF reported 15 000 new cases within a month of Idai.[26]

Public health infrastructure was also damaged. Hospitals were roofless, flooded and without power. People with chronic conditions could not access treatment and pregnant women had no assistance. Six months later, the aid agencies were scaling down or pulling out while many local health facilities were barely stabilised and still in field tents. They always were underfunded and understaffed and damage to roads and bridges makes some of them more difficult to reach. The hope of building back better infrastructure than was there before the storm is fading as donor pledges fall short.[27] Similar questions are asked in relation to the rebuilding of Beira itself: will it go up as before or can it be rethought to cope better with extreme wind and flood?[28]

Regional power lines to South Africa and Zimbabwe were also brought down and exacerbated loadshedding on already constrained centralised grids. The line to South Africa was, however, restored relatively quickly.

Idai and Kenneth struck just before the harvest so peasant farmers lost their crops. Coastal communities farm and fish. They lost their boats as well as the harvest. Aid agencies have brought in emergency provisions for over a million people as well as seed for thousands of peasants in Malawi and Zimbabwe as well as Mozambique. It seems, however, that there has been little to harvest in 2019. By the end of the year, poor households had "long ago exhausted their food reserves" and were surviving on food aid, wild foods and the market. However, market food prices have risen sharply and aid has not got through to Capo Delgado and parts of Moatize where households are in crisis. In Sofala province, where Beira is located, households do have access to food aid but

25 Pasha 15: The unhealthy aftermath of Cyclone Idai, podcast, The Conversation, 17 April, 2019.
26 UNICEF press release, Nearly 15,000 cases of malaria reported in areas of Mozambique affected by Cyclone Idai, 25 April 2019.
27 Tendai Marima, *We will have to start for Zero*, Mail & Guardian, 20 September 2016
28 Ari Shapiro and Jonathan Lambert, *He Thought His City Was Prepared For Big Storms. Then Cyclone Idai Hit*, NPR, 10 April 2019

are still stressed. Cases of pellagra, resulting from a vitamin deficiency, are increasing. The area will remain increasingly stressed until the main harvest in March 2020.[29]

The funding, however, was not and is not adequate to the need.[30] At a UN donor conference in June, Mozambique asked for US$3.2 billion but received pledges for only $1.2 billion.[31] It is likely to receive much less as donor country pledges are rarely honoured in full.

From Zimbabwe, the Centre for Natural Resource Governance comments, "Had there been enough adaptation resources, a significant number of lives could have been saved". While rich countries are responsible for most historical emissions and have done little to curb emissions, people in "poor countries are on the receiving end of deleterious effects of climate change". This creates a climate debt that should be paid, not to governments who have proved corrupt, but direct to the people through "trusted agencies in civil society".[32] The IMF, in contrast, does not mention climate change but is worried by the impact on fiscal discipline. Donor appeals have not raised enough to cover the "humanitarian consequences" of Idai or of the drought and the government has borrowed more money which "worsens the country's debt distress".[33]

South Africa is Africa's top polluter and so has a share of the rich world's climate debt. But it is not everyone's debt. South Africa's economy has produced the most unequal society in the world and the climate debt is owed by rich to poor within the country as well as in Africa. The National Climate Change Adaptation Strategy does not mention climate debt. Rather, it notes that there is a large 'gap' in adaptation funding for Africa and calls for increased funding from developed countries as well as from "continental and national levels" [DEA 2019: 3].

29 Famine early warning systems network, Mozambique food security outlook update, December 2019.

30 Stephen Eisenhammer, Hunger stalks Mozambique after deadly cyclone destroys farmland, Business Day, 1 April 2019; & https://reliefweb. int/report/mozambique/one-month-after-cyclone-idai-food-shortages-outpace-funding

31 https://reliefweb. int/report/mozambique/donors-pledge-usd-12-billion-reconstruction-mozambique-after-cyclones posted on 3 June 2019.

32 CNRG, Cyclone Idai: Time the rich countries compensate victims of climate change disasters, Press release, 18 March 2019.

33 IMF op. cit. p.8.

It also makes no mention of the likelihood that increasing numbers of people will be displaced within countries and across borders as climate change intensifies. South Africa already hosts many people who have been displaced by a combination of interrelated reasons including bad politics, violence and deteriorating economic and agricultural conditions. Thus far, repeated incidents of xenophobic violence indicate that it has not managed very well. In future, as in the past, it may not be one way traffic. South Africans may also find themselves looking for kindness from strangers in neighbouring countries. Neither Home Affairs nor International Relations are included in the various governmental climate change committees proposed under the strategy.

South Africa unready

The dry west

Since 2014, drought has afflicted various parts of South Africa. In parts of KwaZulu-Natal soil moisture and dam levels have not fully recovered from the three year drought of 2014 to 2016. Cape Town narrowly averted running dry in 2018 before average winter rainfall restored dam levels. By October 2019, the dams supplying Cape Town were at 80% capacity. But poor people in the shack settlements still live with permanent Day Zero in Cape Town. Other parts of the Western Cape remain at risk. In 2018, we reported that Beaufort West's Gamka Dam ran dry in August. In 2019, the town has had some winter rain but only enough to fill the dam to 33% of capacity.

Elsewhere, the drought has intensified as it has done in neighbouring countries with emergencies declared in parts of the Free State, Northern Cape and the Eastern Cape. Many areas have not seen substantial rain in six years and increased temperatures have sucked moisture from the soil. As Cupido and Taylor reported in June, farms across the area are being abandoned, "… their gates … locked and the keys handed over to the banks". In the Northern Cape, 8 000 farm jobs have been lost. Thousands more have been lost in the Eastern Cape and Free State.

People from the farms are moving into the small towns across the region. But these towns are there to service the farms and their economies have collapsed along with farming. Imtiaz Sooliman of Gift of the Givers said, "This drought is bigger than anyone has ever seen or ever known". At least 63 towns needed immediate and substantial help and commercial agriculture in the Karoo was in a state of "total collapse". The organisation estimated that the Northern Cape would need R300 million in drought relief for the next year. In October, Deputy President David Mabuza committed R30 million for animal fodder and said government would drill more boreholes.[34]

In the Eastern Cape, several major towns are in deep crisis as drought has combined with the failure of municipal governments. Graaff Reinet is a town of over 36 000 people. The Nqweba Dam is dry and the town now depends on boreholes but the supply doesn't get to the end of the line in the township. A municipal tanker makes erratic deliveries but the water is dirty and undrinkable. Gift of the Givers is delivering bottled water. Local people have formed a Water Crisis Group but "are really struggling to get answers" from the municipality.[35]

Queenstown, with a population of about 70 000, is the major town in the Chris Hani District Municipality. The Bonkolo Dam is dry and the level in the secondary Waterdown Dam is now below 30%. The new Xonxo Dam has been built but is not yet supplying water to the town. Local people say the project is two years behind schedule. Several local villages have no water. Some township areas have had haphazard deliveries by water tankers. Others have piped water for an hour a day but residents say the municipality does not stick to its schedules.[36]

There are also about 70 000 people in Makhanda (formerly Grahamstown). The economy centres on Rhodes University and a number of schools and the town hosts the annual National Arts Festival. Apartheid produced a divided water system. The original system on the affluent west side of town is supplied

34 Delme Cupido and Tristen Taylor, *Drought drives Karoo to collapse*, Business Day, 16 June 2019; Alex Mitchley, *Mabuza commits R30m for drought relief in Northern Cape*, News24, 4 October 2019.
35 Estelle Ellis, *Eastern Cape: 'The worst drought in a thousand years'*, Daily Maverick, 10 October 2019.
36 Nombulelo Damba-Hendrik, *Threat of drought looms over Eastern Cape town*, GroundUp, 4 October 2019.

from the local Settlers Dam. Rhini township on the eastern side is supplied by water transfers down the Great Fish River from the Gariep Dam.

By February 2019, both sides were in crisis. Settlers Dam was nearly empty and it was questioned if Rhodes University could open at the beginning of the academic year. At the same time, the supply to Rhini dried up because of poor maintenance of the water treatment infrastructure by the Department of Water and Sanitation (DWS). Gift of the Givers responded to the municipality's request for help and drew up a rescue plan. They provided emergency bottled water deliveries and launched a programme of borehole drilling which enabled the university to open. Government finally declared the town a disaster area at the end of February and it was understood that Gift of the Givers would be paid for their work out of that money. In May, however, the DWS declared that only local businesses could be paid from the disaster relief funding and paid three such companies for work done by Gift of the Givers. The organisation promptly withdrew from the town.[37]

By this time, the worst of the crisis was over. In the east, the water treatment plant was refurbished and this supply was also connected to the west. This supply is supplemented by the borehole water. By midyear, however, the Settlers Dam was empty so tight water restrictions are still in place. Meanwhile, questions were raised about the safety of the supply from the east as raw sewage was flowing into the Great Fish River from the upstream town of Cradock. The DWS issued repeated directives to the Chris Hani District Municipality to fix the waste water plant. At the same time, Makhanda's own sewage was spilling into the Bloukrans River.[38]

It is striking how much of the actual disaster relief has depended on Gift of the Givers while government has typically avoided taking responsibility and, when it does act, brings in too little too late or treats disaster as a crony business opportunity – a localised version of disaster capitalism.[39] Moreover,

37 Kathryn Cleary, *Rhodes, Givers secure groundwater for university*, Grocotts Mail, 26 February 2019; Tammy Petersen, *Makhanda: The day the taps ran dry*, News 24, 6 March 2019. Statement by Imtiaz Sooliman, *Gift of the Givers Withdraws from Makhanda*, 15 May 2019.

38 Sue Maclennan, *Fish River sewage and Makhanda: DWS answers questions*, 25 June 2019.

39 Naomi Klein, *How power profits from disaster*, The Guardian, 6 July 2017.

government responses are entirely reactive. There are no signs of any serious long-term planning for the Northern Cape as it turns into a desert.

The east coast under water

On the eastern seaboard, flood was the big story of 2019. On the 22nd of April 2019, a cut-off low pressure weather system brought flooding rains across the eastern half of the country. Record rainfall was recorded along the coast from Port St Johns in the Eastern Cape to Durban. The village of Paddock, inland from Port Shepstone, recorded 235 mm. Locations in Durban received over 160 mm in a single day, smashing the previous record of 108 mm measured 19 months earlier on the 10th of October 2017. The record before that was from 1985, over 30 years earlier, when 105 mm was recorded in Durban.[40]

In 2019, 78 people died in the floods in KZN and the Eastern Cape. At least 32 died in Durban and it is likely that some deaths went unrecorded. Some were swept away in the flood, others were buried by landslides. In poor and rich areas, houses tumbled over collapsed embankments. The worst of it was felt by poor people and particularly by shack dwellers whose homes are precarious at the best of times and often built on steep land or flood plains where land is not valued by the market. According to Abahlali baseMjondolo (AbM), they received no help from eThekwini Disaster Management as requests were directed through local ANC councillors who are hostile to them. They comment:[41]

> To be poor in South Africa means that you must constantly live with fire, floods and armed and violent evictions and disconnections. You can never really relax. There is constant worry and stress. There is no holiday in the shacks.

40 Raahil Sain, 11 dead, 2 missing after Eastern Cape floods, Independent on Line, 1 May 2019; Aisha Abdool Karim, Full extent of KZN storm damage still unknown as death toll rises, Daily Maverick, 25 April 2019;Frank Chemaly, DurbanStorm breaks rainfall records, IoL, 24 April 2019; #DurbanStorm: One year later, Daily News, 10 October 2018;

41 Abahlali baseMjondolo, Press Statement: Practical Support for Members Affected by the Floods, 4 May 2019 at http://abahlali. org/node/16911/

A month after the flood, the South Durban Community Environmental Alliance (SDCEA) wrote an open letter to newly re-elected President Cyril Ramaphosa.[42] Ramaphosa visited Durban after the storm and remarked the impact of climate change. SDCEA agreed and noted that the big corporations of South Africa's minerals energy complex (MEC), starting with Eskom and Sasol and including the south Durban oil refineries operated by Engen and Shell and BP, have made a significant contribution to creating the climate crisis.

> We expect these drivers of climate change to continue taking our society over the cliff, because offshore Durban today, four massive corporations – ExxonMobil, Statoil, ENI and Sasol – are exploring for oil and gas in the dangerous Agulhas Current, more than 3km deep, hoping to achieve a find as big as Total did offshore Hermanus in February. These insane digs for fossil fuel must urgently be halted. Moreover, in the spirit of the "polluter pays principle", the damage the major polluters have done must be tallied up, and a bill given them for these liabilities.

In short, adaptation will come to naught if governments and corporates collaborate in expanding fossil fuel production and carbon emissions. Moreover, since the 2017 floods, the eThekwini Metro has done little to increase the resilience of basic infrastructure. Even basic repairs have been neglected – at least in poor areas: "… the Glebelands Hostel roof was badly damaged – but only in early 2019 did repairs begin!" Drains and sewers are clogged with plastic, exacerbating flooding, and Durban's beaches and bay were massively polluted first with plastic and then with sewage. SDCEA continue:

> We have many unemployed construction and general workers in our communities who are very anxious to get started on adaptation projects to fix and strengthen our drainage systems, build sturdier houses, construct safer bridges, restore wetlands, rehabilitate the sponge capacity of our riverine systems and detox our land, especially so that the poisons of plastic pollution are removed.

42 Desmond D'Sa, South Durban Community Environmental Alliance, An open letter to President Cyril Ramaphosa, Daily Maverick, 23 May 2019.

Corruption meanwhile eats at the City's capacity to deliver services, not least in respect of sanitation and waste recycling, as everything that can be is put out to tender. eThekwini, of course, is not alone. Municipal services and infrastructure are breaking down across the country in no small part because a neo-liberal imperative to privatise is partnered with the post-apartheid promotion of emerging entrepreneurs and an established corporate culture of corruption. Such partnering thrives behind closed doors and eats at democracy. It thrives on the bureaucratic obstruction enabled by the misnamed Promotion of Access to Information Act (PAIA) and on corporate confidentiality promoted by business and enshrined in the Competition Act. And it makes for government that refuses responsibility.

While the coast flooded, the inland catchments got little rain through the summer and less through the winter. Where the rain did fall, the grass greened but the soil held no moisture.[43] Farmers said this was a green drought. By late winter, major rivers off the Drakensberg catchment were reduced to a trickle as the mountain areas suffered drought in common with Lesotho.

Refusing responsibility

In 2015, South Africa was a party to the African Ministerial Committee on Environment's call for a 1.5°C temperature target to be adopted at Paris. At a community climate camp in Parys, on the banks of the polluted Vaal River, people called on government to act as if it meant it and to take responsibility:

> That means all government departments, provinces and municipalities. It means the departments responsible for minerals, energy, trade, industry and economic development as well as those responsible for environment, water and sanitation. It means the departments responsible for health, education, land and human settlements. It means the treasuries.

43 Chelsea Pieterse, *Green drought grips KZN*, The Witness, 16 January 2019.

Despite the evidence, despite always remembering to repeat that the poor are hit first and worst by climate change, despite asserting in the NDC that its national priority is to address poverty and inequality, government is quite clear that it will not take responsibility. But it refuses responsibility in secret. During the 2019 round of negotiations, the South African delegation was instructed that government had not decided that it should act on the basis of the IPCC 1.5 report. We must assume then that government did not mean it when it called for 1.5° in 2015. Or it meant it only in so far as it could leave the responsibility at the door of developed nations. At the same time, it does not want its disavowal of responsibility for its own policy positions to be made public.[44]

44 Kevin Bloom, *Our Burning Planet/Greta Thunberg*, Daily Maverick, 19 December 2019.

2 Future Climate

This chapter explores in more detail the somewhat conservative projections[45] for climate impacts in southern Africa, as modelled by climate scientists, and considers the state of the natural and social systems that will have to deal with these impacts in South Africa. Many systems are already in crisis: our ecosystems, rivers and water infrastructure; local government provision of water, energy and other services; infrastructure and human settlements including large informal settlements; and the health system.

Climate change presents us with several cascades of impacts, effects and responses. This chapter starts by identifying the basic climate impacts: temperature rise and its impacts on work and plant growth, changes in rainfall patterns, droughts, floods, sea level rise and storms.[46]

Biodiversity – and biodiverse eco-systems – is the most fundamental support system for our societies. Healthy ecosystems are also crucial for adaptation to climate change, for example the large sale natural regulation of the water cycle through wetlands. But in South Africa, as it is worldwide, ecosystems are being hammered by pollution and ongoing conversion to humanised landscapes.

Water is often seen as the primary pathway through which climate change effects are transmitted. In South Africa, a water scarce country, the water sector is also in serious disarray and the system of management is widely

45 IPCC and other climate change information tends to be carefully vetted – even debated by governments – as well as subjected to intense scientific review, with the result that it is often out of date and underestimates impacts. There seems to be a particular difficulty in dealing with (or computing) the acceleration of climate change as a result of reaching tipping points in the warming process.

46 Much of this information derives from 2013/14 technical reports by SANBI, in response to the 2011 Long Term Adaptation Scenarios (LTAS). It is updated by later reports and enriched by perspectives from international climate research.

acknowledged to be broken. A new Water Master Plan[47] has created controversy, not only for requiring nearly a billion Rand in expenditure, but also for the desperate conditions within the water sector that it reveals. Water services – consistently providing clean water and dealing with domestic and industrial effluent – are the responsibility of local government, itself a source of frustration for citizens who have been let down by local government for decades now.

Climate change has a very direct impact on food provision – both from agriculture and marine fisheries. As a country that is food secure[48] on a national level, but fails to provide nutritious and affordable food to its own population, South Africa is already in a difficult position before the impacts of climate change are taken into account. In 2014, Oxfam found that 13 out of 53 million South Africans suffer hunger on a regular basis, despite spending around half their income on food. Childhood stunting had increased to 26.5%, and obesity levels to 42% among women (amongst the highest in the world), as a result of malnutrition. In 2016, the Pietermaritzburg Agency for Community Social Action (PACSA) food basket programme calculated that households in the area were underspending on nutritious food by 55%: in other words, malnutrition was structurally determined by both poverty and food pricing.[49]

The broader economy is also at the mercy of climate change, including, perhaps ironically, the operational conditions for coal-fired power stations, as shown by the serious Eskom December 2019 loadshedding brought on by an unusually long spell of summer rain – the official explanation – but also by at least 10 years of gross neglect of maintenance of power stations, as well as problems at the newly built Medupi and Kusile power stations. The Medupi and Matimba power stations, built in an already hot climate, are already being tested by increasing heat stress. Electricity blackouts affect numerous parts

47 It is newly launched, but the plan has been in process since 2014 under the authority of three successive water ministers: Nomvula Mokonyane, whose complicity in state capture is under investigation; the short reign of Gugile Nkwinti, whose role in lacklustre land reform has come into view [Mtero et al 2019]; and now under Lindiwe Sisulu, from the ANC leadership dynasty. The plan itself, it is understood, has been stewarded by Trevor Balzer, who long served as acting head of the department.

48 An aggregate, per capita figure, not taking into account distribution realities – see Chapter 3 for food sovereignty.

49 See pacsa. org. za

of the economy – especially small and medium businesses – as well as basic services like pumping water.[50]

Climate change will have very serious impacts on urban and rural settlements, housing, transport and local infrastructure – resulting in particular challenges to local government, in itself a struggling sector.

The health sector in South Africa is only now waking up to the implications of climate change as medical researchers realise that it is in people's bodies where the cascade of impacts hit home, from dirty water to under-nutrition from lack of good food, to mental health problems as a result of increasing climate stress [Chersich et al 2019].

These impacts pose challenges to people and social groups, and we end this chapter by presenting some early indications of how different actors are responding: South African corporates on the one hand and the group of activist and trade union researchers in the Million Climate Jobs campaign on the other.

A strong South African research focus on adaptation

South Africa has an active and confident climate change research community. According to Ziervogel et al [2014: 606]:

> South Africa arguably has the most advanced research, observation, and climate modelling program on the African continent. This expertise is situated across a number of universities and science councils and covers most aspects of earth system science, including atmosphere, oceans, land surface, biogeochemistry, and hydrology. The number of South African researchers leading and participating in international global-change research programs and scientific bodies, such as the Intergovernmental Panel on Climate Change, is relatively high, as is the count of journal articles published by South African authors.

50 Jason Hallowes, Eskom and the deepening water crisis in South Africa, Daily Maverick, 5 April 2019.

South African climate researchers have worked closely with government in international negotiations[51] and supported a number of research and policy making processes including, amongst many others, the National Climate Change Response White Paper, South Africa's three National Communications to the UNFCCC, as well as a national process to scope long-term adaptation scenarios (LTAS – see below). Some sectors – notably biodiversity, agriculture and water – have well developed adaptation responses, at least on paper, while the research in urban settlements and health sectors is more recent. Some city and provincial adaptation strategies have been developed. By 2014 several levels of government were developing adaptation plans, including the LTAS technical reports on climate trends and scenarios, and five plans focused on the implications of climate change for the water, agriculture and forestry, human health, marine fisheries and biodiversity sectors.

According to Ziervogel and her colleagues, the South African research community is currently grappling with two key challenges:

> (1) the knowledge gaps related to inadequate impacts assessment and the quantification of the socioeconomic costs of climate change and
>
> (2) the institutional challenges that make it difficult for organisations in both the public and private sectors to work and collaborate effectively to meet the country's adaptation needs. [2014: 612]

In addition, there are challenges in bringing global climate model projections down to local scale, in which the gaps in South African data have now become important:

> South Africa lacks a robust national system that provides spatially extensive climate data. The most recent quality controlled and nationally gridded climate data date back to 2000. Up-to-date national data for hydrology are increasingly difficult and costly to obtain or generate through modelling. This represents a key constraint for impacts modelling in South Africa, as many sectors, including

51 Francois Engelbrecht, inaugural lecture at the University of the Witwatersrand, 28 November 2019.

> biodiversity, agriculture, urban settlements, and even human health, use climate and water as a key resource underpinning their impacts modelling. [2014: 612]

This echoes increasing concerns about the lack of adequate water monitoring – for both quantity and quality – as these divisions in the DWS are collapsing.

Civil society concerns about SA climate research

But is the South African climate change research adequate to the difficult tasks that await it? Civil society has raised a number of problems with government thinking that are also reflected in the national climate change research approach.[52]

The first is the easy tendency of climate researchers to focus on adaptation and ignore mitigation. This may be understandable as the outcome of close co-operation with a government that is wedded to coal – see the utterances of its current minister of Mineral Resources and Energy, Gwede Mantashe, in defence of jobs as much as in an unrealistic expectation that coal will have "long legs". So while researchers see the damage coal has done and is doing globally, through their adaptation emphasis, they are on message with government negotiators and portray South Africa to be as much a victim of climate change as the rest of Africa.

The focus on adaptation suits the government's focus on seeking climate funding. This may also explain why most adaptation work – with chilling foresight as it turns out – is based on 'low mitigation' scenarios. So far it is these scenarios that have proved most realistic.

Under pressure of reality, this research focus may be changing, as health researchers [Chersich et al 2018] urge their colleagues in the health sector to take mitigation steps. Meanwhile, the latest ranking of greenhouse gas emitters, released at CoP 25 in Madrid, shows that South Africa has just

52 As for example in groundWork comment on successive drafts of the National Adaptation Strategy, in 2016, 2018 and 2019.

overtaken Brazil to move up one place to number 13. And it retains the top spot in Africa.

The second objection is against a view of business as usual – as if climate change adaptation could be an addition to current sector activities rather than demanding a radical shift of paradigm. Much climate adaptation research proceeds as if current economic activities are sustainable – and socially just – to start with. For example, government research in the LTAS programme talks about the expansion of the sugar and timber plantation industries under changing climate conditions [DEA 2013agric], as if these industries were not major sources of environmental injustice – and, in the case of the sugar industry, also ill health. Or as if the (industrial) agricultural sector does not lead to soil losses in the western maize growing districts, or water quality problems resulting from pesticide and fertiliser use. And it assumes that the current agricultural system provides adequate, nutritional and affordable food for the majority of the population.

Third, the climate challenge needs a paradigm shift in response, an approach that is based on the fundamental insights not only that climate change presents opportunities for improvement – for example that an energy system based on renewables will result in immediate health improvements as emissions from coal-fired power stations stop – but that focusing on social justice and environmental sustainability will be necessary in dealing with the impacts of climate change, as has long been argued by environmental justice organisations and is now also stated by both the IPCC 1.5 report and the IPBES report. Moreover, South Africa has an open, but neglected, transformation agenda. Land and water reform, gender equality and the transformation of educational and economic systems should all be integral to any response to the climate crisis.

Fourth, South Africa's climate research and government policies seem to assume a stable world with a few aggravating climate change impacts. However, at around 2°C, if not before, the breakdown of social structures and institutions can be expected. It is also important to keep in mind that there will be an ongoing intensification of climate change impacts. Even with sharp

reductions in GHG emissions, things will continue to get worse for decades before stabilising at a 'new normal' – there is no way back to what used to be 'normal'. Without sharp reductions, it becomes more certain that the earth system will cross tipping points that will take us faster towards unthinkable climate catastrophe.

The disproportionate impacts of climate change on the poor and the vulnerable should impart extra urgency to climate research. Poor people are vulnerable in the first place because they live in a society that denies them the resources to live decent lives, and then does not adequately support them, for example with health care and clean water. Most local governments do not fulfil their duties, as daily service protests show, and national departments – like the DWS – are in disarray or do not fulfil their mandates. The DEA has not improved air quality in 'priority areas' and the Department of Mineral Resource (DMR) protects mines from strict environmental regulation rather than protecting the environment.

Finally, for all its achievements and scope, earth system science is not equipped to deal with the social and political questions that climate change poses. Some critics of earth system science have described giving earth system science the lead role as "handing the keys to spaceship earth to the engineers", as if climate change was in the first place a technical problem [Bonneuil and Fressoz 2015]. Climate researchers have brought some Trojan horses into their preferred solutions – for example 'climate smart agriculture' is a buzzword that conceals unacceptable practices like land grabbing and carbon trading. 'Conservation agriculture' is similarly compromised by substitution of chemicals for tillage.[53]

Nevertheless, local climate scientists are clear that "climate change poses a significant threat to South Africa's water resources, food security, health, infrastructure as well as its ecosystem services and biodiversity" [2014: 606].

We now explore the actual projections – the outcomes of modelling – for the impacts on the natural and social systems on which people depend.

53 BioWatch Fact Sheets: Climate Smart Agriculture, October 2015; Agroecology, December 2015. At: http://www. biowatch. org. za/list. php? type=Fact%20Sheets

Climate hotspot Southern Africa

Hotter and drier

Southern Africa is expected to be a climate change hotspot, according to the IPCC 1.5 report, both hotter and dryer. Temperatures in the subtropical regions of southern Africa have in fact been rising over the last five decades at approximately twice the average global rate of warming. The report foresees more hot nights, longer and more frequent heatwaves, less rain and more evaporation. The drying trend is much less pronounced at 1.5°C than at 2°C, so immediate, substantial and sustained reductions in GHG emissions would make water adaptation easier. The research shows "consistent and statistically significant increases in projected risks of increased meteorological drought in southern Africa at 2°C versus 1.5°C of warming" [2018: 3-145]. According to Davis et al,

> Temperatures over Southern African are expected to increase most notably over the central interior of the region, with smaller increases over coastal areas. Under the A2 emission scenario,[54] temperature increases of 1 to 2°C are projected for the near-future. For the far future, increases of more than 4°C are plausible for the central interior of southern Africa. [2017: 17]

Livestock in southern Africa will experience increased water stress under both 1.5°C and 2°C of global warming, with negative economic consequences. The region is also projected to lose suitable areas for maize, sorghum and cocoa cropping, as well as losses in yield, resulting in decreases in the availability of both water and food in the region. Heat stress will reduce available farm labour days – there will be more days where it is simply too hot to work. Heat stress will also affect farm animals.

Soil moisture will be reduced through higher evapotranspiration rates (plants sucking more moisture from the soil under drier conditions) as well as the soil

54 A low mitigation scenario which is currently the realistic one.

drying out under higher temperatures. The largest increases in temperature are expected in South Africa and parts of Namibia and Botswana. The IPCC report notes, under the low mitigation (A2) scenario,

> … a drying signal (in the models) … over Namibia and Angola extending south-eastwards to Zambia, Zimbabwe, Botswana, the southern region of Mozambique and the Limpopo province of South Africa … These decreases in rainfall are projected to occur most strongly in summer, which is the main rainfall season in these regions … This drying trend is expected to increase over time as a result of increases in the occurrence of mid-level highs over the eastern parts of southern Africa, a strengthening of the Indian Ocean high-pressure system to the south-east of the subcontinent, and an associated northward displacement of tropical lows and cyclones... Significantly drier winters are projected for the south-western Cape of South Africa and are consistent with the projected poleward shift of the westerlies and mid-latitude cyclones …

The western part of Southern Africa (including the Limpopo basin and Western Cape) is projected to become drier and experience increasingly frequent droughts and heatwaves "towards the end of the 21st century", according to the IPCC. Further:

> At 2°C, the region is projected to face robust precipitation decreases of about 10–20% and increases in the number of [consecutive dry days], with longer dry spells projected over Namibia, Botswana, northern Zimbabwe and southern Zambia... Projected reductions in stream flow of 5–10% in the Zambezi River basin have been associated with increased evaporation and transpiration rates resulting from a rise in temperature with issues for hydroelectric power across the region of southern Africa.

However,

> slight to moderate rainfall increases are projected over the central interior and south-eastern parts of South Africa, west coast of Madagascar, Tanzania, eastern DRC and the northern region of Mozambique for the near and mid-future time period. These increases in rainfall are projected to occur in spring and summer.

At the same time, increased rainfall intensity is projected.

Extreme weather events

A general increase in the frequency of extreme rainfall events is likely over the eastern parts of the continent and the western parts of Madagascar [Davis et al 2017]. Coastal storm surges are expected to increase due to sea level rise and an increase in the frequency and intensity of sea storms, accompanied by increases in wave heights [IPCC 2013]. Even if the intensity of sea storms remains unchanged, higher sea levels will mean that smaller storms are likely to have an increased impact on the coastline [Davis et al 2017].

More heatwaves (when the maximum temperature exceeds 35°C for five or more days) can be expected. "The occurrence of fires is closely linked with climate and increases in temperature combined with an increase in dry spells in some areas may result in wildfires affecting larger areas and fires of increased intensity and severity … Low temperatures, including the number of frost days, have decreased in frequency and are expected to become even less frequent in the future" [Davis et al 2017: 20].

Holes in the web of life

"Nature", or the sum of ecosystems, provides us with our home on this planet, to the point that it is difficult to think about what nature does not provide:

> Economic activity, human security, health, well-being and quality of life depend on healthy functioning and biodiverse ecosystems. Ecosystems provide important services to society, such as the formation of soil; the provision of food, fresh water, wood, fibre and fuel; the regulation

Box 1: Breached eco-barriers beyond climate change

Climate change is not the only environmental problem that people on this planet now have to deal with. Magdoff and Foster [2011] list:

- Ocean acidification, also a result of carbon dioxide emissions, that makes life difficult for sea creatures who form their bodies from alkaline materials – including coral reefs.
- Species extinction, a loss of species at a rate of 1000 times the "natural" rate, leading to a biodiversity crisis and ongoing degradation of ecosystems that is also felt in South Africa [see SANBI 2018].
- The overloading of the planet's geochemical cycles with huge amounts of nitrogen and phosphorus as a result of the (over) use of these chemicals in industrial agriculture. The effects include the creation of "dead zones" in the ocean (and other waters) due to depletion of oxygen by the oxygen demand of these chemicals, which deprive living creatures of oxygen.
- The global concentration of aerosols (particulate material in the atmosphere) has doubled from pre-industrial times, in part a result of coal-fired power.
- The level of chemical pollutants and plastic in the oceans, in people's bodies and generally in ecosystems.
- A high rate of conversion of natural to human dominated ecosystems.
- Large stress on the world's fresh water systems, and predicted that by 2025 two thirds of the world's population will face water scarcity.

of climate, flood and disease; protection from storm surges and floods; and a range of cultural, spiritual, educational and recreational services. While biodiversity and healthy ecosystems provide wide-ranging benefits to society on the whole, many communities globally, and especially in Africa, depend directly on the products from local

> ecosystems for the majority of their food, energy, water and medicinal requirements ... [DEA 2013bio: 12]

More than 2 billion people rely directly on wood fuel for energy, and an estimated 4 billion people use medicines directly from nature. Nature's crucial role is not always visible. For example, pollination by animals (including bees, birds and bats) is essential for more than 75% of global food crops, including fruit, vegetables, coffee, cocoa and almonds [IPBES 2019].

Climate change impacts would have been far worse already if marine and terrestrial ecosystems were not acting as sinks for some 60% of global anthropogenic carbon emissions, or 20.5 Gt CO_2 per year [IPBES 2019]. Healthy ecosystems provide buffers against climate impacts. For example, mangrove forests protect against storms and surges from the sea, wetlands slow down and clean flood waters, and wild foods provide emergency food for rural people.

Yet climate change is already eroding the ecosystems on which we rely, worsening existing stresses on ecosystem, of which there are many: degradation of landscapes by removal of vegetation, such as for beef production in the Amazon, undermining its capacity to serve as a 'planetary lung'; overuse of water resources; widespread use of chemicals as fertilisers and pesticides; urbanisation; mining; and direct harvesting from nature, such as for rare hardwood species. Already, biodiversity around the planet – that is diversity in each species' gene pool, in species composition of ecosystems, and the extent of functioning ecosystems, the source of resilience – "is declining faster than at any time in human history" [IPBES 2019: 2].

> Nature across most of the globe has now been significantly altered by multiple human drivers, with the great majority of indicators of ecosystems and biodiversity showing rapid decline. Seventy-five per cent of the land surface is significantly altered, 66 per cent of the ocean area is experiencing increasing cumulative impacts, and over 85 per cent of wetlands (area) has been lost ... Across much of the highly biodiverse tropics, 32 million hectares of primary or recovering forest were lost

> between 2010 and 2015. … Approximately half the live coral cover on coral reefs has been lost since the 1870s, with accelerating losses in recent decades due to climate change exacerbating other drivers. The average abundance of native species in most major terrestrial biomes has fallen by at least 20 per cent [since 1900].

Impacts from climate changes on biodiversity that are already visible across the globe include shifts in species distribution, altered population dynamics and changes in the composition of species within ecosystems.

> Almost half (47 per cent) of threatened terrestrial mammals, excluding bats, and one quarter (23 per cent) of threatened birds may have already been negatively affected by climate change in at least part of their distribution…. Ecosystems such as tundra and taiga and regions such as Greenland, previously little affected by people directly, are increasingly experiencing impacts of climate change… Large reductions and local extinctions of populations are widespread… This indicates that many species are unable to cope locally with the rapid pace of climate change, through either evolutionary or behavioural processes, and that their continued existence will also depend on the extent to which they are able to disperse, to track suitable climatic conditions, and to preserve their capacity to evolve [IPBES 2019:7].

Marine biodiversity will also be hit by global warming and land use change. Overall, threats to biodiversity increase with the rate of global warming.

> For example, a synthesis of many studies estimates that the fraction of species at risk of climate-related extinction is 5 per cent at 2°C warming, rising to 16 per cent at 4.3°C warming. Coral reefs are particularly vulnerable to climate change and are projected to decline to 10-30 per cent of former cover at 1.5°C warming and to less than 1 per cent at 2°C warming [2019:7].

Impacts on biodiversity in South Africa

South Africa is rich in biodiversity. It is one of 17 members of the Group of Like-Minded Mega-Biodiverse Countries that between them contain between 60 and 70% of the world's biodiversity and associated traditional knowledge.[55]

South Africa is divided into nine biomes, based on dominant vegetation types, namely Albany thicket, desert, forest, fynbos, grassland, Nama-Karoo, Succulent Karoo, savanna and the Indian Ocean coastal belt. Of these, four are most threatened by land use change: the Indian Ocean coastal belt; the grasslands, fynbos and forest biomes [DEA 2013bio].

Climate change impacts are expected to change the extent of all biomes. Grasslands, which cover the Highveld and adjacent areas, will be threatened by large-scale invasions of savanna – a dry mixture of grassland and trees – and desert vegetation as the interior of the country dries under climate change. Biodiversity in grasslands will be compromised as it is the biome with the least adequate extent of formal protected areas.

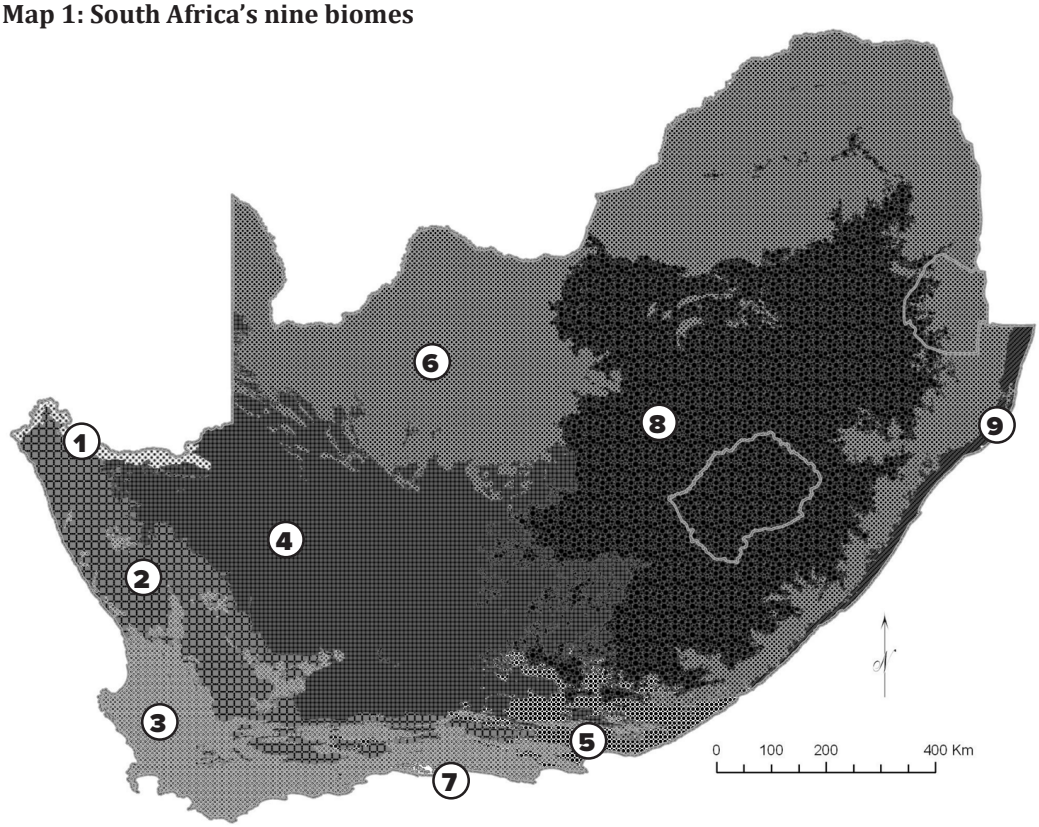
The second most threatened is the Nama-Karoo in the western part of the country, parts of which are expected to turn into desert, while other parts may change into savanna. Third is the Indian Ocean Coastal Belt, which is likely to be replaced by savanna under intermediate and high risk climate scenarios.

The north-eastern regions of fynbos (towards Port Elizabeth) are prone to replacement by Succulent Karoo or Albany thicket under all climate scenarios. Vulnerable to fire impacts, the fynbos biome "is projected to lose about 20%, 45% and 80% of its current suitable climate area relative to its present-day area under 1°C, 2°C and 3°C of warming, respectively" [IPCC 2018: 260].

Indigenous forests only make up 0.4% of South Africa's land area (on the southern coastal plain, in the area between George and Storms River, at high altitudes along the Drakensberg escarpment and the Hogsback area of the Eastern Cape, along the east coast of KwaZulu-Natal, and in fire-protected valleys in the southern and western Cape). Forests are projected to retract significantly as a result of increased fire and reduced rainfall under all climate

55 See https://www. environment. gov. za/likeminded_megadiversecountries_lmmc

Map 1: South Africa's nine biomes



1 Desert
2 Succulent Karoo
3 Fynbos
4 Nama-Karoo
5 Albany Thicket
6 Savanna
7 Forest
8 Grassland
9 Indian Ocean Coastal Belt

Source: DEA 2013bio

scenarios. Albany Thicket is least threatened and projected to suffer losses in area only under the high risk climate scenario. The desert biome is projected to expand at the expense of other biomes under drier conditions in the West of the country [DEA 2013bio].

Most of the projections above date from 2013. As climate change progresses and scientists learn more, the picture has become more gloomy. The latest National Biodiversity Assessment [2019] from SANBI reports that

> … negative impacts of climate change on biodiversity and ecosystem function have now been observed in all realms. Unmitigated, climate change is likely to cause significant changes in South Africa's ecosystem structure and functioning by as early as mid-century, and to result in significant losses in biodiversity in the latter half of this century… Climate change is already triggering large-scale spatial, temporal and compositional shifts in biodiversity. Species' population-level changes are being translated into community-level reorganisations, and even regime shifts (like bush encroachment), which can impair ecological function. Over the last few decades these changes have been noted in South African ecosystems from estuaries, coral communities, open savannas to montane streams, exerting pressure either directly or indirectly on all species within these habitats. Climate change is a key threat to sub-Antarctic ecosystems; mean annual air and sea temperatures have increased at twice the mean global rate at our Prince Edward Islands. [2018: 52]

Climate change threats compound other challenges to biodiversity in South Africa, including habitat degradation, altered fire regimes, introduced pests and weeds, overuse of water resources, use of chemicals in agriculture, urbanisation, mining and overharvesting of some resources [DEA 2013bio]. However, as a sector that is intensely studied, adaptation planning for biodiversity has been proactive, including the incorporation of climate change impacts scenarios into national plans for expanding protected areas out to the middle of this century [Ziervogel 2014: 611].

Broken water system facing climate impacts

Water is the main pathway for climate impacts, through droughts and floods, including flood impacts on infrastructure, extreme heat events and increased evapotranspiration that can sharply reduce soil moisture. These water issues then create a cascade of other problems – food insecurity as a result of failing agriculture and fisheries, impacts on the built environment (housing, local government infrastructure, roads and transport infrastructure) – further challenging local governments responsible for infrastructure maintenance and service delivery, ending up as a range of health impacts from malnutrition to bad water quality.

As one of the 30 driest countries on earth, water scarcity is a part of life in South Africa, which has built a strong water sector research capacity – centred on the South African Water Research Commission – since a major drought in the 1970s. Water debates are vibrant between the department and civil society, communities and local government, big water users, conservationists, researchers and policy analysts and other stakeholders in the sector. However, the water sector has so many challenges currently that climate change remains relatively low on the agenda.

A broken water sector

The water sector is in crisis. The DWS says in its Master Plan, launched at the end of 2019 but in preparation since 2014:

> South Africa is facing a water crisis caused by insufficient water infrastructure maintenance and investment, recurrent droughts driven by climatic variation, inequities in access to water and sanitation, deteriorating water quality, and a lack of skilled water engineers [DWS 2019].

The plan proposes solutions, none of which are new. They rather reflect a department that has failed in both its basic duties and its constitutional mandate for transformation and has been frustrated by water sector partners,

particularly local governments that simply refuse to execute their mandates even as they jealously defend them, and water boards that have steadfastly avoided water reform. Already there are reports that ANC caucus and rival cabinet members are unhappy about what they see as a budget grab by Sisulu.[56]

According to the Master Plan, 14.1 million people, a quarter of the population, were still using sanitation facilities below the Reconstruction and Development Programme (RDP) standard in 2017. Many rural areas and informal settlements in urban areas do not have proper sanitation. Combined with poor municipal waste management, especially in informal settlements, as well as a large proportion of dysfunctional sewage works, this situation leads to increasing impacts on already weakened river systems that receive this dirty water. The Hartebeespoort Dam is an example: it is downstream of around 30 sewage works and a number of informal settlements and the inflow of leaked sewerage results in 'super-eutrophication' – that is, the overload of nutrients depletes oxygen from the water, hammers aquatic biodiversity and reduces the ecosystem capacity to clean itself of pollution. In the Vaal, the army was deployed in October 2018 to deal with the local dysfunctional sewage works, but it left a year and a month later with very little to show for it.[57]

According to the DWS Master Plan, only 10.3 million households (64%) have access to a reliable water supply, implying that 36% of households, or 20 million people, don't have access. These figures probably exaggerate access as there are disconnections and service interruptions in many municipal areas. In December 2019 it was reported that a forensic investigation will be launched into corruption around water tankers which ferry emergency water to areas without water supply in KwaZulu-Natal.[58] According to KZN provincial finance portfolio committee chairperson Sipho Nkosi, the investigation will determine whether municipal councillors who own water tankers and rent them out to the municipality have consciously sabotaged normal water deliveries as part of their 'business plans'. This allegation, often heard in water service protests

56 Setumo Stone, *Lindiwe Sisulu faces backlash over R900bn water master plan*, City Press 9 December 2019.

57 Sesona Nqakamba, SANDF intervention in the Vaal comes to an end, but water department has a ***p***lan, News24, 29 November 2019**.**

58 Bongani Hans, https://www. iol. co. za/news/politics/kzn-cogta-investigates-municipalities-failure-to-provide-clean-water-38859379, accessed 13/12/2019.

in other parts of the country as well, points to corruption at municipal level as an important factor in failing service delivery.

Local governments are not doing well in the water sector. Approximately 56% of the 1 150 municipal sewage works and approximately 44% of the 962 water treatment works (whose job it is to clean water to drinking quality standards) are in a poor or critical condition and in need of urgent rehabilitation and skilled operators. Some 11% of this infrastructure is completely dysfunctional. This is largely due to local government issues, including low technical capacity and corruption,[59] as well as regulatory failure with unseen eco and health impacts. A previous minister, Nomvula Mokonyane, allowed the green and blue drop incentive programme to lapse. Her critics thought she did so in order to hide the poor performance at municipal level such as in the Vaal.

The skills gap is not limited to municipal level. "A skills gap analysis conducted by the Water Research Council in 2015, looking at numbers of staff and their skills relative to required skills, showed significant skills gaps in water sector institutions, including DWS, [catchment management agencies], water boards and municipalities." [DWS 2019: 45].

Between 1999 and 2011, the extent of main rivers in South Africa classified as having a poor ecological condition increased by 500%, with some rivers pushed beyond the point of recovery.

Wetlands play an important role in cleaning and storing water and in reducing downstream flooding after heavy rain as they soak up flood waters. These are functions that will become increasingly important under pressures of climate change. However, South Africa has lost over 50% of its wetlands and, of the remaining 3.2 million hectares, one third, or just over 1 million hectares, is already in a poor condition. The causes of the degradation include an "increasing population, rapid urban expansion, widespread mining, increasing water storage and abstraction, the spread of invasive alien species and poor

59 Corruption in the water sector is not limited to local government. International companies working on the Lesotho Highlands scheme were found guilty of corruption in 2003; the offices of the Lepelle Water Board have recently been raided by the Hawks, and a giant DWS water scheme in the Vhembe district is under investigation.

agricultural practices" [2019:34]. Several of these causes can be read as the results of poor regulation by the DWS itself.

Only 5% of the water used in the agricultural sector is used by black farmers. This means that the department, water boards and catchment agencies have failed in effecting transformation. Current plans propose a combined land reform, water reform and agricultural support initiative for emerging (black) farmers. In addition there are concerns about DWS's drought planning and general response to climate impacts, including how its extensive water infrastructure will be impacted and how it will be protected.

Water quality monitoring is subject to increasing failure, and organisations outside the department – including water boards, NGOs and other government departments – are stepping into the vacuum without having the mandate or the budget for it, postponing rather than solving the problem. The Master Plan admits: "networks gathering rainfall and run-off data have deteriorated" [2019: 34].

The Master Plan – and debates that followed it – also pointed to an ongoing, unfinished process of restructuring the department to respond to the fundamental principle that the water resources of the country belong to its people and that the role of government is to act as the custodian, both allowing reasonable use and protecting the resources. A signal failure – and the result of internal wrangling sometimes based on petty personal interests – is the very slow roll-out of catchment management agencies and catchment management forums, which are supposed to allow for direct people's participation in decisions about water, and decentralised management of water [Munnik, in press].

The financial ill health of the water sector is a key concern in the Master Plan – far overshadowing any concern with climate change. To achieve water security, an estimated capital funding gap of around R33 billion per annum for the next 10 years must be closed, through a combination of improved revenue generation and a significant reduction of costs. But this includes spending on destructive projects including the Mokolo Crocodile West Augmentation Project (MCWAP) and the Lesotho Highlands Water Project Phase 2. The Plan laments

the lack of understanding from other departments and water users of the importance of water, backlogs in operations, maintenance and refurbishment, non-paying users, growing debt, insufficient management of revenue, inefficient institutions, agricultural subsidies, lack of skills, uncreditworthy institutions, financial constraints and sub-optimal procurement. The Plan notes a refurbishment backlog of R59 billion. All told, it argues that capital investment over the next 10 years of at least R90 billion per annum is required to deal with the remaining backlog in basic water and sanitation services, critical refurbishment backlogs caused by poor maintenance, and renewal of aged infrastructure, new water resource developments (dams) and new bulk, connector and reticulation infrastructure.

While the water sector is replete with research and ideas about what to do, the power to act is with national government, where DWS remains one chess piece amongst others in ANC faction fighting, and with local government which suffers from overloaded and unfunded mandates, as well as inefficiency and corruption. The debate about the Master Plan is often more telling than the plan itself. Mike Muller, a former director general of the DWS and architect of the post-apartheid water management system, argues against handing DWS any more tasks because "the centralised administration is just not working".[60]

Climate change and water

The Master Plan recognises that while South Africa "is facing increasing water demands to meet the needs of a rapidly growing and urbanising population, changing lifestyles, and economic growth ... climate change is driving the country towards a warmer and drier future, with predicted longer and more extreme droughts, and more intense floods. Climate change means that there will be less water available to meet water needs" [2019: 8]. And "climate change is projected to increase the variability of rainfall throughout the country, and to reduce average rainfall, particularly in the western part of the country. Climate change will result in more intense floods and droughts. Climate change may

60 Mike Muller, *Water cannot be left to a department pulled from pillar to post*, Business Live, 9 December 2019.

also increase the agricultural demand for water due to higher temperatures, and a reduced ability to rely on rain-fed agriculture" [12].

Groundwater is not exposed to the increased evaporation that will impact on surface water as temperatures increase and will become increasingly important. However, groundwater is a limited and vulnerable source that will need careful management. Artificial recharge of aquifers, supplementing or substituting storage in dams, will be an important element of water management [13]. The Plan also proposes desalination of sea water and the re-use of water – assuming that the sewage plants work properly!

Food, drought and agriculture

South Africa has not been dealt a good hand to face climate change, writes Roland Schulze [2016] in a climate change handbook for farmers:

> Over 80% of the RSA's land surface may be classified semi-arid to arid, with only 18% being dry sub-humid to sub-humid; the potential for crop production is therefore limited. In fact, of the RSA's total surface area, only 13% can be used for arable crop production, and of that only 22% has high potential, with less than 10% of the total arable land under irrigation. The most limiting factor in agriculture is available water, with rainfall generally low and erratic for rain fed agriculture, while the relatively small irrigated sector utilises 60% of the RSA's stored water. [2016: 5]

Climate change projections warn of reductions in food availability in southern Africa. Livestock will be affected by rising temperatures. Problems are expected with the future quality of livestock feed, spread of diseases and water availability and reduction in maize and sorghum cropping areas and yields. And, as the IPCC observes, moving from 1.5°C to 2°C of warming will make a very big difference [IPCC 2018].

The LTAS research [DEA 2013agric] predicts that irrigation water demand could increase by 15 to 30%. It is extremely unlikely that this water will be

Box 2: Day Zero in Cape Town

A dress rehearsal for dealing with climate change took place in 2017-2018 in Cape Town. The Cape Town drought developed over three years from 2014 when dams were 100% full, to 38% full in 2017. In March 2017, the mayor (then Patricia de Lille) declared the city a drought disaster area and set Day Zero – when the City would run out of water, that is, when dams would reach the level of 13.5% of their capacity – for a year later, March 2018. The deadline later moved to April 2018, as people reduced consumption, and was finally 'cancelled' in May 2018.

Over 4 million people, 14% of whom live in informal settlements, depend on the Western Cape Water Supply System which consists of six interlinked dams that also supply agriculture and other urban areas [Ziervogel 2019]. The Western Cape has a reasonably well developed water system because of the need to store rain that falls in winter for use in the summer agricultural growing season. The biggest dam is the Theewaterskloof Dam, which stores more than 40% of the water in the system. Four lessons stand out.

1. The drought was due to climate change, and conditions can be expected to worsen, because less rain is projected to reach Cape Town and its catchments in future, due to "a poleward shift in the moisture corridor across the South Atlantic" [Sousa et al 2018: 3].
2. Water restrictions imposed on the rich in 2017/18 had been a reality for poor people in Cape Town since 2007, as "over 140 000 households have been living on 'drought' restrictions of 87 litres per person per day since they had a Water Management Device installed (often forcibly)" [EMG 2018].
3. An attempt by irrigation farmers to transfer some of 'their' water to help the City backfired, as it made many citizens aware of the large proportion of water used for agriculture and the irrigation board's control over it.
4. The ability to act on the crisis was hampered by 'bad politics', including tension between city and provincial politicians (both DA) and national politicians (ANC).

found, so it is more likely that the irrigation sector will shrink. The research predicts spatial shifts in production areas as a result of climate change. Maize production in the west of the country will become more difficult – which makes protecting high quality agricultural land in Mpumalanga from coal mining even more important.[61]

Climate change will impact on yields of maize, wheat, sorghum, soybeans, pasture and rangeland grasses, and the production of apples and pears, grapes and wine. An increase in plant and animal diseases and insect pests is expected. In the Western Cape, wine farms will have to move to higher, cooler and more southerly locations. Less run-off from rainfall in the Western Cape will have a negative impact on the deciduous fruit industry – apples, pears, nectarines, plums, peaches, apricots and cherries – estimated at a combined turnover of R12.35 billion per year.[62] However, the LTAS research argues that a bigger area will become available for timber plantations on the eastern seaboard and adjacent areas and sugarcane farmers can expect higher yields but also more pests. Here is an example of climate scientists not dealing with the underlying lack of sustainability in particular practices. Timber plantations suck the water out of catchments while sugar, which has a negative impact on people's food security, exacts a heavy environmental toll which will get worse with intensified pesticide use.

Livestock farmers will have to deal with less available forage and heat stress, which will reduce milk yield in dairy cattle and depress conception rates across all breeds. This has already been reported in Australia.[63] Heat stress will affect workers too. It will be too hot on more days per year for farm labour to work.

Less work has gone into predictions specifically focused on emerging farmers, although LTAS research states that "there is evidence that smallholder and subsistence dry land farmers are more vulnerable to climate change than commercial farmers, while large-scale irrigated production is probably least

61 The pressure coal mining puts on agricultural land in Mpumalanga is documented in Bureau for Food and Agricultural Policy (BFAP) 2012. *Evaluating the impact of coal mining on agriculture in the Delmas, Ogies and Leandra districts; A focus on maize production,* a report by BFAP compiled for the Maize Trust.

62 https://www. agriorbit. com/deciduous-fruit-the-when-and-where-of-sa-production/

63 Gundi Rhoades, in https://www. smh. com. au/environment/climate-change/cattle-have-stopped-breeding-koalas-die-of-thirst-a-vet-s-hellish-diary-of-climate-change-20191220-p53m03. html

vulnerable to climate change, conditional upon sufficient water supply for irrigation being available" [2013agric: 12]. These impacts come on top of a lack of land and productive water reform to support emerging farmers.

Globally, diversity within agricultural gene pools has declined dramatically, which undermines the potential to respond to climate change by using a variety of crops and animals because these may simply no longer exist:

> By 2016, 559 of the 6 190 domesticated breeds of mammals used for food and agriculture (over 9 per cent) had become extinct and at least 1 000 more are threatened. In addition, many crop wild relatives that are important for long-term food security lack effective protection, and the conservation status of wild relatives of domesticated mammals and birds is worsening. Reductions in the diversity of cultivated crops, crop wild relatives and domesticated breeds mean that agroecosystems are less resilient against future climate change, pests and pathogens. [IPBES 2019:3]

The commercial farming sector in South Africa is increasingly prepared for climate change:

> In the agricultural sector, individual farmers and farmers' associations are extremely interested in climate change findings and many have started adapting to their experience of historical changes. For example, in the Western Cape, apple orchards have been replaced by vineyards which are more tolerant of higher temperatures; and in the southern Cape commercial farmers have changed from crops to pasture and have increased their water-storage capacities. In the Suid Bokkeveld, in South Africa's arid western region, work on understanding impacts of climate variability and change on rooibos tea farming has been undertaken in partnership with the emerging agricultural sector in this area [Ziervogel 2014: 611].

However, many other factors work in combination with climate change, including commercial viability, and in the dry areas like the Northern Cape

farming operations are going bankrupt in increasing numbers. The province was reported to have lost 50% of its livestock.[64]

Ocean Fisheries

South Africa's marine food sources will also be negatively affected by climate change. The collapse of global fisheries from ocean warming, acidification and plastic pollution, as well as industrial over-fishing, is already in process. The South African fisheries suffer from inequality in access to fishing resources, and over-fishing.

> Commercial fisheries are concentrated on the western and southern coasts, with localised recreational and subsistence fishing spread along much of the coast. The commercial fishing industry contributes about 1% of GDP, and provides an estimated 27 000 jobs, with more than double the number of jobs in secondary industries such as fish processing, transporting fish products and boat building. Subsistence fishing is important for coastal community livelihoods. Many South African fishery resources are overexploited with more accessible coastal resources at greater risk.
>
> Climate change is likely to affect the productivity and diversity of South Africa's fisheries by changing the distribution, abundance and size of resources, their habitat extent, condition and connectivity, their physiology and behaviour and the catchability of resource species. Changes in sea surface temperature (SST), storm frequency, freshwater flow and runoff patterns, productivity, oxygen levels and wind will all have impacts on estuarine, inshore and offshore ecosystems, affecting recruitment, fish behaviour and physiology, influencing fish size, and increasing fish mortalities. This could result in significant adverse impacts on subsistence fishing livelihoods as well as commercial and recreational industries.

64 Jane Dutton Hour, eNCA 20 December 2019.

> Tropical species may move polewards in response to warming temperatures resulting in an expansion of the subtropical region. In contrast, temperate regions may contract, with coastal species being affected by changes in upwelling, related extremes in temperatures, reduced runoff and habitat loss, ultimately leading to a decrease in temperate species diversity and abundance. Stocks under intense exploitation pressure are likely to be more vulnerable to the effects of climate change than optimally exploited populations. Overfishing may result in reduced genetic variability, which may negatively affect the possibilities of an evolutionary response to climate change and the ability of depleted stocks to recover. [DEA 2013fish].

Behavioural cues could be confused by changes in rainfall patterns. The sector also faces a reduction in the number of viable sea fishing days and damage to fishing vessels and docks from sea level rise and storms. In the above, the effects of ocean acidification on fisheries have not been factored in. Nor does the LTAS give any account of the heavy toll of oil and gas exploration and extraction on the marine environment.

Health

The cascade of climate change impacts come together in people's bodies. Key health risks from climate change include: food insecurity, hunger and malnutrition; natural disasters; high injury burden; air pollution; communicable diseases and specifically HIV and AIDS; non-communicable diseases such as diabetes; mental health; and occupational health, particularly through increased heat stress.

The 2019 Lancet Countdown on health and climate change, a report produced by 35 leading academic institutions and UN agencies from every continent, recently put the focus on what this means for the world's children: "A child born today will experience a world that is more than four degrees warmer than the pre-industrial average, with climate change impacting human health from infancy and adolescence to adulthood and old age" [Watts et al 2019:

1]. Climate threats to children's health include hunger, diarrhoea from unsafe water, dengue fever, and air pollution – particularly particulate matter from fossil fuel combustion worsened by climate change – which damages the heart, lungs and other vital organs. Families and livelihoods are at risk from extreme weather conditions, including wildfires and heatwaves which are on the increase in every region in the world – and particularly affect the very old and the very young. The report also warns of the health threats from "downstream risks from climate change, such as migration, poverty exacerbation, violent conflict and mental illness" [2019:2].

These effects are already being felt worldwide. Lancet 2019 reports that "over 220 million additional exposures to heatwaves (with each exposure defined as one person aged 65 years or older exposed to one heatwave) occurred in 2018, compared with a 1986–2005 climatological baseline, higher than ever previously tracked". Up to 15-20% of daylight working hours are already being lost to workers in construction and agriculture as a result of climate change. In 152 countries, there is an increase in exposure of the population to wildfires, and the conditions for infections from diarrhoea and Vibrio bacteria have increased dramatically.

Crisis in the health sector

In South Africa, climate change impacts will stress a national health system that is clearly already in trouble. A recent review based on 74 articles covering the period 1996 to 2018 confirmed that there are huge challenges in South African health care [Maphumulo and Bhengu 2019]. It said that South Africans have lost confidence in the system. The problems go back to apartheid, when the health system was highly fragmented and discriminatory on the basis of race. Despite huge efforts by post-apartheid governments, say the authors, several issues have been raised by the public. The article discusses seven of these:

> … prolonged waiting time because of shortage of human resources, adverse events, poor hygiene and poor infection control measures,

> increased litigation because of avoidable errors, shortage of resources in medicine and equipment and poor record-keeping [2019: 1].

At a Presidential Health Summit in 2018, Ramaphosa reported, in somewhat plainer language, on the complaints he was receiving:

> Since becoming the President of South Africa, I have received numerous complaints about the poor quality of health care that people experience in our clinics and hospitals during their moments of vulnerability. The complaints include inadequate access to medicines, equipment and technology, and numbers of staff in our facilities, unprofessional conduct of staff, labour unrest, corruption and theft of hospital property. They also experience poor delivery of mental health services and delays in accessing health care. Others experience above-inflation increases in medical schemes contributions, and failure of medical schemes to pay for patient services that have been rendered. Several organisations have also raised concerns with me regarding the dysfunctionality of the health system, to the point that it became clear that the system is in crisis and needs urgent rehabilitation. This does not mean that the system has completely collapsed, but that it is edging to a tipping point where it will be impossible to deliver needed services if we do not rescue it. In a country with more than seven million people living with HIV, a nation with rising diabetes, hypertension and cancer rates, and high maternal death and neonatal death rates, poor mental health status, and prevalent disability rates, we cannot afford to have a faltering health system.[65]

Climate health impacts are on the increase

South Africa's health systems are ill prepared for the effects of climate change, argue a team of public health and climate researchers [Chersich et al 2018]

65 Report on the Presidential Health Summit, Birchwood Conference Centre, Johannesburg, 18 – 20 October 2019. https://www. gov. za/sites/default/files/gcis_document/201902/presidential-health-summit-report.pdf accessed 13/12/2019.

in a recent review of 34 papers that assessed the impacts of climate change on South Africa. They predict that climate change will become the number one public health issue of the coming decade, and argue that climate change should be reframed as a health issue and that health professionals need to step up to a greater leadership role on climate change.

They conclude that the most noticeable impacts of climate change to date are extreme weather events, especially droughts. However vector-borne diseases like malaria are also becoming prominent. Climate change also underlies outbreaks of food and waterborne diseases. Health professionals should note that climate change may have mental health effects as it adds to already existing stresses. Further, "climate change heightens the pre-existing vulnerabilities of women, fishing communities, rural subsistence farmers and those living in informal settlements. Further gender disparities, eco-migration and social disruptions may undermine the prevention – but also treatment – of HIV" [2018: 1].

Heatwaves not only reduce productivity at work or in the fields, but directly impact on the elderly and the very young. Poorer people are more vulnerable: during warm weather, corrugated iron shacks – at least 4 million people live in shack settlements but reliable figures are hard to find – are generally 3°C warmer than the outside temperature. Informal settlements are often located in flood plains, which appear to be open land, or on unstable land such as the abandoned gold mining belt in Ekurhuleni. Floods unleash a cascade of effects, including the loss of homes, possessions and food stores, dirty water leading to diarrhoea, famine, migration, conflict and sexual violence inflicted on women in unfamiliar and crowded conditions. No or inadequate services (water, sanitation, electricity, waste removal, health clinics) create vulnerability to extreme rainfall events. Poverty is a critical cause of vulnerability. In 2015, more than half of South Africans (55.5%) or 30 million people lived below the national poverty line of R992 per month, according to Stats SA.[66] The equivalent poverty line is now put at R1 227. The draft national climate change

66 Stats SA, 2017, *Poverty trends in South Africa: An examination of absolute poverty between 2006 and 2015*.

and health adaptation plan 2020-2024[67] observes that poor people who are excluded from the formal economy have a large dependence on the informal economy and natural resources – so many of the impacts will come via that route. However, the boundaries between formal and informal are less defined than this suggests and many people are poor within the formal economy.

Climate-induced health impacts cascade into economic impacts, particularly for poor people. Reduced health leads to fewer workdays – in the formal as well as the informal economy – and lower income leads to nutritional compromises in a vicious downward spiral. Poor, sick people put extra pressure on an already faltering health care system. And in the Highveld and other pollution hotspots, the cost of bad air persists [see 'dirty air' in the next chapter].

Malaria is an emerging health priority as climate zones that allow for this mosquito extend southwards from the traditional malaria areas. It already affects 10% of South Africans, says the draft national climate change health adaptation plan, which encourages greater vigilance in the health sector as malaria areas expand under climate change.

Urban and rural settlements, and local government

The built environment in urban and rural areas will be faced with serious climate change challenges. LTAS research outlined the priorities for human settlements [DEA undated].

Climate change impacts are expected from increased temperatures, made worse by the 'urban heat island' effect, where built-up cities are warmer than the areas around them; by heatwaves and droughts, heavy rainfall and violent storms and, for coastal cities, the dangers of sea level rise and coastal storm surges. The direct impacts can then be followed by increased demand for electricity from air conditioners which cool inside but add to the heat island outside, dangerous water as a result of floods in areas with poor sanitation and waste management, the loss of homes and interruption of livelihoods, forced relocations and damage to infrastructure.

67 This plan has been in various updated draft forms for the past 5 years, to the frustration of many in the climate and health sectors.

These threats are worse for the most vulnerable, such as households without access to electricity, water, sanitation and proper waste management; people living in houses that are poorly built, that are without heating and cooling systems, and located in flood prone areas, as is the case for many shacks in informal settlements. Children and the elderly are more susceptible to illness, heat stress, food insecurity and malnutrition. Also vulnerable are children in households, especially in rural areas, where adults are absent because they are working elsewhere, have died or absconded. As a result of South Africa's apartheid geography, poorer black households live further away from work and often schools, making them more vulnerable to disruption of transport.

While water infrastructure, as noted above, is already under stress, extreme weather will also damage roads, rails, bridges, airports, tunnels and other transport infrastructure. Contaminated mine water – such as acid mine drainage in Johannesburg and on the Highveld coalfields – may spill out and affect infrastructure. Extreme weather conditions can also cause traffic congestion and increased collisions. As noted above, health problems will also increase.

Low cost housing – RDP houses – may be vulnerable to rain, wind and storm damage, as they are poorly built. They are also poorly insulated against extreme weather. Informal settlements often have high densities, poor waste management, narrow passages that make it difficult to evacuate, and are often built on land not meant for urban development, for example low lying land that is prone to flooding.

Coastal settlements are vulnerable to sea-level rise, storm surges and coastal flooding. Livelihoods in coastal settlements could be affected by ocean acidification resulting in poor fishing conditions. Small harbours may be destroyed by storm surges, coastal roads and railways may be washed away, interrupting transport. Rising seas could also result in sewage and wastewater 'backwash' at marine fall-outs. Tourism livelihoods and recreational activities may be impacted and sea water may push into fresh water aquifers near the coast – impoverishing farms and food gardens and contaminating groundwater.

More recent LTAS research notes the possibilities of large-scale migration into cities, which may lead to conflict in situations of scarcity [DEA undated]. An Oxfam report from 2017 states: "On average, 21.8 million people [globally] were reported newly internally displaced by sudden-onset extreme weather disasters each year between 2008 and 2016." There are already reports of farm workers in the Northern Cape moving off farms and into rural towns in large numbers. In the longer run, the social structures and material flows that keep cities going may collapse altogether, leading to a reversal of migration and a profound transformation in settlement patterns where food production and people decisively shift to rural areas, and smaller and more local government systems emerge [Bradford 2019]. Clearly, however, many rural areas will not provide an hospitable environment.

Not all local governments are capable of planning for climate change. Ziervogel et al point out that "cities generally have the resources to develop adaptation responses, but are hampered regarding implementation due to their large size and organisational complexity. Smaller municipalities on the other hand, do not have the human capacity to undertake systemic adaptation planning but are more successful implementers because of their smaller, less complex organisational nature, and because key individuals across functions are well-networked and have a history of working together" [Ziervogel et al 2014: 612].

Corporates see climate trouble ahead

There is a sharp divergence in the responses of corporates and social movements to the impacts of climate change, as the following two sections show. Kevin Bloom, writing under Daily Maverick's 'Our Burning Planet' banner, provided a rare view of what 16 big South African corporates think climate change will mean for their business models: five food producers or retailers, three financial service providers, four mining houses, a hospital group, an industrial brand manager, an alcoholic beverage maker and a clothing retailer.[68]

68 Kevin Bloom, https://www. dailymaverick. co. za/article/2019-11-11-future-foretold-sas-corporate-heavyweights-and-the-zero-sum-game-of-climate-collapse

Shoprite Checkers is considering diversifying its supplies of fresh produce sourced from the Eastern Cape in the light of ongoing and future droughts there caused by climate change. More generally, the food retailers (Tiger Brands, Pioneer Foods and Spar) expect the prices of milk, sugar and wheat to rise. Massmart (which owns Makro, Fruitspot and Game) anticipates that certain products will no longer be on its shelves as a result of extreme weather conditions and events. Massmart noted that ocean acidification could lead to problems in the supply of pilchards, an important source of protein for many South Africans.

Standard Bank worried that its agricultural and home loan book would be exposed to bad debt, leading to higher insurance premiums (for itself). First Rand pointed out that in some geographical areas farmers would no longer be able to obtain insurance or finance on their crops – implying that the bank would no longer finance these farmers to plant. Liberty foresaw an increase in medical aid payouts due to an overall decline in health, as the result of the spread of vector-borne diseases, the occurrence of malnutrition, cardio-respiratory diseases and diarrhoea.

Mining houses (Anglo American Platinum, Harmony Gold, Sibanye-Stillwater and Impala Platinum) were all concerned about their future water supply, which would affect mining, processing and refining operations. While several mining companies made a point of professing their concern about the water supply to communities, Bloom concluded that it is more likely that water will become a zero-sum contest between mines and neighbouring communities. Some mines were concerned about the future water supply from both the Vaal Dam and the Lesotho Highlands, as there are predictions that Lesotho could move into a rain shadow as the climate changes. Marginal operations would likely close. Lesotho and neighbouring parts of South Africa are indeed experiencing serious drought now.

The health implications of climate change could further destabilise workforces. Impala pointed to food scarcity, migration, resource-related conflicts and health issues: the anticipated increases in respiratory, infectious and skin disease; contamination of water and the spread of water-borne

diseases; and the extension of conditions favourable to malaria, dengue fever, cholera and meningitis.

Bloom quoted the response of Mediclinic International, responsible for more than 50 hospitals and day clinics in South Africa, in detail:

> Water plays a critical role in the effective functioning of any hospital – without continuous water supply, hospitals cannot ensure hygiene with an increase in infection control risk. Water shortages, no or limited supply, could cause the shutdown of strategic equipment resulting in limited services in the kitchen and laundry at hospitals in southern Africa. Without water, there can be no hospital.

He then commented that the Mediclinic climate change scenario was already

> … playing itself out in real-time in the country's public hospitals. On 6 November 2019, both eNCA and 702 were reporting on the crisis in Hammanskraal in northern Gauteng, a former apartheid 'location' that had been without water for three weeks. At Jubilee Hospital in Hammanskraal, the surgery theatres had been shut down due to hygiene concerns. A doctor at the facility had tweeted that the wards were 'stinking', and that Jubilee was 'no longer a healthcare centre' but a 'harbour for deadly diseases'.

Other companies were concerned about decreases in tourism (Barloworld), the availability of raw cotton and wool (Truworths), and shortages of grapes for alcohol production (Distell).

Solidarity and building a new society

While South African businesses were focusing on their immediate interests, the Million Climate Jobs campaign had its own predictions of coming hardship [AIDC 2016]. They pleaded for solidarity and using the challenges that climate change will bring, to build a new society. They argued:

A warming climate will affect everything. Six changes will affect humanity most. The first is that heat and drought will kill the crops in many places. In the economic and social system that we live in now, that will produce famines.

Second, the heat will produce rising sea levels and stronger storms. Much of the world's population lives in cities on the coast. Much of those cities, the homes, jobs and businesses, will be lost to the storms. That will mean economic devastation.

Third, climate change will mean economic suffering. The governments who have done nothing for so long will come to us and say that now we must all sacrifice together to save the Earth. There will be budget cuts. Companies will be forced to cuts costs and jobs will go. We will sacrifice our incomes, our jobs, and our children's health. The rich and the politicians will sacrifice nothing. And they will use guns, tanks and the police to force us to sacrifice.

Fourth, climate change will mean hundreds of millions of refugees globally. They will flee droughts, famines, floods and the wars. They will drown in the seas, or walk to borders patrolled by men and women with machine guns. Many millions of these refugees will be coming to South Africa from other parts of Africa.

Fifth, climate change will mean an orgy of racism and xenophobia. Where the hungry and homeless mass on one side of the border, on the other side racisms will rise to justify not letting them in. And everywhere, amid chaos and want, governments and the rich will look for scapegoats to blame – for anybody to blame but themselves. Because they will be acutely aware that we will be blaming them.

Sixth, climate change will lead to wars. The process is not simple, and there will never be a simple climate war. Great power politics and local conflicts will always be involved. But if you want an example of [how] forty years of climate change, drought, famine, refugees and war can come together, look at Darfur in Sudan. There are many causes to the

wars in Darfur and neighbouring Chad, but at the core, on the ground, are poor farmers and poor hunters killing each other for disappearing grass.

But…

At every step of the way there will be alternatives. When there are famines, governments can feed the hungry. When there is economic devastation, people can share equally and rebuild anew. People can welcome refugees to new homes in new countries, with new jobs and schools for their children. Where war threatens, people can build mass movements for peace.

All this is possible. The great majority of the devastation will happen not simply because of climate change, but because climate change will happen in a greedy, cruel, market driven social and economic system. We do not have to live that way. Every step of the way, we can campaign for sharing and kindness.

Climate jobs are a solution that shares work and shares money so we can take care of each other. They are a step in building a different society.

The next chapter explores these perspectives and possibilities.

3 Just transition – a view from the ground

This chapter explores concrete utopian thinking – imagining alternative futures by combining what we know about the present with what can be thought or has been prefigured in alternative social practices. It presents the Million Climate Jobs campaign as one such initiative, before exploring the close but constantly shifting relationship between two overlapping constituencies in South Africa over the past decades: workers and communities. Labour and environmental justice movements both respond to capital's twin appropriation of labour and of 'nature' to turn a profit. It considers community and labour participation in the National Planning Commission's just transition consultation process, and concludes with an open agenda for a just transition emerging from activists in communities polluted by coal.

Utopian thinking

Crisis contains opportunity. The disruption of the currently dominant fossil fuel energy system, the increasing chaos induced by climate change events, including the breakdown of large societal systems like states and long distance trade, large migrations and refugee movements, and a growing awareness among people that the current elite and its capitalist system have brought us into this mess – all these factors together require thinking about and moving towards a new, better society. Many agree that this change is urgently necessary, but for many even thinking that a different society is possible, and what it would be like, is a challenge. For others, "It's easier to imagine the end of the world than the end of capitalism".[69] In the meantime, debates are rolling

69 This remark is attributed to both Fredric Jameson and Slavoj Zizek, in Fisher 2009.

forward and decisions are being made. In such a situation, there is a need for utopian thinking – in particular, concrete utopian thinking.

Utopian thinking has had a bad press ever since Thomas More created the word as a Latin pun between "good place" (eutopia) and "nowhere" (outopia). It could mean unrealistic dreaming about being someplace else, or in an unreal world. But utopian thinking can also be a tool for freeing the imagination, argues Ruth Levitas [2017], and is crucially important in a time of climate change. It can play three roles:

1. imagining and debating what future societies may look like;
2. uncovering utopian thinking in current ideologies by showing what images of society lie behind the current relationships and practices that allow wealth to be concentrated in the hands of the elite and a hierarchy of important and unimportant people to be constructed; and
3. finding examples of the new society in practices that already occur around us, prefiguring a new society.

Examples of such prefiguration, or parts of a new society that already exist, are the solidarity during a workers' strike or a march against climate change inaction, care within families and extended families, or team work in the work place. What does this tell us? David Graeber [2011] argues that, in fact, capitalism incorporates and relies on such solidarity practices as a subsidy – for example, the care that goes into "reproducing new workers", as well as "team spirit" at work. If this is so, freedom and change may be achieved by nourishing and hooking up areas of freedom and solidarity in a new configuration of spaces and practices not dominated by capitalist relations. Its potential is that these areas and practices may grow even within the current system.

Concrete utopias

For utopian thinking to be useful, and not just wishful thinking, it has to be in the form of "concrete utopias", which is "the practice of constructing models of alternative ways of living on the basis of some assumed set of resources"

[Hartwig, 2007: 74]. Utopian thinking is an essential counterbalance to being stuck in the realities of the present power system, unable to imagine another world or hope for it. Concrete utopian thinking can take the known building blocks and dynamics of the world as we live in it – the "oppressive reality we deal with every day" – and imagine its reconfiguration.

Concrete utopian thinking results in a process, rather than a blueprint. It is "a process in which praxis educates fantasy, and fantasy educates praxis…" [Hartwig, 2007: 74]. Concrete utopian thinking is grounded in "a keen sense of the reality … of unactualised possibility". So it can be a response to the obvious waste of talent of so many people caged in by the current and unforgiving economic system, excluded from resources as a result of the enclosures of colonialism and capitalism, especially in its neo-liberal form, and prevented from responding to challenges such as climate change. In short, concrete utopian thinking is driven by the basic human drive to happiness, or more technically "universal free flourishing".[70] Hartwig [2007: 187 – 189] proposes that such flourishing would require the following principles:

- a normative order informed by the values of trust, solidarity, sensitivity to suffering, nurturing and care, in universally recognised rights (freedoms) and duties;
- constitutional democracy organised around people's councils or assemblies forged to articulate self-determination, with as much local autonomy and participatory democracy as possible;
- the massive redistribution, transformation and limitation of resource use dictated by considerations of equity and ecology, including the socialisation of knowledge;
- the co-operative organisation of production (of goods) and services by interlinked autonomous associations at a local and regional level;

70 Using "flourishing" as a benchmark sees human happiness and flourishing as the highest good. It opposes a politics of "minimum requirements" for life.

- distributive principles along the lines of "from each in accordance with their wants, abilities and needs" and "to each according to their essential needs and innovative enterprise" such that minimally no one is forced to sell their labour power or work for a master;
- the recognition of diversity and pluralism for political, scientific and educational creativity.

This is offered here not as a final word, but as an example of a concrete utopia and to invite debate.

Envisioning a million climate jobs

An important South African example of concrete utopian thinking is the Million Climate Jobs campaign [AIDC 2011; updated in 2016]. In 2011, forty civil society organisations, including trade unions, participated in the production of a series of technical papers that covered agriculture and food security; energy; water; health; housing and construction; transport; zero waste; ecological restoration; leisure and tourism; manufacturing; sanitation; trade; climate change impact assessments; financing climate jobs; and transforming local government. In broad terms, the campaign proposed that South Africans:

1. produce electricity from wind and solar power;
2. reduce energy use through energy efficiency in industries;
3. reduce energy use in homes and buildings by constructing new buildings to be energy efficient and by retrofitting existing buildings;
4. reduce the use of energy in transport by improving and expanding public transport;
5. produce food through organic small-scale agroecology; and
6. protect water, soil and biodiversity resources.

While the 2011 edition also paid attention to issues like primary health care and protecting water resources, the 2016 update focused in on climate jobs:

"jobs which stop the world heating up from climate change by cutting 76% of South Africa's greenhouse gas emissions". It reassured readers that "these cuts would still allow enormous room for much more electricity use, transport use and affordable housing. This is a programme of conversion to a low carbon economy that is a programme for more jobs and more services for ordinary people." Table 1 shows how the million jobs would be made up:

Table 1: One million climate jobs [AIDC 2016]

Electricity & Renewable Energy	250 000 jobs
Transport	390 000
Construction & Repairs	150 000 to 200 000
Agriculture	100 000 to 500 000
Waste, Industry and Education	110 000
TOTAL	1 000 000 jobs

Electricity

Electricity is responsible for 44% of South Africa's GHG emissions. Replacing coal-fired electricity system with renewables by 2040 would not only drastically reduce these emissions, but also provide 250 000 climate jobs. These would come from building and installing wind power (66 000 jobs), building and installing solar power (122 000 jobs); building and operating a smart grid (62 000 jobs) and maintenance and repairs of renewable installations (a workforce of 88 000 that would grow over time).

These figures are based on replacing the existing system. They can be compared to the outcomes modelled by the CSIR [2017] which assume a large increase in electricity demand. CSIR shows that, in a 'least cost' scenario, new generating capacity is mostly renewable backed up with gas or storage and no new coal or nuclear power would be built. By 2050, this would cost R73 billion less than a system dominated by coal and nuclear power. The least cost energy mix would consist of around 49% wind; 21% solar PV; 6% hydro; 12% gas or storage; and Medupi and Kusile would still be producing about 11%. CO_2 emissions in 2050 would be 86 Mt a year as against 187 Mt/y in the system with new coal.

The CSIR's 'decarbonised scenario' would produce just 10 Mt/y in 2050. It would cost R50 billion more than 'least cost' but still be cheaper than the system with new coal and nuclear power. The 2050 energy mix would consist of about 22% solar PV; 48% wind; 13% concentrated solar power; 6% biogas; and 5% fossil gas. It would use 30% less water than least cost and 75% less than the coal heavy system. The decarbonised system also creates most jobs: 330 000 by 2050 compared with between 313 000 jobs in least cost and 295 000 in the coal and nuclear dominated system – including jobs in the mines. The Highveld should become a major renewable energy hub and has now been declared a renewable energy development zone (REDZ). Analyst Clyde Mallinson[71] notes that this will makes good use of the existing transmission network centred on the region.

The Million Climate Jobs campaign foresees that wind power installations would be erected mostly in rural areas, where they could share the land with grazing, for example. But because most of the jobs would be in manufacturing, it is crucial to make sure that these jobs are in South Africa and not overseas. That requires government – and other political actors – to prioritise the development of a renewables manufacturing strategy. Solar panels could be placed on roof tops of houses, parking lots and shops as well as in industrial scale power plants. There would be an immense demand for power: triple the capacity for electricity generation that we currently have, and in addition, an electric vehicle industry (and supporting infrastructure for charging the batteries) will replace the fossil fuel car industry.

Transport

The Million Climate Jobs campaign foresees a very different transport sector, which is currently responsible for around 16% of total South Africa emissions.[72] An estimated 390 000 new jobs could be created, based on meeting – in a carbon-constrained environment – the transport needs of 31 million people (of whom 14 million are currently walking to work and school,

71 Clyde Mallinson, *Breath of fresh air for dying sector*, Mail & Guardian, 27 Sep 2019.
72 This number includes Sasol's emissions in its dirty coal to liquid fuel process.

8 million travel in cars, 6 million in mini bus taxis, 2 million in buses and 1 million in trains). The transport system would move from fossil fuels (petrol and diesel) to electricity from renewable sources. The result would be "a cut of 90% in transport emissions over twenty years. And most South Africans will have cleaner, faster and cheaper travel" [2016: 36].

The transport vision includes more safety, and convenience, including looking after passengers with toilets, tea and food available at stop-over points. A well-run bus service will have 6 million new passengers and create 250 000 new jobs, trains will transport 1 million new passengers with 30 000 new jobs; and mini bus taxis will have 1 million new passengers and 70 000 new jobs. "Plus we would need at least 30 000 new jobs for the first ten years building a bigger rail network and all train lines. And we would need about 30 000 jobs for three years building new bus rapid transit lines and stations" [31]. Assuring the safety of passengers will require a 25% increase in jobs as conductors and guards on taxis, buses and trains. As the transport sector is electrified, "we estimate we will need 20 000 new direct jobs in pioneering an electric vehicle industry, and we will save many more jobs that would otherwise disappear" [34].

Transport construction, such as for new railways, will help provide new jobs for the 20 000 people who work in fuel, oil and refineries. Since aviation contributes only 1% of emissions, the plan does not propose capping air travel, but plans to shift domestic air travel onto new high speed national trains.

Agriculture

The report emphasises that large numbers of South Africans make their living from the land, an estimated "2 000 000 small-scale farmers; 600 000 farm workers; 200 000 medium-sized black commercial farmers and 35 000 large ('white') commercial farmers" [2016:19]. An agricultural sector that deals with climate change has the potential to create 100 000 to 500 000 climate change jobs. Only 9% of South Africa's emissions come from agriculture: 5% from the digestive systems of cattle, sheep and goats; 3% from using animal manure and animal urine on the fields to help grow crops. Around 1% comes

from using commercial manufactured fertilisers. As farms are abandoned, savanna and grasslands are growing back, which could be reducing South Africa's overall emissions by about 4% per year (or cancel out unavoidable livestock GHGs). This is an unguided process that could be enhanced by using agroecological techniques.

The report argues that "farmers and rural people need four things now. Rural people who lose their livelihoods because of climate change need climate subsidies. Small farmers need an enormous amount of help to cope with the new climate. Small farmers, semi-subsistence farmers and farm workers will need much more good land to cope. That means land reform, which includes access to water. Rural areas and rural people will need many of the new climate jobs in energy" [2016: 17].

The built environment

The campaign foresees 150 000 to 200 000 jobs working on the built environment to deal with climate change, including catching up on current service deficits. This will need serious co-operation from all levels of government:

> We will need every municipality to map communities, informal settlements and other infrastructure that is at risk from flooding and other impacts of climate change. This will include getting an accurate picture of the communities whose lack of access to water, electricity and housing will be made worse by climate change. Government, and particularly the government statistical service, StatsSA, needs to be more consciously tracking mitigation and adaptation measures so that local, provincial and national government can make better decisions about what still needs to be done. …
>
> We will need many jobs in construction to respond to climate change. Many of these kinds of jobs are currently low-paid, insecure, short term and unsafe. We want them decently paid, permanent and safe …

> Municipalities are the obvious people to employ many more workers to carry out climate construction jobs at the local level.
>
> It would also make sense for these municipal construction workforces to take on most of the work of maintenance and repair of solar PV and wind turbines [because]: (1) the amount of repair and maintenance work will grow steadily over twenty years – enough for 88 000 workers by the end of twenty years. Municipal workers could do most of the necessary conversion and construction work on the built environment early in the twenty years. (2) Then they would be available as a local, skilled workforce to do the repair work. That would give municipal construction workers permanent, secure jobs… Many of these jobs will be skilled and semi-skilled construction workers. We will also need engineers, technologists, technicians, and other highly educated staff. [2016: 36 & 37]

Jobs will include:

- Constructing new roads and adapting existing roads to withstand climate changes such as increased temperature and flooding.
- Changing storm water pipes across municipalities to have a bigger diameter to deal with the increase in rain intensity.
- Making street lights and traffic lights more energy efficient.
- Increasing the role of disaster and emergency workers, and making them better prepared to identify climate related hazards early, deal with climate related emergencies and prepare communities for the impacts of climate change.
- Planting trees in public places. [40]

Other work would include creating dedicated bicycle lanes. But the most important would be to construct houses and infrastructure that can deal with climate change. This would include ecological urban design to deal with floods and increased rainfall intensity by providing water harvesting storm water drains, soak-in areas to replenish groundwater and the construction

of artificial wetlands to slow down floods and improve the quality of urban surface run-off.

Waste

Emissions from waste amount to 4% of national emissions. About nine tenths of these emissions come from solid waste and the other 10% come from sewage and other waste water. The campaign proposes biogas digesters. Alternative ways of dealing with waste water treatment, such as Integrated Algal Ponds, are also possible. There is a large waste picking and recycling economy in South Africa [see Box 4].

Industry

Of South Africa emissions, 16% come from industry, not counting electricity use. According to the Million Climate Jobs campaign:

> The climate jobs here would be of two kinds. One would be in research to work out new ways of reducing emissions. The other would be in specialist teams of advisers that can go into large and small businesses and offer tailored advice on ways to reduce emissions and increase energy efficiency … Our estimate is that in twenty years it should be possible to reduce industrial emissions by almost half, from 16% of the current total to 10% of the current total. Perhaps, with international cooperation, it will be possible to do better than that. [44]

The Million Climate Jobs campaign estimates 110 000 climate jobs in waste, industry and related education and training.

The report concludes: "within thirty years, and with international cooperation in industry and some technological change, it will be possible to reduce all emissions from 547 million tons a year to 54 million tons – a cut of 90%" [53].

Environmental justice and labour

The Million Climate Jobs campaign was the outcome of collaboration between trade unions and environmental justice organisations. In fact, labour engaged in the environmental justice movement from the start. In 1992, in the context of the turbulent political transition, Earthlife Africa hosted an international conference on environment, development and justice to consider "what it means to be green in South Africa". Comrades from the labour movement brought workers' environmental issues into that forum to be shared and debated alongside the issues brought in by people from rural communities, civics, the women's movement, the environmental movement, religious bodies and a range of development organisations. The phrase 'environmental justice' was introduced by Dana Alston who was speaking from black people's experience of environmental racism in the USA. It resonated with delegates as speaking to their issues while also giving them a common frame through which to seek unity of purpose.

Vic Thorpe of the International Federation of Chemical Energy and General Workers Unions (ICEF) observed that their members "organise in just about the most polluting industries on the face of the earth … [producing] vast tonnages of greenhouse gases and acid rain sulphurs and nitrogen oxides …" [Thorpe 1992: 77]. They are on the front line of industrial pollution at work and often at home with their families in the same neighbourhood. The damage to the environment and to people's health is a product of a global regime of accumulation and the workers movement was born in the struggle against the injustices of that regime. ICEF subsequently merged with the international mining federation and is now called IndustriAll. Its South African affiliates are Numsa, NUM and Ceppwawu.

Thorpe was joined by Mopholosi Morokong of the South African Chemical Workers Union, and Shirley Miller of the Chemical Workers Industrial Union (now Ceppwawu), who emphasised workers' right to know about industrial production processes and the raw materials, products and wastes involved, their right to act on that knowledge and to participate in industrial planning. And they saw workers bringing their own agenda into a common struggle to

transform production, protect the environment and create a more equal world [in Hallowes 1993].

Since then, the alliance of red and green has waxed and waned and the struggle against the global empire of capital has been driven back. The idea of a just transition has nevertheless acquired a certain force. Trade unions became more involved in the climate debate from 2008. They saw a "need to counter the jobs versus environment narrative" and started campaigning for a just transition for workers whose jobs would be on the line [Rosemberg 2015: 6]. That campaign was taken into the International Labour Organisation (ILO) and resulted in the adoption of guidelines on a just transition. It then also secured a line recognising "the imperatives of just transition" in the 2015 Paris Agreement.

In 2009, meanwhile, a climate justice campaign to stop the World Bank lending Eskom money to build Medupi and, more broadly, to oppose all funding for Eskom's coal and nuclear expansion plans, was coordinated by groundWork and Earthlife with the broad support of about 190 organisations in South Africa, Africa and internationally. The campaign called for a just transition for the workers in the energy system – in both Eskom and the energy intensive industries that it supplies – as part a broader transformation of the economy to serve people rather than the global regime of accumulation. It asserted that renewables would create more jobs and should be manufactured and funded locally. And it warned that Medupi and the coal expansion enabled by the World Bank loan would sink Eskom and South Africa in debt while rising tariffs would drive more people into penury. Further, since South Africa was already responsible for 40% of emissions from Africa, the project would add to a climate debt owed to the rest of the continent.[73]

In the run up to CoP17, the 2011 round of climate negotiations held in Durban, Cosatu adopted a policy framework on climate change centred on a just transition. It was composed of 15 principles, starting with the recognition that "the fundamental cause of the climate crisis is the expansionist logic of the capitalist system". It supported the International Trade Union Council's

73 groundWork Press Release, *South Africans say no to Eskom's R29 billion World Bank loan*, 16 February 2010.

(ITUC) demand that a just transition must protect workers moving out of dirty jobs but went beyond that to reiterate the call for a deep transformation of the economy to serve the people rather than capital. A just transition is for all, not only for affected workers. The policy endorsed the Million Climate Jobs campaign, in which the unions were well represented, as a practical initiative both to address the unemployment crisis and to respond to climate change. Complementary to this, Numsa developed its position for a socially owned renewable energy sector and formed regional research groups to take the debate to the shop floor.

The Million Climate Jobs campaign was also supported by environmental justice organisations and, from 2011 to about 2013 when Cosatu was consumed by the divisions that led to the expulsion of Numsa, it provided a common red-green platform. Organisations from the pollution front lines participating in the Durban climate camp in November 2013, declared,

> A great deal of work needs to be done if we are to respond adequately to climate change. The market has not and will not create the jobs to do it but leaves millions of us without employment and the means to live. We therefore support the campaign for One Million Climate Jobs which understands that this must be a public initiative driven by people and supported by government.

These organisations also focus on resistance as people fight for their lives and fight against dispossession. They said 'No' to the expansion of coal-fired power and nuclear power, to the mines encroaching on their land and to fracking for gas under it and producing the widescale contamination of water. They said 'No' to the port and petroleum expansion in south Durban and to exploration for more oil offshore. They said 'No' to the expansion of the minerals energy complex and 'No' to the never-ending expansion of capital. They called for a steep reduction in emissions and a drive to develop renewables under people's democratic control.[74]

74 Durban Climate Camp Declaration, 15 November 2013.

Emphasising the people's commons under the title 'Our Life, Our Water, Our Sea, Our Air, Our Land', community groups reiterated these positions at a national 'frackdown' gathering in October 2018. As government put fossil fuel extraction on the fast track, they noted that resistance is integral to the struggle for a just transition. At that time, the project to dig out a new container port in south Durban had been put on ice, fracking had been stalled for eight years and there was no smooth ride for oil exploration off the east coast as coastal communities mobilised to challenge the oil majors. But they observed that democratic spaces are being closed down or outsourced to consultants who have an interest in projects being approved. They committed to fight for open democracy and real participation to make the path to a just transition.

Throughout these three decades, the positions of the environmental justice and labour movements have echoed each other even if they have not been identical. The structural reason for that is that capital requires the appropriation of labour and of 'nature' to turn a profit – and that in turn means that people are dispossessed.

The National Planning Commission

The international experience indicates that dialogue between 'social actors' affected by the transition is a crucial part of the planning process. Amongst other things, this is to build trust as there is held to be little chance of a successful transition without it. But this also begs the question as to who will be party to the process. The meaning of participation was a critical issue in the National Planning Commission's (NPC) 2018-19 dialogue process for a just transition. In formal terms, this was to be a review of Chapter 5 of the National Development Plan (NDP), "Ensuring environmental sustainability and an equitable transition to a low-carbon economy". This was not a promising place to start. The NDP, published in 2012, had two goals: 'eliminating' poverty and reducing inequality by 2030. To make that easier, it took a miserly measure of what counts as poverty and aimed for a very modest reduction in inequality. Even more telling, the only means of achieving these goals was economic growth – at 5.4% a year from 2010 to 2030.

The 2014 groundWork Report called it "planning for poverty". Growth was already failing and even Treasury's low growth forecasts were hopelessly optimistic – for global as well as local reasons. The NDP recognised that growth favours the rich and so called for 'inclusive growth'. This turned out to be cheap labour. Degraded labour and environmental regulations generally go together and so it was with the NDP as it called for 'streamlined' environmental planning. The chapters on economy and infrastructure made clear that environment and climate are subordinate to growth and particularly the growth of fossil fuel extraction and use. The environment chapter hardly contradicted this line. It wanted renewables "in parallel with responsible exploitation of fossil fuels" [198] and called for 'green growth' and 'clean coal'.

In 2018, in our view, what was needed was a break with this past rather than a review. And, at the start of the process, the NPC did signal a shift. First, framing the issue as a 'just transition' showed a sharper focus. Second, according to the commissioner responsible for the environment section, Tasneem Essop, the IPCC 1.5 report was a 'game changer', creating a new sense of urgency for government and non-government actors alike. Climate change needed to be made a priority. Climate justice actors thought it was urgent in the 1990s already. But this could be taken as an admission that government and corporate actors were either not reading the science or were carefully ignoring it – and possibly doing so in bad faith.

It should also be noted that, although the phrase just transition has been accepted in government, it is used to mean a very slow transition and/or a transition to 'clean coal' or, preferably, a just transition to the fourth industrial revolution.[75] Or it means nothing at all. In February 2019, Total announced that it had struck gas condensate in the Brulpadda Well in turbulent waters 180 kilometres off the Cape south coast. Gwede Mantashe, minister of mineral resources, immediately hailed it as a 'game changer' for the 'oceans

75 The 4th industrial revolution, according to Klaus Schwab of the World Economic Forum, "is characterised by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human". Such is the view from the heights of Davos. https://www. weforum. org/about/the-fourth-industrial-revolution-by-klaus-schwab.

economy'.[76] It bears mentioning that the impacts on fisheries may indeed be game changing.

Ramaphosa echoed Mantashe's celebration of Brulpadda in the State of the Nation address the next week. He did give climate change a one line mention. It comes in a section on rapid historical change which is really about "embracing the opportunities" of rapid technological change – it gets two pages and ends with the announcement that he has "appointed a Presidential Commission on the 4th Industrial Revolution".[77] So it does not seem that government really is gripped by the urgency of responding to climate change.

The NPC is not government but is a kind of think tank attached to the Presidency. It has a 'convening power', according to Essop, to facilitate a dialogue of the 'social partners' – government, business, labour and civil society – "to build consensus on a common vision for a just transition to a low carbon, climate resilient economy and society by 2050…"

This process started, and was intended to end, with a 'high level' dialogue with about 25 people in the room. The participants told the NPC that this would not wash. A credible process must at least visit all the provinces and particularly the communities most affected by the energy system. To do this, the NPC had to raise money from international donors but it was still challenged on process. In Durban, for example, participants noted that the dialogue touched only a tiny minority of the people. They thought a just transition is not only about the issues but about how politics is done. They were looking for an exercise in deep democracy, for forms of dialogue and participatory decision making that include everyone, not only for the NPC process but for governance in general. And they were also sceptical of what sort of consensus might be produced by 'social partners' of very unequal power and whether the process would not simply conceal antagonistic interests in favour of the powerful.

The process nevertheless also presented an opportunity for community groups to begin debating the just transition and to build movement towards a different

76 *Mantashe says oil and gas exploration off cape south coast expected to boost economy*, Ports & Ships, 4 February 2019.

77 President Cyril Ramaphosa, State of the Nation Address, Parliament, 7 February 2019, pp32&33.

vision of society. The tour through the provinces was also decisive for the NPC itself. In Middelburg on the Highveld, at a meeting with community activists ahead of the stakeholder dialogue, they were confronted with what the coal economy does to people and inspired by the emerging community agenda for a just transition [see further on in this chapter]. In the Free State, they were confronted by the impacts of climate change as the long running drought has resulted in "huge job losses". While the NPC attempts to outline pathways to zero emissions in 2050, it makes three proposals for immediate action: that just transition pilots should be run in these two hotspots; that labour and social plans be negotiated for power stations due for decommissioning; and that there should be planning for job losses in declining industries and job creation "in the economy including new green sectors".[78]

Following a 'concluding' national conference, the NPC's report on the process notes both "common and divergent stakeholder perspectives" under the themes of governance, land, water, energy and economy. It recorded numerous points of agreement and highlighted key differences:

- The conflict between mining and people's rights to clean air and water, and to uncontaminated land.
- The call for municipalisation in a context where local government has failed.
- The privatisation of electricity through the REIPPs as opposed to the call for socially owned renewable energy.
- The unbundling of Eskom, seen by unions as a precursor to privatisation.

Key points of agreement included:

- Consensus on zero carbon by 2050 at the concluding conference. However, the date was contested in the KZN workshop with participants calling for 2040 or 2030. In our view, the carbon budget is used up. Zero should have been yesterday. The target date is therefore a judgement on how fast it is possible to phase out fossil fuels.

78 NPC, Social Partner Dialogue for a Just Transition, May 2018 to June2019, Revised proposal following the outcomes of the Concluding Conference held on 29 May 2019. (Section 6)

- There was a strong consensus that phasing out coal "can only happen through an inclusive and transparent just transition planning process".

An inclusive just transition process must include the labour movement. For the most part, the unions did not participate in the provincial dialogues although, with the support of ITUC and the ILO, the NPC held a national level roundtable with labour. Their reluctant participation may be for one of two reasons: that they see the NDP, and hence all NPC processes, as hostile to workers; and/or that they prefer the more exclusive social partner dialogue in Nedlac. For communities and the environmental justice movement however, Nedlac is closed and the NPC offers a more open process even if it is limited. A pilot process on the Highveld will sink or swim according to its transformative potential. But that potential will only come into the process if it is brought in by the community and by labour, hopefully working together.

An emerging community agenda for the just transition

What follows in the next sections of this chapter reflects and responds to emerging community perspectives[79] on alternative futures. Our starting point is the community agenda developed in preparation for participation in the National Planning Commission process, and a 'national coal exchange' – a meeting of coal affected communities – in July 2019. We place this emerging agenda within the broad stream of environmental justice thinking worldwide as it has grappled with questions of the future.

Deadly air

The activists who crowded into groundWork's Middelburg office in July discussed their situation, the future and debates around a just transition from fossil fuels. We start with their experiences of coal combustion, coal mines and the authorities that should protect them – but don't. These experiences

79 There are of course many different community voices, but the tactical question in this debate is to create a broad, rich and coherent consensus which can have influence in transition debates as well as provide practical direction to communities in terms of issues that are (increasingly) not decided by government at any level.

inform their resistance to coal and constitute the background from which they envision a life after coal. The first reality they live with is deadly air.

Many of the activists came from the Mpumalanga Highveld, where the central coal basin has been mined for over a century and 12 huge coal-fired power stations belch out pollution alongside Sasol's giant coal-to-liquid plant and a number of heavy steel and metal industries. The people live in a haze of pollution. eMalahleni and Middelburg are the oldest centres of coal mining and people in eMalahleni's Ackerville township reported in 2017 that

> … the dust just comes from everywhere. The nights are worse than the days. Everyone sleeps with their windows closed but it gets in anyway. In the morning they sweep black dust from their verandas and paving. Emily Buhali cannot manage that. Sweeping raises the dust and instantly triggers a range of symptoms – burning eyes, inflamed sinuses and headaches. The dust also gets into the house and gathers on the curtains which she has to wash frequently. But then, as all the women say, you can't hang out the washing. [gWR2017: 21]

The health impacts of particulate emissions from mines, coal-fired power stations and steel and other metal production are overwhelming. Ackerville is close to a TB hospital – because of apartheid spatial planning it is located in one of the worst air pollution areas on the Highveld – and some people receive treatment there. Many people in Ackerville are 'on oxygen', especially at night. These purifiers and nebulisers depend on electricity but ironically, electricity supply to Ackerville is often interrupted as the municipality has failed to pay Eskom[80] and is subject to additional loadshedding. eMalahleni activists understand that they are caught in a perverse situation in an area sacrificed to the production of coal-fired electricity under apartheid as well as under the ANC since 1994.

In June 2019, groundWork and the Vukani Environmental Movement in eMalahleni, represented by the Centre for Environmental Rights, launched the

80 eMalahleni is Eskom's 2nd biggest municipal defaulter with over R2.7 billion debt before interest.

Deadly Air court case,[81] demanding that government cleans up the air over the Mpumalanga Highveld. The case records the frustration over government inaction since 2007,[82] when the Mpumalanga Highveld was declared part of the Highveld Priority Area (HPA). By 2012, an Air Quality Management Plan (AQMP) for the area was drawn up, but to date the regulations for implementing and enforcing the plan have not been gazetted and the plan has remained a dead letter. The environmental justice groups are asking the court to declare the current levels of air pollution on the Highveld a violation of people's Constitutional right to an environment not harmful to their health or well-being (section 24), and to force government to take meaningful action to implement and enforce the HPA AQMP.

The AQMP has also been radically undermined since Eskom, responsible for the bulk of air pollution in the area, applied for another round of postponements of compliance with air pollution emission standards for some of its stations on the Highveld, and for other stations to never comply with emission standards. Activists thus have no reason to expect government to deal with longstanding and worsening air quality in the area.

Air quality is also bad in Marapong, Lephalale, a township that was built directly next to Eskom's Matimba coal-fired power station as a result of racist local politics under apartheid. The dirty air is immediately next door:[83]

> The air pollution is bad, you can smell the coal, even in the morning. When you drive on the main road, and it is windy, you can see the coal dust being blown off the coal stockpile. There is also a smell from the stockpiles. When you wake up, there is black dust, and you can smell it. We get a black dust on window sills and surfaces. Around four o'clock in the afternoon, you can see the smoke from the Matimba chimneys, it doesn't go up, it comes down. It causes sicknesses. Small babies have lung disease, asthma, and TB is going higher compared to before. It affects pregnant women. Children of now are different from before.

81 https://lifeaftercoal. org. za/about/deadly-air

82 Inaction on the Highveld's deadly air of course has a much longer history, but the 2007 declaration of a priority area created expectations of action. For more on that see groundWork Report 2017.

83 Bettie Kageng interview in Marapong, 2018

> When you go to the clinic, the babies at two months old have breathing problems. They have skin allergies, their eyes are affected. The future generation is affected, they are getting born with diseases. HIV infection are rising, and now everybody has TB.

Coal mining is still expanding in the Phola area, 35 kilometres west of Witbank, Millicent Sungube of the Greater Phola and Ogies Womens Forum reported to the coal exchange:

> Phola has more than 12 mines around it. Social impacts are high, as well as air pollution, water pollution and scarcity of water. This is because we are sharing our water with nearby mines. We no longer have land. Women have a food security group but are battling to find land for farming. We have high unemployment, our brothers fail their medical tests so outsiders come in and take our brothers' jobs.

Blasting is experienced as an assault. It throws up clouds of dust and shakes the ground so that people's houses crack. It also throws up fly rock. In Vosmans, eMalahleni, a rock the size of a football crashed through one family's roof and narrowly missed a sleeping baby. Such events are traumatic and made more so because there is no accountability. The mines simply deny responsibility.

The failure of DMR and coal companies to properly close coal mines is illustrated by the experience of people in Ermelo, also on the Highveld:

> In our area, most mines operate without water licences, we managed to make a noise and close them down. But they left the mine unrehabilitated. People went in there and died. There are zama-zamas on abandoned coal mines. They are exposed to methane that they breathe. People get sick, but those mines also collapse on them and kill them.

Despite official indifference, activists in the Ermelo area have taken it upon themselves to approach the DMR about the problems created by these unrehabilitated mines.

Dirty tactics

Lucky Tshabalala attended the coal exchange from Newcastle in KwaZulu-Natal. At home, he was facing a court action brought against him by the Ikwezi mine. Following a community protest against the mine, Tshabalala was accused of intimidating and assaulting a mine manager. He maintained his innocence throughout, but the mine claimed to have two witnesses against him while community members were too afraid to testify in his favour as there is a history of intimidation of residents opposing the mine. As Lorraine Kakaza of WoMin reported:[84]

> The Newcastle community has a lot of experience with activists who stand for their rights and exercise their right to say no to mining suffering harassment and threats. Activists stood firm for men and women who have lost their land, and whose houses are cracking due to blasting. Many community members have been displaced by the mine and are now staying in dark shacks throughout winter, their children suffering. Graves have been relocated without families' consent, forced to accept R20 000 compensation to perform traditional burial rites and ceremonies. The mine turned its back on promises of creating jobs for local community and building proper houses for them before they were moved.

The prosecutor withdrew the case, says Kakaza, when it became evident that the charges were false.

Intimidation of activists is nothing new, as activists from Somkhele and Fuleni, north of Richards Bay, also reported. They have fought an ongoing battle against the Tendele anthracite mine that is relentlessly expanding its footprint and pushing the community out of its way. Somkhele's Bongani Pearce has received death threats for his activism against coal. He has had his truck and his house burnt down. He has been warned by traditional authorities to stop

84 https://womin. org. za/%E2%80%9Chands-off-our-activists-%E2%80%9D-%E2%80%93-activist-wins-court-case-in-newcastle

his activism and they have sent thugs to beat people who attend meetings that he has called.

But it is impossible to stop the activism, given the experiences of people in mine affected communities. Take as an example what Somkhele resident Mr Mpondlela Mtshali has lived through as mining destroyed his world:[85]

> I came to Somkhele when I was young. Before the mine came in, it was a beautiful place. I lived from farming. The mine affected my farming in a very painful way. It destroyed me in so many ways, even killed my livestock, cows and goats. How did that happen? When the mine blasts, the rocks fall on them and kill them. The mine did pay for those cows that had been killed. They paid for one goat, but many other goats they did not pay for. I only notice when they don't come home, they are hit by rocks. It is hard to say that it was them who killed those goats. I then took my livestock away to Nongoma and hired a place so they can stay safely.
>
> I had 200 cattle and goats. The mine wanted to mine in my area. But I refused to move until the mine had met my conditions. I wanted a farm where I could run all this livestock. Also, it should be a space without other people. I did not want to intrude and then have politics with my new neighbours for the rest of my life.
>
> They did not compensate me for the land. I said when negotiating, I don't want money, they needed to buy me a farm. The negotiations were ongoing for four years. They eventually bought me a farm in Utrecht, 390 ha. But there is no house on the farm. In Somkhele I had a house in which I had lived for almost all of my life. I did not want to move out before all my demands were met. But it was difficult. Rocks from the mine were falling around me. I was fenced off, my visitors were restricted, and all my movements were checked. When I took part in a 50/50 documentary, people from the mine came and interrupted. They

85 Interview, 10 June 2018 with V Munnik, J Cock, R. Makgalaka and N. Shange, Mtubatuba.

> told the crew I was not telling the truth. They told me to talk to the mine manager over the phone before I could complete the interview.
>
> The mine took my family graves out, to make way for the mine, but not in a satisfactory manner, they did not stick to what we had agreed on. I was given some money for the necessary rituals, but not enough. They said, "You can't sell a person, especially one that is dead".
>
> The mine does not care about me. They hired people to kill me, they were saying I was blocking development. I was hearing rumours around, and I could see many signs, some people I had conversations with no longer wanted to talk to me.

The dirty tactics are systematic, not just opportunistic. Activists now recognise a pattern in which new 'community structures' emerge, often with the backing of existing and prospective mines, local government or the traditional authority. They focus on getting jobs from the mines and this leads to increased conflict in communities. The main reason some people in neighbouring communities support mines is because they are desperately poor and believe, or want to believe, that they will get a job. They are mostly disappointed. And they then see what they will lose: their livelihoods, homes, and the benefits of the commons like clean water and clean air. But when they resist, they do so at risk to their lives, under conditions that resemble a civil war being waged within the community. Under those conditions, what are the prospects for developing an alternative vision of life after coal?

Coal dependence and the just transition

During recent research by the Wits Society, Work and Politics (SWOP) Institute, researchers found a caging of the mind, an enclosure of the imagination of people in the Highveld who are dependent on coal. The research specifically focused on understanding the nature and effects of coal dependence – and not how many people, as a proportion of the population, are dependent on coal [Cock 2019]. It focused on currently employed coal miners and community businesses that sell to coal miners, including food, accommodation, clothing

(washing and mending) and other small businesses. It revealed the anxiety specifically coal dependent people on the Highveld feel about life after coal. What it also does is to explain the deadening effect of coal dependence on the ability to imagine life without coal.

Most coal dependent people were shocked to hear talk about closing mines and coal-fired power stations. They could not imagine a life without coal. In their minds, coal equalled electricity, which in turn equalled modernity – embodied in appliances such as fridges, stoves, TVs and radios. Coal jobs – on average paying twice the wage of comparable jobs, around R11 000 per month – set coal workers apart. The disappearance of coal jobs would lead to poverty, crime and, in general, 'a dark future'. Most of the people interviewed had no idea that renewable energy could offer alternatives, or that climate change was an issue that necessitated the end of coal.

These limitations do not apply to the activists. When reviewing the findings of the Wits research, participants in the July coal exchange argued that coal dependence differs enormously from one location to the next. Coal dependency on the Highveld may be high because the only real economic alternatives are working on white farms, which is viewed as "a return to the slavery of the past". In Somkhele and Fuleni, by contrast, there is a strong rural economy and social fabric and very strong opposition to the expansion of coal mining. However, activists agreed that knowledge of a just transition was near to non-existent in their communities.

The activists themselves are very aware of what needs to be done to deal with the aftermath of coal, as is documented in the next section, but also feel a growing concern that local and provincial governments will not be able to deal with the coming impacts of climate change. They are also engaged in national debates around a just transition. Most of them have discussed the concept at various community meetings and several participated in the NPC 'stakeholder dialogue meetings'. They are aware that transitions in other countries relied on extensive dialogues – 80 meetings in the case of Alberta, Canada – but also that dialogue without power runs the risk of co-option or empty formality, as international trade union researchers Sweeney and Treat warn [2018]. They

are therefore organising in communities and with workers to create their own social power to press their demands and agendas. In Middelburg and in Durban, Commissioner Tasneem Essop met with community representatives ahead of the stakeholder meetings. Following the Middelburg meeting, she declared that the Mpumalanga Highveld was the epicentre for the just transition, and should receive special attention from planners and decision makers.

Open agenda for a just transition

This section introduces some starting points for a community driven, open agenda for a just transition. It is an open agenda because it is an invitation to explore proposals already identified by coal affected communities. We relate these proposals to ideas and practices from a broad environmental justice tradition, in South Africa and globally, that prefigure what different societies and economies may look like. We also draw on the Pluriverse collection, described by its editors as "a broad transcultural compilation of concrete concepts, worldviews, and practices from around the world, challenging the modernist ontology of universalism in favour of a multiplicity of possible worlds" [2019: xvii] or, as it is explained in the Fourth Declaration of the Lacandon Jungle (1996) by the Zapatista National Liberation Army – quoted in the collection:

> In the world of the powerful there is room only for the big and their helpers. In the world we want, everybody fits. The world we want is a world in which many worlds fit… we speak the words which find the unity which will embrace us in history and which will discard the abandonment which confronts and destroys us.

1. Build a new energy system

Coal exchange activists started their agenda with: "We need a new energy system, based on socially owned renewables with jobs in manufacturing as well as construction and operations".

The transition from fossil fuels, and particularly coal in South Africa, is at the heart of the broader transition. And this will be a big process, as the Million Jobs Campaign showed when it projected that 250 000 climate jobs need to be created in the energy sector. But fossil fuel technologies do not only involve burning fossil fuels. These technologies are supported by extensive hard infrastructure: the power stations, the grid, the distribution network, the coal mines, the coal trucks, the conveyer belts and the inter-basin transfer systems that bring clean water to the power stations. It is also supported by an extensive social system, which consists of the rules, the laws, the support systems like training of engineers and routines of doing things [Geels 2010]. This creates a large constituency with interests in the perpetuation of the fossil fuel energy system – and an extensive change once the transition starts happening.

We need to question how the characteristics of renewable energy will be used for transformation – so that the transition is not just a replacement of fossil fuels with renewables within the same large-scale, centralised, capitalist system. One popular idea developed over decades in the broad environmental justice movement is the idea of energy sovereignty, where energy is regarded as part of the people's commons – a resource held by people in common – and derived from various different renewable energy resources. This could be a combination of off-grid, independent energy systems, which could also be linked up to a central grid where the energy generating conditions of renewables can be balanced out (for example, when the wind does not blow in one place, it blows in another). Renewables can be dispersed and small-scale, and this makes them attractive as building blocks for a new system based on local democratic control.

Activists at the July coal exchange meeting proposed that Eskom – despite its history of hostility towards renewable energies – must be instructed to build renewables systems. Activists also explored the possibilities for community owned renewables, after having seen the example of renewables at Doornkop, outside Middelburg, where the community has installed their own solar power system with PV panels on the roof of their community centre and a set of batteries to store electricity. They argued that it is important for communities and activists to engage with the municipality on the energy transition:

> All these things are going to be implemented where our communities live so we need to force our way into these discussions and decisions. Maybe we can create a platform where activists can come together and create one position.

The municipality will need to up its game and be opened to democratic process:

> There are people who are deployed as municipal manager or chief finance officer, there are those who know what's going on, who push their own agendas, and those who don't know anything. Mostly our municipalities are failing in service delivery because they don't want to consult. They don't want to include people in their IDPs. This just transition, we need to force our way into the decision making.

This insistence on democratic decision making takes activists beyond dialogue as talking, into dialogue that results in real change.

2. Rehabilitate individual mines and the mining region as a whole to restore and detoxify damaged land and ecosystems

The activists live in areas destroyed by mines and they have been pursuing the options for rehabilitation for some time. At the coal exchange, activists recalled participating in a process of dialogue in 2015 and 2016 with the legal NGO CER:

> We asked about the funds for rehabilitation: why is the DMR sitting alone with those funds and how much is available for now? We did go to DMR, they said some mines deposited money with them but it is not enough for rehabilitation… Why do the municipalities in coal affected areas allow the mines to leave without rehabilitation? There is a lot of work in rehabilitation, work that could be done by mine workers who are losing their jobs. Municipalities should, for example, undertake public works to deal with small AMD (acid mine drainage) fountains (dispersed seepage points from coal mines). The question is, who

> controls the money for rehabilitation? It's the DMR. We should go to Mantashe and talk about all the new mines and what the plans are for their rehabilitation.

In 2018, the CER published a report that found that:

> Neither the law, nor the accounting standards governing company disclosures, ensure the necessary transparency and accountability about financial provision for environmental rehabilitation. The information disclosed by mining companies, about the costs of rehabilitation of the environmental damage that they cause, and about the money that they are obliged to set aside to fix it, is inconsistent, unclear, in some cases unreliable, and not comparable between companies. It is therefore impossible for shareholders or taxpayers to hold companies or regulators to account. [CER 2018]

In theory, says the report, mines should pay over enough money so that the state (DMR) will be able to do the rehabilitation if the company should fail. But the evidence on the ground is that rehabilitation often does not happen at all. Mines are put on "care and maintenance", with skeleton staff and no rehabilitation. The effect is that rehabilitation obligations are postponed, sometimes indefinitely, as mines are abandoned. Other mine owners – especially the larger companies exiting coal and exiting South Africa – sell their mines to much smaller companies which do not have the means to rehabilitate. This will result in abandonment and/or imposing the burden on the state and the taxpayers to rehabilitate. In some cases, mines are simply abandoned, and officials claim that they cannot trace the owners.

In the absence of effective state provision, coal mine owners have started writing their own rehabilitation policy – by the mines and for the mines – through the Mine Water Coordinating Body, for rehabilitation relevant to water issues. The Chamber of Mines (now the Minerals Council South Africa) has guidelines for rehabilitation, but these are guidelines, not regulations.

A government that deals properly with climate change would make it a priority to rehabilitate mines, as part of creating resources for new economies in coal affected areas. Soil can be rehabilitated to some extent, and if natural ecosystems are re-established, can absorb some carbon from the atmosphere. Rehabilitated soils can be used for new purposes, but this depends crucially on land reform. In addition, climate change impacts, such as heavy rain and floods, may make the contamination of both soil and water worse: what will happen if there is a flood in an AMD area? Will the water spill out and poison a larger piece of land than at present?

3. Make people's food gardens as a first step towards creating a healthy food system under democratic control, based on ecological agriculture and ensuring enough for all

Activists said:

> This is something that is within our control. What role can food gardens play in changing the system? Commercial farms don't produce for us, but for the market. If we had our own food gardens, we could determine what type of seeds we use. And we can determine what we grow and how we fight food insecurity. But we would need to solve the challenge of accessing water and land. There are things we do not need to buy, that we can grow in our own backyard… People do not have knowledge of gardening … they just find a way of getting food that is easier, which is buying. It could be cheaper to grow food in the back garden. … We should approach the municipality for land and water for food gardens.
>
> The women's group in Phola has food gardens. We use agroecology because it uses less water. It's another way, it's a tough process, you have to dig, use tins, but it is something that we know about and we can share skills with others. At present, the mines and Eskom's power stations use lots of water. As they close, the water should be allocated to people and to food gardens in communities in coal-affected areas.

Community activists in the Vaal have also started with agroecology. However:

> After we have prepared the soil and food is to be harvested, some people come and take for themselves. We need a secure space. Markets are a big issue because, if we produce a surplus, there is no market. We need a people's market.

The meeting discussed the biggest obstacle: the land that is already destroyed by mining. The chances for full restoration are not good. The rehabilitation of the land to restore the agricultural potential is not easy. You can restore 25% or so, and it is a long-term process. You can remake the soil but you can't reproduce the geology. If the mines say they will give you back the land in the condition before they dug it out, they are lying. But it is still necessary to undertake rehabilitation to prevent ongoing contamination and give long-term restoration a chance. There are some crops that you can grow on poor land. One option is hemp, a variety of dagga, that can be grown for fibres to make clothes or rope or as a feedstock for chemicals. Alternatively, you can use the damaged land to build big solar power plants. Some of the land is subject to land claims. People need to think what to do with that land. People also need access to land, and therefore land reform will be an important part of thinking about the transition.

4. A wealth of thinking and practices for food sovereignty

Activists can draw on an extensive body of work in agroecology and related approaches. A crucial question is how to bring food systems under democratic control. This creates a basis for autonomy, health and political power which will become more critical under pressure of climate change impacts. The peasant movement La Via Campesina, which defends smallholder farmers against corporate agriculture, uses the term 'political agroecology' to stress that "agricultural sustainability cannot be achieved simply by technological innovations of an environmental or agronomical nature, but by much-needed institutional change in power relations, that is, by taking into account social, cultural, agricultural, and political factors." [Toledo 2019: 87]. A related

concept is 'food sovereignty', which refers to "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems" [La Via Campesina 2007, quoted in Escobar 2019: 185].

Toledo points out that

> … most of the world's agricultural production continues to be generated by peasants, or small-scale traditional farmers with an estimated population between 1 300 and 1 600 million. Their farming knowledge and practices are the product of over 10 000 years of tradition and experimentation. A study made by the international non-governmental organisation GRAIN in 2009 confirmed that peasants or small-scale farmers indeed produce most of the food globally consumed by humans, but adding that they accomplish this feat in only 25 per cent of the total agricultural land surface in plots averaging 2.2 hectares. The remaining three quarters of the total agricultural land is owned by 8 per cent of agricultural producers including medium-, large-, and very large-scale landowners … and corporations, which usually adopt the agro-industrial production model. [Toledo 2019: 87]

This means that the dominant agricultural model needs to be transformed. It is responsible for much pollution and profits from false claims that it provides national food security. Overall in the country enough food is produced, but that does not mean that all the people who need the food actually get it. They do not. In South Africa, millions of people periodically suffer from hunger and 20% of children are affected by stunting [Otterbach and Rogan 2017]. Industrial agriculture is also supported by hidden fossil fuel subsidies. In a single global food market, dominated by industrial agricultural chains with chemical and machine corporations on one side and big supermarket groups on the other, peasant farmers cannot compete and battle to defend themselves against land and water grabs.

In South Africa, land and water grabs date back to settler and apartheid times and have left the majority landless. Peasant agriculture, which survived despite

this onslaught, was deliberately broken to eliminate competition against white agriculture [Bundy 1988]. While the apartheid Bantustans supported a small elite to become commercial farmers, the bulk of state support was for white commercial agriculture, including subsidies to keep white farmers on the land in politically tense rural areas like the Waterberg. Peasant agriculture was neglected. This is why the environmental justice movement should involve itself in agriculture and land reform debates.

5. Reconstruct settlements to deal with climate impacts

The townships need to be fixed. Dealing with the disasters of climate change is also about dealing with the deficit in service delivery. In anticipation of the intensified storms and droughts that climate change will bring, it is crucial to fix the broken roads, storm water drains, water and sewage pipes, and provide proper municipal services.

In Vosman and other settlements in Emalahleni, the sewage is running down the streets. In several places on the Highveld, the taps have been dry for months. Elsewhere, they run dry every week and, when the water does come through, it smells foul. Rubbish clogs the drains and piles up all over. But, say activists, "There is no response from the municipalities when we complain". They call for a proper waste system and say communities need to talk to waste pickers, who do the actual work of recycling, as well as to the municipality.

The one place with good water is Doornkop. Here, the community owns the land so the municipality defines it as private land and does not deliver any services. The community therefore supplies its own water from a borehole and, because it is far from any mine, the water is clean. The community must also deal with its own rubbish and sewage and is actively exploring and testing different options.

Part of sustainable settlements is to build good, energy efficient homes supplied with solar water heaters (with servicing after installation) so that people stay comfortable with minimal energy use. Currently, RDP houses are built without ceilings and are not oriented to let in the sun in winter and shade the windows in summer. If they are built properly, they need less heating –

Box 3: A new food system can be built on the principles of agroecology

According to the Nyeleni Declaration of 2015,[86] a new food system should be built on the following principles:

- Agroecology is a way of life and the language of Nature, that we learn as her children. It is not a mere set of technologies or production practices.
- The production practices of agroecology are based on ecological principles like building life in the soil, recycling nutrients, the dynamic management of biodiversity and energy conservation at all scales.
- Territories [or access to land] are a fundamental pillar of agroecology.
- Collective rights and access to the commons are fundamental pillars of agroecology.
- The diverse knowledges and ways of knowing of our peoples are fundamental to agroecology. We develop our ways of knowing through dialogue among them.
- The core of our cosmovisions is the necessary equilibrium between nature, the cosmos and human beings. We recognise that as humans we are but a part of nature and the cosmos.
- We love our lands and our peoples, and without that we cannot defend our agroecology, fight for our rights, or feed the world. We reject the commodification of all forms of life.
- Families, communities, collectives, organisations and movements are the fertile soil in which agroecology flourishes. Collective self-organisation and action are what make it possible to scale-up agroecology, build local food systems, and challenge corporate control of our food system

86 See the full declaration including strategies at http://www. foodsovereignty. org/wp-content/uploads/2015/02/Download-declaration-Agroecology-Nyeleni-2015. pdf

- The autonomy of agroecology displaces the control of global markets and generates self-governance by communities. It means we minimise the use of purchased inputs that come from outside. It requires the re-shaping of markets so that they are based on the principles of solidarity economy and the ethics of responsible production and consumption.
- Agroecology is political; it requires us to challenge and transform structures of power in society. We need to put the control of seeds, biodiversity, land and territories, waters, knowledge, culture and the commons in the hands of the peoples who feed the world.
- Women and their knowledge, values, vision and leadership are critical for moving forward.
- Youth, together with women, provide one of the two principle social bases for the evolution of agroecology. Agroecology can provide a radical space for young people to contribute to the social and ecological transformation that is underway in many of our societies.

they are warmer in winter and cooler in summer. At Doornkop, people have learnt that, if you move to renewables, the first thing to think about is how you use energy.

There is a very large potential for job creation in this area, as the Million Climate Jobs campaign pointed out. And local governments need to fulfil their mandates, including responding to climate change, on a much more professional level.

6. Plan to put work and amenities within people's reach, to make walking and cycling the easy options and developing safe and reliable transport for longer trips

Transport is an important issue to the communities where the activists come from:

> Our towns should be more cycle friendly. Public transport should be made better. There are too many cars with too many emissions. In many places there is nowhere for people to walk.

But it's surprising how many people do walk. Sustainable Energy Africa did a survey and found that half the people in the country walk to work or to school. People also walk some distance to catch transport. Activists said:

> We must ask: Where is your work? Where are the public amenities? Are they within walking distance? Are there buses to get you there? Are there buses that run between towns? Are they safe?
>
> It is difficult to take a bus in South Africa. In other countries, there are proper, integrated systems. The taxis act like they own us. We went to taxi bosses to ask about their policies. We don't know the law in their environment. We are the ones paying them. How can we be part of decision making about the transport system? What platform is there to make choices? In Cape Town the BRT [Bus Rapid Transport] managers had to promise to involve the taxi drivers otherwise they would sabotage the buses. Municipalities (may) control these things. We need to be part of this decision making.

Again, the Million Climate Jobs campaign has pointed to the urgent need to upgrade South Africa's transport system, and the many jobs that can be created when this is done in order to cut fossil fuel emissions through moving to different transport systems.

7. Create a zero waste economy, eliminating built-in redundancy and throw-away products and developing high levels of recycling and composting of wastes

Activists at the coal exchange have strong opinions on waste:

> We can encourage community members to avoid buying things in plastic, with the result that shop owners will notice and start using

less or no plastic. We can preach this in our different communities. Use plastic bags more than once. Say "no to plastic, I am an activist". We have to do campaigns around domestic waste. We can use baskets made by people in the community. It's a bit like energy – you need to think how can we do things differently.

We agree with reduce, re-use, recycle. We do have waste pickers who find work in recycling. The big issue with recycling is land. They recycle but where are they going to sort and store those things? We have to have land to do it on. Without land we will find those isolated wastes will go back into the street. That is something to negotiate with the municipalities.

The government needs to put a heavy tax on plastic. Municipalities should have proper dumping sites – but for recycling it's better to separate at source before it gets to the dump. Questions need to be asked about the design of products: are they designed to be recycled? These questions should also be asked of renewables, for example, what happens to the solar panels at the end of their life?

Box 4: Waste pickers are part of the environmental justice movement

South African waste pickers organised themselves into a national movement when they founded the South African Waste Pickers Association in 2009. Their livelihood is made from taking recyclables off waste dumps and streets and selling them. Despite being an important part of the local economy and making a substantial contribution to the management of municipal waste, their role is mostly not recognised.

Instead, waste pickers have been referred to negatively as scavengers and treated as if they themselves are waste. SAWPA therefore campaigned for government to recognise their work, and have won recognition in the Waste Act and in the National Waste Management Strategy. This has now been followed up with draft guidelines for integrating waste pickers into

local waste management plans. The guidelines were developed with the participation of waste pickers as well as local and national government. But real integration into local waste management systems is beginning to happen only in a handful of places. In Sasolburg, for example, waste pickers have established a materials recovery facility on land donated by the municipality and have organised separation at source in one area of town. As yet, recognition has not included payment for the substantial cost savings in the waste management system due to the activities of the waste pickers. Nor are they recognised in 'social partner' forums, such as Nedlac, where unions are held to represent workers but do not represent informal workers.

It is a sign of the low priority given to waste management in South Africa that we do not know how much municipal waste is produced, recycled or dumped in South Africa. Developing a waste information system has been consistently identified as a priority since the early 1990s and has been consistently neglected. Of the 1 327 waste dumps that are documented in South Africa, over 639 general waste landfills and 58 highly hazardous landfill sites are unlicensed. The few that are licensed are usually ill managed. Very many unlicensed waste dumps are situated in black communities. This is a practice that was inherited from the apartheid government and continues to be reinforced by the development policies of the democratic government. A different waste management system is urgently required.

8. Protect people's health with improved health care

People on the Mpumalanga Highveld have been hit hard by air pollution from coal-fired power stations, smouldering dumps at mines, the dust from blasting operations and the transport of coal. Yet, the Department of Health has never seen fit to design a dedicated programme to deal with these issues, nor has it done research about what the health needs may be in this coal affected region. Highveld residents have difficulties in accessing adequate public medical care [groundWork Report 2017]. This issue has been raised a number of times,

including in the community meeting with the NPC in Middelburg, where people said:

> There should be a plan from the Department of Health to deal with the effects of air pollution on the Highveld. They should keep statistics on respiratory diseases so that they understand what the impact is. There should also be a plan for transport to take sick people to the clinics or hospitals.

9. Protect the income of retrenched workers

The activists in the coal exchange meeting were very concerned about what was happening to workers in what they see as an unplanned transition already in process. An immediate example is mineworkers laid off at the Sethemba and Sandile shafts of the Optimum complex. The workers, who live in KwaZamokuhle, Hendrina town, joined the coal exchange activists and regional trade union leaders for a dialogue on a just transition on the 19th of July 2019. Highveld activists have extended solidarity to the workers in support of their search for solutions [see Chapter 6].

Finding new jobs for workers in a just transition should be part of a bigger programme of skilling people for the new economy. Activists knew about mines (Exxaro's Arnot mine) where some workers were sent to learn about chicken farming. Under the law, mines are supposed to offer skills training for workers when they close. Some mines – such as Anglo's recently shuttered Twickenham platinum mine – have given training but it is confined to mining skills. Community activists want to see a diversification of training. The question of jobs lost and compensated or replaced during a transition is central to the concerns of trade unions and will be discussed in Chapter 5 of this report.

There is an urgent need to think not only about replacing lost fossil fuel jobs, but about decent jobs in general, argued activists. "Currently we don't view agriculture as a sector that can provide decent jobs. We need to think not only about skills for workers but also about education. It is about how we create

sectors that can provide decent jobs, and sectors that can absorb the current workforce." This discussion resonates with the Million Climate Jobs campaign.

10. Introduce a Basic Income Grant (BIG)

The Basic Income Grant is a response to the current economic system. Activists said:

> In this country, as long as we have capitalism as the way to organise our economy, unemployment will be structural. It cannot create jobs for everybody. There is 40% unemployment. We think everybody should be entitled to a small amount of money to get by on the basics. It should be a universal grant that everybody gets. People with jobs and people who are rich also get it, but are taxed, and the tax should be designed so they pay back more than what they are paid with the BIG. The idea of a BIG is that everybody has some kind of income. Currently people rely on pensions, disability grants, and the child support grant. These are conditional grants. The BIG is an unconditional grant. You do not need to have a means test to show you are poor. Means testing is difficult and expensive to administer because it takes a lot of work. It can also be abused. In some places, councillors decide who is eligible for free basic electricity and they may ask, "who do they vote for?" With a universal grant, neither politicians nor bureaucrats can get in the way.

11. Think about the economy in a new way

Environmental justice activists have long been disenchanted by capitalism. A favourite song at the start of meetings is "We don't want the agenda of the capitalists".

Achieving a just transition requires us to think in new ways about not only energy, but also society, economics, food, how we relate to soil ecosystems and so on. Among the many ways of thinking about a new economy, a wellbeing economy offers an interesting perspective. It is based on the idea that

economic thinking should start by asking what the needs of people are, and then ask how to fulfil them, rather than plan an economy that serves profit. A just transition requires a transition to a democratic order supported by an economy based on economic, social and environmental justice rather than growth. The ideas that can drive this radical shift will come not only from increasingly pointed critiques of capitalism's role in environmental destruction [Magdoff and Foster 2011], but also from alternatives such as replacing the current growth economy with a wellbeing economy in which people live and work in meaningful and positive relationships with each other and the planet [Fioramonti 2017]. A basic income grant would be a sign of a caring economy – instead of an extractive, highly unequal economy. A zero-waste economy, with high levels of recycling and composting of wastes, requires new ways of thinking about production and consumption. The challenge for South Africa is to move away from a mining colony and its political economy. The immediate interface of this transition is at the level of local government.

12. Open democracy: make demands on local government

The activists in the Coal Exchange have been interacting with local municipalities over a long time. They anticipate that local governments, who already fail to provide services such as water, sanitation, waste management, roads and health clinics, will be seriously challenged by the impacts of climate change. So they posed two questions: 1. What do we want from our local municipalities? 2. How will we organise to achieve this?

> The municipality must involve communities in decision making through a stakeholders' forum. We want real public participation. Ward committees should be chosen openly, based on geography, not on politics. There must be: participation in decision making; service delivery; accountability; access to information. We want to be part of the decision making process. It should be transparent, accountable, and include monitoring and evaluation of services such as waste and sewage. Each municipality must have representatives of every provincial department when decisions are made, to overcome working

> in isolation. We want job creation. Community needs must be part of the planning. The municipality must go to the community. It must consult with the community on any development regarding the mines.

How can this be achieved from an activist perspective? Activists declared:

> We will mobilise and organise the communities. We will draft an agreement between the municipality and the communities, within a time frame. We will engage with the local municipality; visit each household in the community; attend community meetings; and engage with different media platforms in the community. We must have a recognised forum with representatives of each ward. The delegates for the meetings must stay the same – they should not change for every meeting. We will engage in the implementation process so that we know what is happening in the implementation. If not, we toyi-toyi.

Open democracy is an important part of this:

> Municipal IDPs and budget consultations must be transparent. We need to get the records of decisions. So if a municipality decides to build a community hall instead of a clinic, what informs that decision? When we talk about open democracy, the question is also do we have enough information to be involved in the planning process? What informs our struggle: when the mines blast and we toyi toyi, they say they are operating within legal limits. How do we know? Can I go on line and get all the information I need? Can we achieve a fair transition without proper access to information? For instance, who knows what is happening at Eskom? How will it be refinanced? Do we understand what unbundling will mean for us?

These discussions show an emerging agenda from communities and environmental and social justice activists. They amount to a strong demand to transform South Africa from a mining colony, dominated by the capital and

political structures created by the MEC, to resemble more a democracy that serves its people, and does not ruin the environments its people live in.

There are many obstacles to this road from our distant and recent political history – and climate change adds more challenges. The next chapter engages with developments and debates focused on Eskom, energy planning and a just transition.

4 Declining power

South Africa's economy is notoriously dependent on coal. It provides 67% of primary energy, over 90% of electric power, and about 25% of liquid fuels. The country produces 250 Mt/y of coal, down from 263 Mt in 2014. In the year ending March 2019, Eskom burnt 114 Mt, down from 125 Mt in 2012, and emitted 221 Mt CO_2. Sasol mines about 40 Mt/y of coal and converts it to liquid fuels, emitting 64 Mt CO_2e in South Africa. Some 25 Mt/y coal is used by local industry. And about 70 Mt/y is exported. Eskom says it employs 48 000 people, Sasol employs about 28 000, and the coal mines employ between 75 000 and 85 000 depending on the state of the market.[87]

This chapter focuses on Eskom for several reasons. It is by far the biggest source of carbon emissions but it is technically easier to decarbonise the power sector than, for example, iron and steel or transport. Further, the integrated resource planning system provides the means through which a purposeful transition from a coal burning system to a renewable energy system could be achieved. And because new renewables are now cheaper than new coal-fired power, and will soon be cheaper than existing coal power, a rapid transition makes economic sense. A different kind of reason is that a transition is already happening, unplanned and chaotic, because Eskom is falling apart and this is part of the larger breakup of the minerals energy complex (MEC) – the regime of accumulation that shaped South Africa's development throughout the last century [Fine and Rustomjee 1996]. This chapter opens with a brief account of Eskom's place in that history. It then looks at post-apartheid policy and

87 That includes Sasol's mines, so Sasol mine jobs are double counted here. Information is from the Minerals Council of South Africa, Eskom Annual Reports and Sasol Climate Change Report. See also Burton et al 2019.

planning, focusing particularly on the successive integrated resource plans (IRPs) as a path into the politics of decline.

Eskom and the MEC – cracking up

Over the last century, Eskom has been at the centre of the MEC, which combines the interests of particular government departments, state-owned corporations and private corporations. The MEC produced a highly concentrated economy – one in which wealth and the power to direct development is held by a very few large corporations. It was founded on colonial and apartheid dispossession and cheap labour and driven by cheap and dirty energy from coal. The model of building big coal-fired base-load to supply 'cheap and abundant' power to energy intensive industries was the model of the MEC. Over the last decade, this model has fallen apart even as Eskom and government tried to reproduce it.

Following World War II, Eskom established itself as a monopoly power utility with the support of the big mining houses led by Anglo American. Over the next four decades it built ever bigger power stations as it tried to keep pace with demand driven by mining and smelting gold. Anglo was Eskom's biggest customer and its biggest supplier of coal.

During the 1970s, commodities boomed in response to the 'oil shocks', the demand for electricity soared and debt was cheap as the international banks needed to invest a surplus of 'petrodollars'. State and private corporations collaborated to create a coal export market with the construction of the Richards Bay terminal and port. Eskom borrowed heavily and completed seven new giant power stations between 1979 and 1992. The oil shocks were a symptom of the world turned upside down for the imperial powers but, in the 1980s, the US reasserted its dented authority. It imposed neo-liberal policies, pushing interest rates sky high and collapsing commodity prices along with the value of Third World currencies, including the Rand.

By the end of the 1980s, South Africa's economy was in recession and anti-apartheid sanctions were biting. The demand for electricity fell well short of

Eskom's projections, leaving it with a massive surplus of capacity just as the political transition got under way. Eskom then mothballed some plant while pushing demand primarily through offering the world's cheapest electricity to energy intensive users. The cheapest power of all went to BHP Billiton's new Hillside and Mozal aluminium smelters in Richards Bay and Maputo. Eskom switched on Majuba, its newest power station, four years after it was completed, just as Hillside went into production in 1996.

Under pressure from the anti-apartheid movement, in 1991 Eskom also initiated an electrification programme to supply power to the black townships. It hoped both to reposition itself politically and to use up some of its excess generating capacity. This turned out to be one of the most successful projects of the post-apartheid period as millions of households gained 'access' to electricity. However, it was supplied under the rubric of cost recovery, including for the new infrastructure, so the people in the townships were charged more than those in white suburbs and about seven times more than big corporations. Black households consumed much less than anticipated and millions were cut off almost as soon as they gained access [Fiil-Flynn 2001]. Hence, the economic returns anticipated by Eskom did not materialise.

Neo-liberal breakdowns

Neo-liberal policies were introduced by the apartheid government and entrenched by the first democratic government with the misnamed Growth, Employment and Redistribution (GEAR) economic policy. In 1998, the White Paper on Energy said that a state owned company should operate the grid but Eskom's power stations should be privatised as it was assumed that 'the market' would lead the action to create economic growth and jobs. It predicted that Eskom's surplus would be consumed and new power plants would be needed by 2007. It said that building them should be left to private investors.

Privatisation, however, did not happen. It was resisted by Eskom as well as the unions and major elements within the ANC. And it was incompatible with the real heart of the energy policy – the long-term commitment to cheap energy for industry as the foundation of international competitiveness. The conflict

resulted in paralysis. While government barred Eskom from planning new plants, private investors were not interested so long as there was no price escalation in prospect.

Through the 2000s, even as the surplus power was consumed, government and Eskom kept punting energy intensive industries. In 2004 government adopted the rhetoric of the developmental state and put privatisation 'on hold'. It declared that Eskom would lead on building new generating plants but an additional third of new capacity would be reserved for private independent power producers (IPPs).[88] The instruction to build came at least five years too late. In 2007, just as Eskom broke ground to lay the foundations for Medupi, the power system faltered and nation-wide loadshedding followed in January 2008. In March that year – as the meltdown on Wall Street dragged the world economy into recession – Eskom said it would need to double generation capacity to 80 000 MW by 2025 at a total cost of some R1.3 trillion.[89] As we observed at the time, "While the capacity figure looked heroic, the cost figure looked like a gross under-estimate" [Hallowes 2009: 13]. Meanwhile, it emerged that the ANC would benefit directly from the award of the boiler contract for Medupi and Kusile to Hitachi Africa.

The first Integrated Resource Plans

The next year, in September 2009, Eskom published its own IRP. In the context of recession, with the loss of a million jobs in South Africa, demand plummeted and so restored Eskom's 'spinning margin' – the surplus of capacity over peak demand. Eskom nevertheless took the view that the 'great recession' would moderate demand growth in the short term and merely delay the need for 80 000 MW to 2028. This was integrated planning in name but not in substance and it displayed Eskom's continued dominance of the Department of Energy (DoE) which is legally responsible for planning.

88 Public Enterprises Minister Alec Erwin, *Economic Cluster: Higher Growth, Sustained Growth, and Shared Growth*, Parliamentary media briefing, 17 February 2005.

89 Eskom New Build News, no.5 and Annual Report 2008 p.18.

Integrated resource planning was mandated by the energy White Paper of 1998. It was supposed to mark a shift from conventional supply side planning – that is, a focus on building new energy generators – to an approach that puts demand first and starts with the question 'energy for what?' It then considers how to meet the demand, including through 'demand side management' designed to reduce demand. It also requires that public participation should be integrated into the planning process.

Following the false start in 2009, the DoE finally produced the IRP 2010. It did so in collaboration with a secret 'technical committee' composed of the MEC A list: Eskom, Anglo American, BHP Billiton, Sasol, Xstrata and the Chamber of Mines.[90] Minor modifications were made following public consultations and a 'policy adjusted' version was adopted by cabinet in March 2011. It embodied the MEC's vision for future power. Its most striking feature was its projection of rapidly increasing demand largely driven by an expansion of ferrochrome smelting and topped by a 30% 'spinning margin' with minimal demand side management. Exaggerated demand then allowed a traditional power expansion plan with capacity required to more than double from about 40 000 MW in 2010 to 89 000 MW in 2030. It called for 19 800 MW of new coal-fired power, including Eskom's new build centred on Medupi and Kusile, and 9 600 MW of nuclear power. It thus reproduced the traditional model of the MEC: big generators supplying base load to big industry. It implied a sharp rise in carbon and sulphur emissions, ever larger ash dumps and a legacy of unmanageable nuclear waste. It did open the door for renewables but they were reserved for private IPPs and given a niche role. By 2030, coal was to produce 65% of the supply, nuclear 20% and renewables 9%.

The IRP 2010 saw surging demand in the immediate future to 2016. This would exceed Eskom's additional new build capacity and privatised renewables, together with 'cogeneration' and 'own generation' by big corporates including Sasol and Anglo, would rapidly fill the gap in supply. At the time, groundWork objected that the intention was to create a "discrete corporate market in

90 See McDaid 2010; Lynley Donnelly, 'Cloud Over Power Plan', *Mail and Guardian,* 19 March 2010; Chris Yelland, 'National Integrated Resource Plan for Electricity, or Conflict Brewing?' *EE Publishers,* 22 April 2010.

[privatised] power" while expanding the power system and marginalising energy conservation.[91]

The IRP was to be updated every two years to adapt to changing circumstances. The DoE duly published a draft for public comment in 2013 together with the first draft Integrated Energy Plan (IEP) for all energy production and use. Contrary to the expectations in IRP 2010, actual demand was in decline for two main reasons. First, the economy had barely recovered from the recession of 2008-09 and, by 2013, global commodity prices were again in decline. Second, Eskom demanded ever higher tariffs to pay for its new build and for escalating coal costs and big industrial consumers were, for the first time, constrained to focus on energy conservation. The DoE therefore had to moderate the 2010 forecast. The draft 'update' created several scenarios with capacity requirements in 2030 ranging from 66 000 MW to 82 000 MW. On this basis, it concluded that nuclear was not needed before 2025 if at all. This conclusion was not acceptable to then President Jacob Zuma. The DoE went silent and the IRP update was shelved. So was the IEP.

After 2009, when recession saved Eskom's 'spinning margin', the utility 'kept the lights on' through the 2010 World Cup, the 2011 CoP17 and the 2014 elections by delaying maintenance on its plant. From 2012, it was already calling on the big corporate users to reduce their consumption during peak demand periods. At the same time, the Zuma administration destabilised governance of the utility as they opened it up for more brazen looting. In 2014, both its plant and its top management were falling apart. National loadshedding resumed in November and December and became more or less routine in early 2015.

REIPPPP

The first REIPP projects, meanwhile, were brought into production. They were the product of a thoroughly neo-liberal procurement process imposed by the Treasury in 2011. Treasury declared that a renewable energy feed in tariff,

91 groundWork comment on: The NERSA Cogeneration Regulatory Rules and Feed-In Tariff Consultation Paper, February 2011.

introduced by Nersa following extensive consultation, was anti-competitive and therefore illegal. Without any consultation, it substituted an auction system and seconded a Treasury team to the DoE to run it. In this process, government announces a bidding round and stipulates how much capacity it wants from each technology. IPP companies can then bid to build a project but these bids, which might not be accepted, cost tens of millions. First, IPPs must pay out R15 000 just to get the DoE's 'request for proposals' which details what is required of a bid and the criteria on which it will be judged. This document and the IPP's response to it are treated as secret. They must then prepare fully developed proposals, including funding arrangements, land tenure agreements and EIAs, and they have to be able to calculate a price for the electricity produced over the lifetime of the project. Bids have to meet a range of 'developmental' criteria and those that do so (in the judgement of the DoE) are then ranked by price with the lowest winning.

Government thus imposed very high costs of entry and, having blocked renewables for two decades, it now wanted big projects fast. So the process was custom made for transnational corporations with access to capital, command of the technology and capacity to deliver projects. And that means that the profits will be taken out of the country to join the already substantial flow of money extracted from the economy. Electricity from the first bid round was over-priced – and returns high profits – but the price per kWh decreased dramatically from the first to the fourth round, as shown in Table 2, while the cost of coal escalated. Nevertheless, a Council for Scientific and Industrial Research (CSIR) Energy Centre study showed that wind and solar PV energy from the first round saved the economy R800 million in the first year of production [Bischof-Niemz 2015]. This was highly unusual as the purely financial cost to the economy is usually greater than the benefit when renewables are first introduced.

Table 2: Renewable energy price in R/kWh at April 2015 rand values

Bid round	1. Nov 2011	2. Mar 2012	3. Aug 2013	4. Aug 2014
Solar PV	3.44	2.05	1.10	0.82
Wind	1.42	1.12	0.82	0.65

Source: Joanne Calitz, Crescent Mushwana and Tobias Bischof-Niemz, Financial benefits of renewables in South Africa in 2015, CSIR Energy Centre, 14 August 2015.

The benefit from the first round of the REIPP projects was largely due to Eskom's crisis. The projects saved Eskom R3.3 billion in diesel for its over-used peaking plants. And it saved the economy R1.6 billion as it supplied energy where Eskom could not.

Having won the plaudits of international investors with the REIPP programme, government followed it with a call for coal-fired 'base load' IPPs (BLIPPs). This confirmed that the real priority from Treasury was for privatisation over climate or environment.

Eskom stalls the REIPPs

By the end of 2015, it appeared that Eskom had turned a corner. In the context of shrinking demand, the power supply flipped from shortage to surplus as soon as the much delayed first unit of Medupi was fired up. Eskom then refused to sign power purchase agreements with the fourth round REIPPs and so stalled the implementation. It argued that IPP power was displacing cheaper power from its own stations. Power from the first three rounds, that Eskom had already signed, was indeed more expensive than Eskom's. Fourth round prices, however, came in at or below Eskom's costs and substantially less than the costs of new coal. And an additional round, called 'round four expedited', brought the prices down to 62c/kWh for both wind and solar. Eskom's operating costs were then 72c/kWh.

Eskom, however, now wanted to expand sales and saw the IPPs cutting into its market as it expected ever more surplus capacity as successive Medupi and Kusile units were fired up and better maintenance improved plant availability

at its older stations. Over the next three years it mounted a campaign against renewables in general and the REIPP programme in particular. At the same time, it announced a preference for short term coal contracts over reinvesting in the big old tied mines. This pushed up coal costs even faster and put more coal trucks on the road.

The later IRPs

In November 2016, the DoE released an IEP – the overall plan including oil, gas and liquid fuels as well as electricity – as well as the IRP 2016 'base case' for the period to 2050.[92] They attracted a storm of protest because the DoE gave a mere two weeks for comment, with hearings only in the main metropolitan centres, and some of the background papers had not even been published.

The substance of the plans was equally problematic. In particular, the IRP once again exaggerated future demand despite acknowledging that it had been in decline since 2011. Even big industry, represented by the Energy Intensive Users Group (EIUG), complained that this would lead to overbuilding. They argued that the completion of Medupi, Kusile and Ingula would already result in overcapacity and "there is no need for an urgent investment decision for further base load in the near term".[93] Eskom, on the other hand, was then calling on industry to invest in new plant to soak up surplus capacity while both the IEP and the IRP paid scant attention to energy conservation.

Further, the IRP 2016 inflated the known costs of renewables while depressing the costs of coal and nuclear. It also put an arbitrary limit on how much renewable energy could be added each year. Most observers concluded that the DoE had distorted the data to favour coal and nuclear and were steamrolling the process to limit debate. The DoE denied it but was forced to extend the comment period to the 31st of March 2017 and to take the hearings to the

92 The base case is the first scenario produced by a model using the best assumptions available for model inputs such as future demand, production costs, externalised costs and the like. The base case should be a 'least cost' scenario. Subsequent scenarios test what happens if particular assumptions are changed or if particular policies are imposed.

93 EIUG high level comment on the IRP Base Case, 7 December, 2016.

other provincial capitals – but not to the areas most affected by the energy system. An amended IRP was then promised in the second half of the year.

Eskom's anti-renewables campaign, meanwhile, exploded into view when the Coal Truckers' Forum, the organisation of trucker bosses, ordered 50 or so coal trucks to a protest in Tshwane in March 2017. Repeating figures given them by then acting CEO Matshela Koko, the coal truckers declared that the REIPPs were forcing the closure of five power stations and so threatened to drive them out of business. They did not mention Eskom's declining sales, the impact of Medupi and Kusile units firing up, or that these stations had long been scheduled for closure, as documented in the IRP 2010. And they appeared oblivious to the much more immediate threat to trucking posed by the Majuba coal railway line. Already delayed by two years, the line was due to open at the end of 2017 and would have taken about half the truck fleet off the road. It has been delayed again and was due to open before 2020.[94]

Eskom confirmed the closures a full week later but gave no timeframe. The unions, who had not been consulted on the power station closures, were outraged. They rallied in defence of coal jobs and by mid-year were making common cause with the coal truck bosses, who now claimed that a million jobs were threatened by renewables. They also reiterated their opposition to the 'creeping privatisation' represented by the REIPPs. And they recalled earlier demands, stemming from 2011 before Cosatu split, for a just transition and the development of a socially owned renewables sector. They insisted that no power plants should close until government had a plan for a just transition to protect workers' jobs.[95]

At the same time, the political turmoil in the country and within the ruling party intensified. The Public Protector's *State of Capture* report into "alleged improper and unethical conduct by the President and other state functionaries" was published in October 2016. It confirmed almost daily media reports that

94 Eskom has released no statements and cracked no champagne, but it seems that the line is working but carrying only 36% of Majuba's requirement. So 700 coal trucks a day are still delivering by road. See: http://www. eskom. co. za/Whatweredoing/ElectricityGeneration/PowerStations/Pages/Majuba_Power_Station. aspx

95 *Shutting of power stations is 'hostile act' by Eskom, Cosatu says*, Business Day, 7 March 2017; Irvin Jim, *Numsa demands a socially owned energy renewables programme*, Daily Maverick, 5 May 2017.

Eskom was being used to enrich Zuma's cronies, notably through the hijacking of the Optimum mine. As Swilling et al [2017] argued, this was not merely about corruption but amounted to a covert putsch on the Constitution both to consolidate political power and to open up state coffers.

At midnight on the 30th of March 2017, Zuma sacked Finance Minister Pravin Gordhan and his deputy, who were widely seen as the last holdouts against this agenda. Nine other ministers and nine deputies went with them in a wholesale cabinet reshuffle. They included the Minister of Energy who, despite appearing loyal to Zuma, had failed to deliver the nuclear project. Her successor lasted six months before being replaced by David Mahlobo, moved from State Security, who was expected to take a more robust approach to dismantling Constitutional constraints.

He did indeed try to bully through a plan that foregrounded nuclear power. At an energy summit – to which the organisations of the Life After Coal campaign were pointedly not invited – he announced that IRP 2017 had been finalised and approved by Cabinet the night before and was not open for public debate. A week later, at the ANC elective conference, Zuma lost power, lost control of the party and, two months later, in February 2018, he was ousted as president of the country. IRP 2017, if it in fact existed, was never gazetted.

The incoming president, Cyril Ramaphosa, moved quickly to try to stabilise Eskom, appointing a new board and a new CEO uncontaminated by the corruption scandals. By now, however, the corporation was deep into the death spiral with declining sales, increased costs and massive and unpayable debt primarily for Medupi and Kusile. Hence, it now threatened the Treasury which stands surety for R350 billion but would be on the line for much more if Eskom defaulted. Effectively, Eskom's bondholders were now driving a boardroom agenda focused on the money rather than the organisation.

The focus on Eskom, however, tended to obscure a larger story. As we commented in the groundWork Report 2017:

> The various parties … seem driven to put the MEC back together again. This is not more likely than in the case of Humpty Dumpty.

> The king's horses and men are all at odds. Eskom is floundering. The big corporations that were both its major coal suppliers and major customers are no longer tethered to the country and hardly stand out from the pack of TNCs looking for quick returns and a ready exit. Small corporates, cronies and neo-colonial adventurers are pushing into their place, many of them a breath away from bankruptcy. Eskom's coal supply is fragmenting as the big old mines wind down, in part because the coal field is physically depleted, in part because the institutional relations are fragmenting. And, at the end of it, there is little reason for the rest of the country to pay tribute for the restoration of the MEC.

At the direction of Jeff Radebe, Ramaphosa's first energy minister, but in the face of continued opposition from the coal truckers and unions, Eskom signed the REIPP power purchase agreements. Union antagonism to the new board deepened when the new management announced in June that, to cut costs, there would be a zero percent wage increase. The effect was to provoke united action from the three Eskom unions – NUM, Numsa and Solidarity – who were previously divided by political differences. They blamed Eskom's financial problems on the IPPs, corruption, a bloated top management and the failure to contain coal costs. Numsa said that the deal with the IPPs showed that Eskom was negotiating in bad faith.[96] They did not mention the extraordinary escalation of costs at Medupi and Kusile.

While Eskom workers are barred from striking on the grounds that they provide an essential service, management soon discovered that this would not shield their zero percent decision. Formally, workers embarked on a series of lunch time pickets while union leaders declared that they were prepared to shut down the power system. Informally, numerous wildcat actions forced Eskom to reintroduce loadshedding and showed that workers could bring down the power system. Eskom accused workers of sabotage.[97] The strike was finally settled with a 7.5% increase at the end of August but union hostility to

96 Ray White, *Numsa blames Eskom's financial woes on IPPs, bloated top management*, Eye Witness News, 29 June 2019. Sarah Smit, *No shutdown yet for Eskom workers*, Mail & Guardian, 12 June 2018.

97 Justin Brown, *Eskom on load shedding: We're not out of the woods*, Fin24, 24 June 2018; *Unions hold the cards as Eskom faces fresh strike threat*, Fin24, 13 August 2018.

the new management has been entrenched. Both NUM and Numsa repeatedly called for the board and CEO Phakamani Hadebe to be sacked, saying that they had sabotaged Eskom and threatened workers' jobs by signing the REIPP agreements.[98]

IRP 2018

Also in August, the DoE published the long-promised IRP 2018 for comment. It acknowledged that previous IRPs exaggerated future demand and repeated well rehearsed reasons: the failure of GDP growth; Eskom's supply shortage from 2011 to 2015; and improved energy efficiency largely in response to escalating tariffs.

By this time, tariffs were nearly five times what they were in 2007, largely because of the cost of constructing Medupi and Kusile along with rising coal costs. Moreover, Eskom was asking for annual increases of 15% for the next three years to March 2022. The IRP 2018 followed suit. It said "tariffs will immediately move to 'cost-reflective' levels" and showed a massive 40% real increase in those three years before levelling out [51].

At the same time, Eskom was desperately trying to boost sales to soak up its surplus capacity and increase revenues. Big energy intensive industries were already demanding special price cuts and, in mid-2018, Hadebe was doing deals with them. In short, demand side management was not on Eskom's agenda and it also vanished from the IRP. The IRP was thus caught in the contradictions created by Eskom's new build – punting sales while escalating tariffs. It repeated the wishful 2016 future demand projections, albeit from a lower base, driven by a fairy tale of GDP growth. And it effectively favoured big industry and the rich at the cost of municipalities and the poor in the following ways:

- Deals for big industry leaves the bill for the new build with residential and commercial consumers.

98 Bonga Dlulane, *Numsa, NUM call for sacking of Eskom CEO and board over IPPs*, EWN, 18 November 2018.

- Rising tariffs inadvertently drive demand side management. Leaving DSM to price favours the rich who have options, against the poor who do not.
- This provokes accelerated grid defection by commerce and the middle classes as the cost advantage of small-scale dispersed 'embedded' renewables increases.
- Municipalities and poor people will then be left with an overpriced slum grid. Over 56% of people in South Africa are poor and many who have 'access' to electricity are cut off – either disconnected or without money for pre-paid meters.
- Small-scale dispersed generators and household 'prosumers'[99] are thus made a threat to the system rather than part of it. And there is no conception of integrating the poor majority into an emerging system.

On supply, the IRP 2018 specified what new plant was needed in the period to 2030. It modelled requirements through to 2050 but argued that things are changing too fast for concrete planning beyond 2030. Regular IRP updates would modify these plans for the 2020s as well as extend the planning horizon. It acknowledged that a least cost plan would include only renewable technologies backed by storage or gas. However, the 'recommended plan' retained the 2016 limits on renewables and forced in both the completion of Medupi and Kusile, said to be already 'committed', and 1 000 MW of new coal – the privatised Thabametsi and Khanyisa BLIPPs. It did not give annual figures for carbon emissions, water use, total capacity, the share of production for each technology, projected peak demand, reserve margins or DSM savings.

In November, the parliamentary portfolio committee on energy held hearings on the IRP at short notice and only for those who could afford to get to Cape Town. They heard a diversity of views but produced a report that endorsed the views of the coal and nuclear lobbies, proclaiming amongst other things that

99 Prosumers are simultaneously producers and consumers (in this case of electricity).

"coal is our prestige". They largely ignored submissions on the implications for climate change and on the impacts of coal on people's health.[100]

Detour through Nedlac

The DoE then sent an amended version for discussion behind closed doors at the National Economic Development and Labour Council (Nedlac) but kept it from the public. Nedlac provides a space for the 'social partners' – government, business and labour – to seek consensus on economic issues. Community is a sort of add on social partner, with representation determined by "the Minister [of Labour] in consultation with organised business and organised labour".[101] Accountability is supposed to be held by each of the social partners but there is no broader public accountability and no public record of discussion.

In the Nedlac energy task team set up to discuss the IRP, it appears that the coal and nuclear lobbies were able to corner the labour and community seats. Thus, the labour representative – supposed to represent Cosatu, Fedusa and Nactu – advocated forcibly for nuclear power in defiance of a resolution of Cosatu's Congress stating that Cosatu is anti-nuclear.[102] This did not, apparently, draw any demand for organisational discipline or accountability from the labour convenor in Nedlac, Cosatu's General Secretary Bheki Ntshalinshali. Fedusa has also stated its opposition to nuclear power but, it appears, did not challenge the position taken in Nedlac.

This reflects broader problems of labour representation in Nedlac. The most obvious problem is that the South African Federation of Trade Unions (Saftu), the second largest union federation, is excluded. Saftu was launched in 2017 following the expulsion of Numsa from Cosatu and it appears that Cosatu is now blocking its inclusion in Nedlac.[103] The expulsion of Numsa, however, was itself a symptom of a deeper fragmentation and loss of democratic accountability

100 Richard Halsey, *The IRP: Members of the parliamentary energy committee ignoring the impact of climate change*, Daily Maverick, 29 November 2018.

101 The Nedlac Act of 1994, paragraph 10.2.

102 Cosatu 11th Congress. Resolution 2.4.6.5

103 Sarah Smit, *Nedlac struggles with inclusivity*, Mail & Guardian, 2 August 2019; Luyolo Mkentane, *Partners want rejuvenation of Nedlac for new era*, Business Day, 3 November 2019.

within the labour movement. The result has been a degradation of the labour movement's capacity for coherent and collective engagement in policy issues both inside and outside of Nedlac.[104]

Community representation is even more problematic and appears to depend on who gets themselves into the room. On the energy task team, the spot was taken by a member of the almost defunct South African Civics Association (Sanco) who advocated for coal and reportedly said, "We don't give a damn about air quality issues".[105] It is not clear if this is in fact the view of Sanco as an organisation. There was no representation of communities directly affected by mining and burning coal or of environmental organisations.

Phantom surplus

Whereas Eskom had previously neglected maintenance in order to keep the lights on, the new management – installed following the fall of Zuma – did the same to cut costs. Since the new units at Medupi and Kusile were scheduled to come on line at regular intervals, and each one contributed to an ever wider spinning margin, they perhaps thought that maintenance on the older units was hardly worth it. Eskom's installed capacity is now 48 000 MW – not including the renewable IPPs and with eight units at Medupi and Kusile still to be counted – while peak demand last winter barely reached 34 000 MW – for a massive 30% reserve margin.[106] By November 2018, however, Eskom's energy availability factor (EAF) dropped as more units broke down. Coal stocks were also run down.

And the new units did not save them. To the contrary, it emerged that Eskom and the country was R450 billion in debt for two dud power stations. Hitachi's boilers, which had profited the ANC, are not just badly put together but badly designed; the coal grinding mills don't work properly; the fabric bag house meant to filter fly-ash pollution from the exhaust gases is dysfunctional; the contractor for the ash handling plants has gone bust and stopped work; and

104 Interview Hameda Deedat and Sizwe Tyiso, Naledi, 3 September 2019.
105 Interview, Mike Levington, 3 September 2019.
106 Eskom AR 2019 and Weekly System Status Report – 2019 Week 29.

parts are being taken from Kusile Unit 6, which is still under construction, for repairs to completed units. Completed units are repeatedly shut down for repair and said to be working at 50% capacity.[107]

The power cuts in early December 2018 were followed by 'Stage 4' loadshedding– the most severe power cuts to date – in February 2019, shortly after President Ramaphosa's State of the Nation address and just before the Budget Speech. Eskom was now widely recognised as the biggest risk facing the country and it occupied a central place in Ramaphosa's address. He said that the utility would be restructured to establish "three separate entities – Generation, Transmission and Distribution – under Eskom Holdings" and promised that government would lead a process with labour and other stakeholders for a just transition.

That announcement got a hostile reception from the unions who see 'unbundling' as the prelude to privatisation and job losses. Ramaphosa responded with assurances that there would be no privatisation – the divisions would be 100% state-owned – and no forced retrenchments. The unions, however, did not and do not trust these assurances.[108]

In the Budget speech two weeks later, Finance Minister Tito Mboweni clearly invited debate on privatisation. At the same time, he gave Eskom a bail out of R23 billion a year for ten years "conditional on an independent Chief Reorganisation Officer (CRO) being jointly appointed by the Ministers of Finance and Public Enterprises …".

107 Terence Creamer, *'Treasonous' tweets won't help Eskom out of current 'crisis'*, 6 December 2018; Linda Ensor, *Gordhan told to come up with recovery plan for Medupi and Kusile*, 14 March 2019; Chris Yelland, *Shuffling the deck chairs as the crises at Kusile and Titanic Eskom continue*, Daily Maverick, 29 July 2019.

108 Marianne Merten, SONA 2019: *Ramaphosa uses his reply to answer internal critics over Eskom restructuring*, Daily Maverick, 15 February 2019; SAFTU statement, *SAFTU condemns Ramaphosa's pro-big business and 'business as usual' SONA*, 8 February 2019; Irvin Jim, *We will defend Eskom in the streets – NUMSA*, Politics Web, 8 February 2019; Marleny Arnoldi, *Industry shares sentiments on Eskom, energy landscape following SoNA*, Engineering News, 8 February 2019.

Debt and tariffs

Eskom declared a loss of R22 billion for the financial year to March 2019. And its debt keeps rising. By November 2019, it came to R460 billion[109] but Eskom's income is sufficient to manage only R200 billion. The Treasury formally guarantees R350 billion but effectively guarantees the lot since Eskom cannot be allowed to default. A default would trigger investor demands for instant repayment not only of Eskom debt but of the state guaranteed debt of other state-owned corporations, including arms manufacturer Denel and South African Airways. Theoretically, Treasury would be liable to pay out over R600 billion overnight, which it does not have. In practice, it would likely get a bailout from the International Monetary Fund (IMF) who would demand budget cuts – including in social spending – to enforce repayment of creditors.

In February 2019, Eskom proposed that the Treasury take over R100 billion of its debt. This amount was calculated on the assumption that Nersa would award it a 15% annual tariff increase over the next three years.[110] That meant an increase from 94c/kWh in 2018/19 to R1.43/kWh in 2021/22 in the wholesale tariff. And there was an additional 4.5% increase in the first year to compensate Eskom for under-recovery in 2014. So the total 2019 increase would be 19.5%. Eskom's application therefore met with a storm of protest from all stakeholders, from local community groups to big industry, at Nersa's hearings in January 2019.

Eskom's tariff applications routinely claim to protect the poor. Well over half of South Africans are poor and another quarter are vulnerable to being pushed into poverty [Schotte et al 2017]. Many poor households use multiple forms of energy – electricity for lights and TV or until the money runs out, and coal or paraffin for cooking. Many of the vulnerable quarter depend exclusively on electricity. The South Durban Community Environmental Alliance (SDCEA) surveyed local residents in 2017 and found that 75% said that electricity was unaffordable and 46% had experienced disconnections. Steeply rising

109 Ray Mahlaka, *Mboweni's amended strategy document on reforms kicks the Eskom debt question down the road*, Daily Maverick, 1 November 2019.

110 Chris Yelland and Roger Lilley, *Eskom CFO Calib Cassim: 'If we go down, we bring down the sovereign and the economy'*, EE Publishers, 11 February 2019.

electricity tariffs would thus contribute to deepening poverty or to pushing people into poverty.[111] On the Highveld, people burn more coal as the price rises, thus increasing the level of indoor air pollution.

In 2009, climate justice organisations campaigned against the World Bank funding Medupi with its biggest loan ever to any African project. They said it was bad energy. It was wrong to fund coal power in the time of climate change, wrong to fund power designed for big industry, wrong to pretend that it was to provide energy for people, wrong because of the massive social and environmental externalities, and wrong because Eskom wanted people to pay the price of decisions taken by Eskom without consulting them.

The World Bank funding was followed by the African Development Bank, the New Development Bank, the China Development Bank and a full house of export credit guarantees from Europe and the US. In its submission to Nersa on Eskom's tariff application, SDCEA declared, "This is 'Odious Debt' that simply should not be repaid."[112]

The Energy Intensive Users Group (EIUG) represents 28 corporations who consume more than half of South Africa's electricity.[113] Eskom has previously argued that electricity is sold below cost and the biggest users therefore get the biggest subsidies.[114] We think there are several other subsidies to big industry, including that: environmental costs are excluded from the bill; in terms of a special pricing agreement, South 32's aluminium smelters gets the cheapest energy in the world; it was big industry that demanded big base-load plants but now baulk at the actual costs and have switched allegiance from coal to renewables. The EIUG told Nersa that there would be "immediate, catastrophic and irreversible" consequences for South Africa's mining and industrial companies if the tariffs were raised by more than inflation.

In the event, Treasury has thus far rejected the proposal that it take over a large part of Eskom's debt. And Nersa rejected the 15% tariff increase. It

111 SDCEA submission to Parliamentary Portfolio Committee on Energy, 23 October 2018.

112 SDCEA, *Why the POOR of Durban oppose Eskom's unjustifiable electricity tariff increases*, Presentation to the National Energy Regulator at the ICC Durban, 17 January 2019.

113 At https://eiug. org. za/ on 11 November 2019.

114 Eskom Revenue Application: Multi-Year Price Determination 2013/14 to 2017/18 (MYPD 3), p.16.

awarded Eskom an increase of 9.41% in 2019, 8.1% in 2020 and 5.2% in 2021. The first year's increase is additional to the 4.5% recovery already awarded. The total of 13.9% for 2019 is thus well above inflation which StatsSA puts at between 4% and 5%. Eskom is now challenging Nersa's earlier decisions in court, arguing that its debt is driven by years of "chronic underpricing". In a second case, it is challenging Nersa's 2019 decision on the basis that it treated the R23 billion bailout from the Treasury as operating revenue rather than capital. The benefit was thus handed to electricity consumers rather than to Eskom.[115] Treasury's conditions, on the other hand, are that the bailouts "will be used to settle debt and interest payments and nothing else" [DPE 2019: 27].

The bailout money was called on earlier than planned. On the 2nd of April, the Treasury had to authorise a R5 billion payment to prevent Eskom defaulting. That was followed by a further R12 billion later that month. In addition, the banks have been 'strong armed' into providing bridging loans on several occasions. They are all exposed to Eskom debt and fear that a default could bring down South Africa's financial system.[116]

By mid-year it was clear that R23 billion a year was not enough as Eskom needed about R50 billion a year to stay afloat. In July, Mboweni allocated an extra R26 billion for 2019/20 and R33 billion for 2020/21. At this time, there was still no sign of a CRO in the office and no clear plan to address the debt. Creditors, however, had done rather well. Because Eskom looked ever more risky, its bonds attracted higher interest. The holders of a particular dollar denominated bond got returns of 22% in the first six months of the year. The additional allocation reduced risk and so reduced the interest paid on Eskom debt.[117]

115 Terence Creamer, *Eskom's review of Nersa rulings draws direct link between debt surge and 'inadequate tariff'*, Engineering News, 26 July 2019; Sikonathi Mantshantsha, *Eskom in court bid to raise electricity prices 16% to recover R69bn cash bailout – and to raise another R34bn*, Daily Maverick, 18 October 2019.

116 Reuters, *South Africa brings forward Eskom bailout to avert default*, Engineering News, 23 April 2019; Marianne Merten, *Floundering Eskom ship running out of ballast as Treasury prepares Special Appropriation Bill*, Daily Maverick, 4 July 2019; Interview Grove Steyn, 12 September 2019.

117 Bloomberg, *Eskom gets bailout funding. Now it needs a rescue plan*, Engineering News, 26 July 2019; Patrick Cairns, *Would you buy Eskom's bonds?* Moneyweb, 29 August 2019.

Box 5: Two plans for dealing with debt and a just transition

In December 2018, Ramaphosa appointed a Presidential Task Team to advise on what to do about Eskom's debt. They recommended that Eskom's divisions should be unbundled and a special purpose fund be established. This fund was dubbed a green bailout but has since been called the Just Transition Transaction. It seeks to access climate funds in return for an accelerated phase out of coal-fired power. That, in turn, means a substantial acceleration in the pace of building renewables.

The funds would come from a combination of grants and concessionary funding from development finance institutions (DFIs), presumably the European Investment Bank and development aid agencies, "backed by European and other governments",[118] which would then "leverage internal affordable debt denominated in Rand and other public sources".[119] These funds would be put into a 'blended finance vehicle' with two pots of money. The first would provide debt finance to Eskom at less than commercial rates. This would a) restore its ability to borrow on the market; and b) reduce the interest on its existing and new debt, while c) buying out a portion of the existing debt. Money from the second pot would fund a Just Transition Fund initially focused on Mpumalanga. This is where the grant funding and very cheap DFI loans would go. It would be used to fund the process of coordinating "a sizeable economic rejuvenation" of the province and should be supported by other policy measures to 'crowd in' renewables investment in manufacturing as well as generation.

The proposal, as it stands, calls for a 15% reduction in emissions against the least cost scenario developed by the CSIR [2017]. This would add up to a cumulative reduction in carbon emissions of 715 Mt with emissions in 2050 at about 30 Mt. We are told that the 15% is illustrative and could be increased. This would be necessary if South Africa's power sector emissions reductions are to be credible in climate terms. Alternatively, additional measures would be needed to bring emissions to zero by 2040.

118 Meridian Economics, *A transformative Just Transition Climate Transaction for South Africa*, Briefing Note, 29 October 2019

119 Mark Swilling, response to Patrick Bond, posted on CJN! SA list serve, 11 October 2019.

The amount of the fund is not yet fixed but is put in the region of US$11 billion or more – that is between R150 and R200 billion raised at "a below sovereign, concessionary interest rate". In effect, the reduction in carbon emissions would be paid for through a combination of grant money and money lent at below the normal rate of DFI lending to governments. This money would be paid into the 'blended finance vehicle' over time and payment would depend on emission reductions being achieved. It is also dependent on the separation of Eskom's divisions. This is to ensure that Generation does not pull Transmission down with it and that, as system operator, Transmission does not favour Eskom Generation over other suppliers.

At present, however, there is no deal. There is just a model which awaits its content and that is still to be negotiated. We are assured that the "international DFI community" is highly interested, as are senior South African politicians, starting with the president. But for a deal to be done, government has to negotiate it. And there is considerable argument within government over the best way of handling Eskom's debt. In the view of one journalist, the 'green deal' has already been rejected – apparently by Treasury.[120] And it seems that the window of opportunity is closing.

In December, Cosatu put forward a different proposal for dealing with Eskom's unmanageable debt. It noted that the Treasury had not made any proposals in its October policy statement and, if there was no agreed and credible plan put forward in the February 2020 budget speech, government debt would get a junk rating with severe consequences for workers. It argues that workers' funds are already heavily invested in Eskom. The Public Investment Corporation (PIC) holds R104 billion of Eskom debt – R95 billion on behalf of the Government Employees Pension Fund (GEPF) and R9 billion on behalf of the Unemployment Insurance Fund (UIF).

In an earlier article, Dick Forslund of AIDC argues that the effect is that one part of the state is paying interest at high rates to another part of the state. He also shows that both the GEPF and the UIF have massive surpluses in

120 Marianne Merten, *Floundering Eskom ship running out of ballast as Treasury prepares Special Appropriation Bill*, Daily Maverick, 4 July 2019.

relation to their obligations to pay out pensions or unemployment benefits. The GEPF could therefore convert its Eskom bonds to an interest free loan without risk to its ability to pay pensions. This would be a far better option for state employees than the austerity programme planned by Treasury.

Cosatu proposes that the PIC's loan to Eskom be converted into equity and doubled to make R200 billion. Another R50 billion should be put in by the Industrial Development Corporation (IDC) and/or the Development Bank of Southern Africa (DBSA). This would reduce Eskom's debt to the R200 billion that its income can cover. Cosatu says it is negotiating this proposal with key government departments and is "in a unique position of strength to negotiate key demands, for example, that state enterprises and government do not retrench workers or privatise, that a stimulus plan be implemented [and] funds be shifted towards industrialisation". A key demand is that a just transition plan must be developed for the workers at the power stations and coal mines. Production of renewable energy technologies should also be localised, particularly in Mpumalanga, Limpopo and the Eastern Cape, and funded by public and private investments. This proposal does not, however, create a pot of money for that investment.[121]

Restructuring

There were several reasons to fear that unbundling would lead to privatisation. First, the history suggests it. The proposal of the 1998 Energy White Paper was for a state owned national transmission, system and market operator while the power stations would be sold off and private corporations would compete to supply power to the grid. In the present debate, there is broad agreement that transmission should remain in public hands.

Comparatively little attention has been given to distribution. Municipalities have a constitutional right and obligation to distribute power and most do, although many are neglecting maintenance. At present, Eskom distributes

121 Dick Forslund, *The Government Employee Pension Fund, budget austerity and the Eskom debt crisis*, Daily Maverick, 29 August 2019; Kevin Davie, *Cosatu suggests an Eskom solution,* Mail & Guardian, 13 December 2019.

for or with 90 municipalities who do not have the technical capacity for it. Public ownership is therefore through local government or a hybrid of local government and Eskom. Privatisation of distribution does not appear to be on anyone's agenda.

The focus is therefore on generation. The IPPs are already privatised and some prominent energy analysts have supported selling off the power stations. Thus Grove Steyn argues that transmission and distribution are natural monopolies but "generation is best organised as a competitive sector". Tobias Bischoff-Niemz and Johan van den Berg similarly argue that government control of the grid "practically constitutes control over the electricity industry" while the power stations could be auctioned off for R450 billion – enough to cover Eskom's debt.[122]

The Treasury presented this idea as an option in a discussion paper published in August [2019a], so indicating that, despite Ramaphosa's statements in February, privatisation was still on the table. By November, however, it was cut from a second draft of the paper [2019b]. There are possibly two reasons for this. First, there is considerable scepticism that anyone would actually buy them, let alone that they would fetch R450 billion, particularly if the power stations come with existing labour and environmental obligations as proposed. Second, the political support for privatisation does not match the resistance to it.

Treasury's revised draft followed the publication of the Department of Public Enterprises' (DPE) *Roadmap for Eskom in a Reformed Electricity Supply Industry* published in late October. Presenting it, Pravin Gordhan emphasised again that there would be no privatisation.[123] The plan is to separate the three divisions – first functionally and then legally – but as "wholly owned" subsidiaries of Eskom Holdings, each with its own board. This separation is justified in part because Eskom is just too big and unwieldy to manage. It is

122 Grove Steyn, presentation at a public debate hosted by EE Publishers: *Should Eskom be restructured, and if so how and when?* 10 May 2018; Tobias Bischof-Niemz and Johan van den Berg, *How to remove the Eskom albatross from around SA's neck*, Business Day 22 January 2018.

123 Lameez Omarjee and Jan Cronje, *Eskom privatisation is 'fake news' – Gordhan*, Fin24, 29 October 2019.

held to allow more focus within each entity and to enable transparency of information about operations and costs.

The priority is to separate Transmission, which will "act as an unbiased electricity market broker, to promote capital investment within the industry and to catalyse energy efficiency and cost sustainability" [DPE 2019: 17]. It will be the system and market operator, buying power from Eskom generation and IPPs and selling it to Eskom distribution, municipalities, big energy intensive industries, and the Southern African Power Pool (SAPP), and responsible for planning. It will own the national grid and the peaking power stations used to balance supply and demand.

Eskom Generation will keep its fleet of coal and nuclear stations and the Sere wind plant. Each plant will sign a separate power purchase agreement (PPA) "with predefined, fixed and guaranteed tariffs for energy" with Transmission. Such agreements will presumably take account of Transmission's obligation to use the cheapest available power first. "Consideration is being given" to splitting Generation into "two or more" Eskom subsidiaries "to introduce inter-company competition". It is not clear why this is needed since each power station is to be individually contracted to Transmission and effectively in competition with all other power stations. In the longer term, "the generation market will become more competitive and decentralised with new public, private and other generators entering this market …" [24].

That privatisation is disavowed should no doubt be credited to the intensity of the union resistance to it and might have been taken as a victory. But the long-term vision of a 'generation market' sounds much like what they have denounced as privatisation by stealth. Moreover, the unions have made it a strategic imperative to save Eskom as a vertically integrated monopoly utility. Following Ramaphosa's February statement, Numsa said the state had declared war on the working class and announced that the working class would "defend Eskom in the streets". And it followed up with a statement headed "call for total national shut down" – although the statement does not in fact make that call. It states that the crisis in Eskom is "self-generated" in order to create the conditions for privatisation. In particular, separating Transmission

is intended to hollow out Eskom and open the way to fast-track privatisation.[124] Numsa identifies the causes of the crisis as: the IPP contracts; inflated coal costs; a bloated top executive; and the corruption and cost overruns at Medupi and Kusile. The underlying causes are the ANC's privatisation agenda and the corruption inherent in capitalism.

The NUM has reacted with equal vehemence to the publication of the DPE's Eskom roadmap which aims to put pressure on unions "to make unnecessary concessions to please White Monopoly Capital bosses in London and Washington". The union lists five demands, "to save ESKOM". Government must: stop the unbundling; and cancel the IPP agreements to improve Eskom revenue. Eskom must: stop selling electricity to the municipalities, but sell "directly to the public through a prepaid system"; take over the 'cost-plus' mines both to supply itself and to export "for improving revenue"; and start building nuclear power "which is CO_2 emissions-free". In short, the vertical integration of Eskom must be reinforced with total control of the entire value chain. The statement concludes, "If these demands are not met we will shut down electricity generation, transmission, and distribution as such plunging the country into darkness. It is not a threat but a promise."[125]

124 Irvin Jim, *We will defend Eskom in the streets – NUMSA*, Politics Web, 8 February 2019; Phakamile Hlubi-Majola, *Eskom: Call for total national shut down – NUMSA*, Politics Web, 21 February 2019;

125 Joseph Montisetse, *Darkness and load shedding are loading – NUM*, Politics Web, 30 October 2019.

Box 6: New-Eskom

In September 2018, the Alternative Information and Development Centre (AIDC), the New York based Trade Unions for Energy Democracy (TUED), and the Transnational Institute (TNI) teamed up with NUM and Numsa to form the Eskom Research Reference Group. The group says it "is researching both the origins and structural features of the current crisis and how to address it. The research work is looking beyond Eskom's immediate challenges to map a bold approach to South Africa's energy transition."[126] It will bring out a report, "provisionally titled *Our Power: Achieving a Just Energy Transition for South Africa*, … constructed around three core commitments:

1. Build a 'New Eskom': Fully Public and Serving the People
2. Secure a Democratic and Just Energy Transition
3. Fulfil the Promise of Socially Owned Renewable Energy"

The first priority, however, is to save Eskom. The group endorses the union view that unbundling – the separation of Eskom's divisions – is the first step to privatisation. "Nevertheless," it argues, "the utility must be reformed from top to bottom, with transparent and effective governance structures introduced that give decision making powers to workers, middle management and representatives of communities and municipalities". The state-owned corporation will thus be transformed into a "fully public" utility which will lead the just transition to a renewable system and the making of a broader public partnership:

> Under the guidance and leadership of a reformed public utility, communities and municipalities will play a larger role in energy decision-making and management than is currently the case. However, these entities will function as partners in the fully public system, and not as agents of private interests positioned to undermine Eskom as a fully public provider.

126 At www. new-eskom. org; Sandra van Niekerk, *A different Eskom: Achieving a just energy transition for South Africa*, Daily Maverick, 4 July 2019.

Eskom would thus remain large – indeed, become much larger – and remain in charge. It may also be thought that this leaves the unions as the avant garde of the working class. The question that then arises is whether the economy, the society and the just transition will not be hostage to saving Eskom since it would retain the power, so to say, to plunge the country into darkness.

In this context, the Reference Group will need to address the organisational inertia and resistance that the project of transforming Eskom will encounter. Eskom's very being has been shaped in the century-long history of the MEC. In the process it has developed all the pathologies of large corporations. It is both secretive and arrogant. It has used its monopoly on strategic information to serve its own interests, and those of the MEC, above those of society [Marquard 2006]. This includes information on demand and supply, pricing agreements with major corporations, the operation of individual power plants, coal sources and contracts, and pollution and pollution impacts. Most recently, it has concealed the catastrophic ineptitude and corruption of the new build.

Eskom has also been deeply hostile and resistant to renewables, energy efficiency and pollution control. This reflects the Generation division's dominance within Eskom, its entrenched interest in coal, and its cosy relationships, first with the coal majors of the MEC – which started breaking down around 2012 – followed by the network of patronage with 'emerging' colliers. Such is the position of Generation, we have been told in confidence, that it requires that Transmission signs a secrecy agreement before it will give them information necessary to operate the system.

Eight years ago, when Numsa launched its original campaign for a socially owned renewables sector, the vision appeared more flexible. It said this meant a "mix of different forms of collective ownership … [which] includes energy parastatals, cooperatives, municipal owned entities and other forms of community energy enterprises". The use of plurals is significant and it is repeated. Amongst other "non-negotiables", Numsa would "fight for social

ownership of utilities (generation, transmission and distribution)".[127] The core concern was thus social ownership. Vertical integration did not feature and there was no implied hierarchy in the relationship between utilities operating at different scales or between the collectives. A union discussion paper noted that "there is nothing inherently progressive about state ownership". In contrast, "social ownership … must emphasise accessibility and affordability of energy, and democratic and participatory control". And it emphasises process and associated political questions, including: In respect of "technology transfer, how will it be possible to initially work in partnership with foreign companies, but then become more independent as the sector develops and the technological capacity increases? Similarly, how might it be possible to develop intermediate regulation of the private sector in the interim period before it is possible to actually socialise it?"[128]

The scale of the crisis at Eskom has been exposed since that time. In our view, it is a symptom of the larger implosion of the MEC, aided and abetted as it has been by corruption enabled by the neo-liberal compulsion to put everything out to tender. Privatisation 'by stealth' through the REIPP has been ongoing since 2011, without Eskom being unbundled. There is unquestionably a danger that unbundling will lead to the privatisation of parts of the Generation division. This would presage a renewed assault on the environment as well as on labour. Private owners would prioritise profits, sweat the assets and save on environmental compliance whenever they can get away with it – particularly if they are working to a deadline for closure. Eskom must take responsibility for the process of closing its coal plants over the next two decades. In particular, it must close plants that do not and will not comply with environmental emission standards.

That said, we do not believe that the separation of Eskom's divisions must necessarily lead there. Rather, the separation of Eskom's divisions may be a precondition for a just transition to socially owned renewables across

127 Karl Cloete, Numsa Deputy General Secretary, Envisioning a Socially Owned Renewable Energy Sector, A Numsa working perspective. 2012.

128 Numsa (2012), Discussion paper for workshop on 28-29 January, to prepare for the International Conference on Building a Socially Owned Renewable Energy Sector in South Africa.

different scales: community based cooperatives and municipal generators as well as a national generator.

We are tempted also to think of it in the context of the even larger breakdown – the breakdown of the US led regime of capitalist accumulation which has reached a terminal crisis [Arrighi 1994]. And this crisis must be terminal for capitalism as such. For either we have a rapid and just transition to a very different society or we crash and burn along with capitalism. At present, it should be said, the second option seems more likely.

The question for us then, is what sort of society do we want and need to fight for – as we fight for our lives – and what kind of energy system would serve it? And although we must necessarily take direction from the work of imagination, the utopian visions, we must also find a flexibility of manoeuvre as suggested by the questions raised by Numsa in 2012. As the process unfolds in the messiness of human history and the chaos of climate breakdown, will it indeed be possible to partner with foreign or domestic corporations to ensure technology transfer to people over a set period of time? At the international level, how can intellectual property rights be brought into public hands? Or should the process of socialisation depend entirely on expropriation?

IRP 2019

The IRP 2019 was finally agreed in Nedlac in October and was pretty much the same as the amended 2018 version sent there by the DoE in March. It was then sent straight to Cabinet and promulgated before the public had sight of it. As in 2018, it specifies the energy mix for the next decade only. It provides no vision beyond that, although a set of nine 'decisions' show that it remains at the centre of an intense struggle over the future of power.

These decisions also indicate what issues were so contentious at Nedlac that the IRP process was stalled there for a year. The climate crisis was evidently not one of them. As noted in Chapter 1, carbon emissions from burning fossil fuels are still rising, the concentration of CO_2 in the atmosphere has touched 415 ppm, July 2019 was the hottest month ever and the droughts, floods

and cyclones are getting ever more severe. People are dying, thousands of other species are made extinct each year and the world is now on the road to runaway climate change and a "Hothouse Earth" from which there will be no return.

In comment on IRP 2018, groundWork observed that there was no real constraint on carbon emissions in the IRP. For the decade of the twenties, it effectively allows emissions of 275 Mt from electricity generation every year. This is unchanged in IRP 2019. But there is no scenario in which emissions come close to that limit. In the year to March 2019, Eskom's environmental performance was dismal. It produced less electricity than in 2018, but much more pollution. CO_2 emissions rose from 205 Mt in 2018 to 221 Mt in 2019. Other power plants, mainly at Sasol, emit less than 10 Mt. So total emissions are 44 Mt short of the supposed carbon constraint. As the IRP puts it, the constraint makes no difference to the energy mix [89].

Independently of the climate crisis, mining and burning coal has massive impacts on the land, on water and air quality and on people's health. Epidemiological research shows that over 2 200 people die each year from breathing Eskom's deadly air. Many more suffer illness and days when they are immobilised for want of breath [Holland 2017]. The IRP 2018 seriously understated the impacts of these pollutants on people's health. And it simply ignored the impacts on land and water. Nor did it register any externalities from nuclear power.

The IRP 2019 barely registers comments on health impacts. To the contrary, it says, "Taking into account supply and demand balance and the impact of loadshedding on the economy, shutting down of MES non-compliant power plants … [is] not recommended". MES are minimum emission standards which put a legal limit on how much pollution a facility may emit into the air. This is followed by "Decision 3: Support Eskom to comply with MES over time, taking into account the energy security imperative and the risk of adverse economic impact" [44]. In other words, the IRP says that Eskom will be allowed to break the law until such time as it is convenient to comply. However, there is apparently no intention to comply with SO_2 emission standards as sulphur scrubbers do not feature in the IRP 2019 plan for installing pollution abatement equipment on Eskom's plants [55].

The plan

IRP 2019 retains the fanciful growth forecast of IRP 2018 and aims at market expansion. But whereas the 2018 plan assumed the system was in surplus, IRP 2019 is confronted with the shortage induced by the ongoing turmoil at Eskom. Demand side interventions are therefore needed to "minimise … loadshedding" and excessive use of expensive diesel-fired peaking plant in the short term [43]. Beyond that, there is no mention of demand side management and energy efficiency, along with fuel switching to gas, is driven by price and not by policy [29]. Energy conservation is not mentioned. As noted above, the cost of neglecting it will be transferred to poor people.

What really took a year of argument at Nedlac was the future of coal and nuclear power. IRP 2019 acknowledges that only wind and solar PV, backed by gas or storage, are built in a 'least cost' plan. Coal and nuclear power do not make the cut. But this outcome, it seems, is not acceptable to the minister, Gwede Mantashe, the newly reunited Department of Mineral Resources and Energy (DMRE), or to the coal and nuclear lobbies that found voice in Nedlac.

Table 3 shows the IRP 2019 supply plan with: existing capacity for each technology; the dates for decommissioning old coal plants; the completion dates for new plant that is already 'committed'; completion dates for new plant that must be procured; the refurbishment of Koeberg; the total capacity for each technology in 2030; and 'embedded' generation installed for own use at businesses or homes. The bottom two rows show the share of installed capacity in 2030 and the share of energy produced: 60% will come from coal; 5% from nuclear and 24% from renewables. The share of embedded generation is not shown, indicating that the IRP fails to integrate decentralised power into its conception of the system.

But it is short on information. It does not give annual figures for carbon emissions, water use, projected peak demand, reserve margins or DSM savings. Nor does it show a least cost plan for comparison.

Under the heading "Energy Mix and Just Transition", the IRP 2019 says, "Due to the expected decommissioning of approximately 24 100 MW of coal power plants in the period beyond 2030 to 2050, attention must be given to the path

adopted to give effect to the energy mix and the preparation work necessary to execute the retirement and replacement of these plants" [44]. This suggests first that the transition is driven by plant closures. It is not a transition from one power system to another or from one economic paradigm to another. Second, it indicates that the transition starts in 2030 – allowing plenty of time to prepare – and ignores the fact that several units are already shut down, that over 5 000 MW are due for closure by 2022 and 11 000 MW will be closed by 2030. Eskom's comments on the IRP 2018 indicate that Grootvlei is closed by 2020, Komati by 2021, Hendrina by 2022 and Camden by 2023. The process at Arnot is stretched out, with the first unit closing in 2021 and the last in 2029. Kriel is closed between 2026 and 2029.

In this report, we argue that the transition is indeed being driven by plant closure rather than any real vision. There is scarcely even a modicum of preparation – Eskom has yet to initiate a single EIA for decommissioning stations and has been obsessively secretive, first about the decommissioning schedule and then about what plans it may have – if any. This is making for a chaotic and brutal process. Responding to questions specifically about Hendrina, officials say that consultants will shortly be appointed to do a social impact assessment but an EIA will be initiated only once a decision has been made on the future use of the site.[129]

The IRP 2019 text goes on to cite the International Labour Organisation (ILO) just transition guideline. While the ILO speaks of a just transition for all, the focus is on labour and jobs and the "greening of economies" [ILO 2015: 4] without unduly disturbing the existing orders of production and social power. This is clearly also the focus of the IRP. Decision 4 says, "For coherent policy development in support of the development of a just transition plan, consolidate into a single team the various initiatives being undertaken on just transition" [45]. The composition and location of that team is likely to be hotly contested.

129 Meshack Hlongwane, Corporate Affairs Business Partner, Eskom Holdings. Answers to written questions, 21 August 2019.

As in 2018, IRP 2019 puts an arbitrary limit on how much wind and solar energy may be built each year. It says this "'smooths out' the capacity allocation" and so creates a steady pipeline of projects. Decision 5, however, gives a different rationale. It says the limits will be retained "pending the finalisation of a just transition plan" [46]. This begs the question, how long? After 2030? But since the transition is being driven by coal plant closures, limiting renewables does not slow it down. Compared with 2018, there is a marginal increase in the allocation for solar PV in the period to 2030 but wind is given an extra 6 000 MW. This likely reflects the fact that power is needed in the short term and renewables are the fastest way of getting it.

The real reason for limiting renewables is to allow space for new coal. While the IRP assumes that all units at Kusile are 'already committed', the last two units would arguably not be included in a least cost IRP. In addition, 1 500 MW of new coal, up from 1 000 MW in 2018, is 'forced' into the energy mix. This capacity is reserved for coal BLIPPs. DMRE represents the first 1 000 MW as already procured. This is misleading and clearly intended to make it seem that two plants – Thabametsi in Lephalale and Khanyisa in eMalahleni – are a fait accompli. Both face legal challenges to outstanding authorisations and neither has achieved financial closure.[130] The 1 500 MW of new coal comes at considerable extra cost, requiring an effective subsidy in the order of R45 billion over their lifetime.

The Department, however, seems to envisage burning coal into the next century. According to Decision 6: "South Africa should not sterilise the development of its coal resources for purposes of power generation, instead all new coal power projects must be based on high efficiency, low emission technologies [HELE] and other cleaner coal technologies". This sentiment has its echo in the DPE's Eskom roadmap which says, "Coal will remain important for future economic growth and industrialisation" and should be 'Clean Coal' [DPE 2019: 24]. The IRP says, "HELE coal technologies including underground coal gasification, integrated gasification combined cycle, carbon capture utilization and storage, ultra-supercritical, super-critical and similar technologies are

130 Final agreements with funders showing how the plant will be paid for.

preferred for the exploitation of our coal resources" [46]. Unfortunately, these 'clean coal' technologies are even more expensive, add to the enormous resource consumption of coal-fired generation, and either don't work or make little difference to the harm done to health and the environment. [See box 7: Not so clean coal.]

The DMRE is also enthusiastic about the future of gas. For the period to 2030, however, it was persuaded that the gas will not be available in the quantities implied by the 2018 plan. New gas (or diesel) adds 6 380 MW in IRP 2019 compared with 11 930 in IRP 2018. But there also needs to be considerable demand to justify the construction of new gas infrastructure. Decision 7 therefore states: "To support the development of gas infrastructure and in addition to the new gas to power capacity in [Table 3], convert existing diesel-fired power plants (Peakers) to gas" [47].

The IRP represents nuclear as a "clean energy technology" [47]. It is true that there are no air emissions at the power station. The production chain from mining and fuel fabrication to waste disposal is, however, highly energy intensive and destructive. The West Rand already exhibits a ruined landscape carpeted with radioactive dust. There is also a massive concentration of high level radioactive waste confined to the Koeberg site with nowhere to go.

No new nuclear power is built in the decade to 2030 – and if they did start now, it would not be completed by then – but the IRP is concerned to mark out a space for nuclear beyond that. Therefore: "Decision 8: Commence preparations for a nuclear build programme to the extent of 2 500 MW at a pace and scale that the country can afford because it is a no-regret option in the long term" [48]. The phrase "pace and scale that the country can afford" is now part of the ritual rhetoric of pro-nuclear statements. The scale, however, is already nominated as 2 500 MW. And making it modular – with yet to be proven technologies – is unlikely to make it cheaper. As for regrets, they are already piled high in shack settlements surrounded by radioactive mine dumps on the West Rand.

Decision 9 concerns the foolish agreement to buy power from Inga 3, a project to dam the Congo River at a site where Inga 1 and Inga 2 have already

Table 3: The IRP 2019 capacity plan

	Coal	Coal (Decomissioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37 149		1 860	2 100	2 912	1 474	1 980	300	3 830	499
2019	2 155	-2373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1 433	-557				114	300			
2021	1 433	-1 403				300	818			
2022	711	-844			513	400 1 000	1 600			
2023	750	-555				1 000	1 600			500
2024			1 860				1 600		1 000	500
2025						1 000	1 600			500
2026		-1 219					1 600			500
2027	750	-847					1 600		2 000	500
2028		-475				1 000	1 600			500
2029		-1 694			1 575	1 000	1 600			500
2030		-1 050		2 500		1 000	1 600			500
TOTAL INSTALLED CAPACITY by 2020 (MW)	33 364		1 860	4 600	5 000	8 288	17 742	600	6 830	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MW)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	
	Committed									
	Decommissioning									
	New Capacity									
	Koeberg life extension									

Note: Under hydro, existing capacity is mostly Cabora Bassa in Mozambique. The new capacity refers to Inga 3 on the Congo River and is unlikely to be delivered. Source: IRP 2019 Table 5

failed. It says: "In support of regional electricity interconnection, including hydropower and gas, South Africa will participate in strategic power projects that enable the development of cross border infrastructure needed for the regional energy trading". IRP 2019 claims that this "hydropower was selected on its own merits" based on "the commercial parameters … submitted by the project developers for Inga" [48]. The inevitable cost and time overruns are likely to challenge those parameters. While the power is to be evacuated to South Africa, Ange Asanzi of International Rivers observes that "the project will displace 30 000 people … separating local farmers and fishermen from the river that sustains their livelihoods".[131]

Decision 1 concerns the last column in the table and is focused on short term security of supply: "Undertake a power purchase programme to assist with the acquisition of capacity needed to supplement Eskom's declining plant performance and to reduce the extensive utilisation of diesel peaking generators in the immediate to medium term. Lead-time is therefore key." This will be similar to the "medium-term power purchase programme … adopted following the IRP 2010" and will buy power from existing facilities that "are generally not run as it is cheaper to buy power from Eskom" [44]. In other words, companies like Sasol will be paid a premium to supply their own electricity.

The IRP also allows the expansion of small-scale embedded generation (SSEG) from solar PV. It says "the DMRE is inundated with requests from companies, municipalities and private individuals" who want to install solar power but are blocked by regulatory paralysis. This is the fastest way of adding new capacity to the system and, as the IRP puts it, "increasing the embedded generation allocation … present[s] the opportunity to address the shortage" [49]. Nevertheless, the IRP treats SSEG as outside the national power system and hence as reducing demand from that system. It does not conceive a system of networked generators that integrates small-scale dispersed generators and household 'prosumers'. Nor does it conceive a system that integrates the poor majority of the country as prosumers.

131 Ange Asanzi, *Here's why African Development Bank must withdraw Inga 3 Dam support*, BizNews, 20 June 2019.

Box 7: Not so clean coal

The mandate for clean coal in Decision 6 is laced with irony given that Decision 3 allows Eskom to continue with coal that is too dirty to be legal. Eskom says it is too expensive to comply with minimum emission standards for sulphur dioxide emissions. Consequently, government wants to double the allowed amount of sulphur pollution. But even this looks out of reach. Eskom also complains that the standard technology, flue gas desulphurisation (FGD), uses lots of water, limestone that needs to be mined and trucked in, and energy from the power station itself. In other words, addressing one problem of dirty coal tends to create a series of other problems.

FGD is an expensive but standard technology. Carbon capture and storage (CCS) barely exists. There are only 18 carbon capture projects around the world, most of them capturing carbon from produced gas at oil wells. Only four actually aim to store it underground forever and, all told, they have buried a grand total of about 33 Mt. Most of the rest is used for enhanced oil recovery (EOR) – they pump the CO_2 into an oil well to restore the pressure and so extract more oil.[132] About half the CO_2 comes back up with the oil. And the well produces more oil which, of course, is destined to be burnt.

There are two coal power stations in the world with carbon capture plants. The plant at SaskPower's Boundary Dam in Canada captures CO_2 from one of four units. It was over-budget, over-time and doesn't work very well. It has captured about half the CO_2 emitted from that unit and consumed about a third of the energy produced by it. The CO_2 is sold for EOR to a neighbouring oil company. Otherwise, says SaskPower, the plant would not be economic. Nor, as it turns out, is it economic with it. Following "its costly experience", comment David Schlissel and Dennis Wamsted of the Institute for Energy Economics and Financial Analysis (IEEFA), the company has decided "against retrofitting two other units at Boundary Dam with carbon capture technology" [2018: 6]. The other plant is at the Parish power station in Texas, USA. The story is similar. The plant captures a bit more than a third

132 Global CCS Institute, The Global Status of CCS 2018. At https://indd. adobe. com/view/2dab1be7-edd0-447d-b020-06242ea2cf3b

of the CO_2 produced by one of eight units. And they built an extra gas-fired power unit just to run the carbon capture plant. They pipe the CO_2 to an oil well about 130 kilometres away and production at the well has increased from 300 barrels a day to 4 000. Not quite zero then.

Integrated Gasification Combined Cycle (IGCC) has also been beset by failure. It consists of a conventional 'natural' gas combined cycle power station with a "chemistry set bolted onto it … to strip out methane from coal" and supply it to the power plant.[133] As with CCS, about a third of the energy generated by the gas plant is used to run the coal gasifiers (the chemistry set) but the process is meant to separate the carbon before combustion and so enable CCS.

The Kemper power plant in Mississippi, USA, was to be the flagship for this technology. The gas power station was completed on time in 2014 and started running on fossil gas that was then being produced by fracking. The gasification plant failed to achieve successive milestones, was way over budget and was finally abandoned in 2017. Even if it had worked, Schlissel and Wamsted note that it would have been less efficient than a conventional gas plant and would have cost a lot more in maintenance. Further, the plant consumes massive quantities of water and much more than anticipated.

High water consumption is a common feature of all CCS plants, "affecting all stages of the process – from cooling the plant to capturing, compressing and injecting the captured CO_2", and would double a coal plant's water consumption. "For coal facilities in arid regions this is obviously a deal-breaker," comment Schlissel and Wamsted [10]. Another problem is where to put it. It can be injected into specific geological formations but, if it is done on the scale required, there is no certainty that it will not leak out. In South Africa, two potential storage sites have been identified – offshore of KwaZulu-Natal and offshore of the Eastern Cape. A vast network of pipelines would be needed to carry compressed CO_2 from the Highveld and Waterberg to these sites.

133 David Wagman, *The three factors that doomed Kemper County IGCC*, IEEE Spectrum, 30 June 2017.

Supercritical and ultra-supercritical plants are more efficient than subcritical plants. New subcritical plants should convert about 38% of the energy in coal into electricity. Eskom's plants get less than 35%. Supercritical plants, such as Medupi and Kusile, should convert around 42% – if they work – and ultra-supercritical plants convert about 45%. Put another way, ultra-supercritical plants get about 14% more energy out of every tonne of coal burnt. But burning a tonne of coal still produces the same amount of pollution. Taking out the sulphur, nitrogen and particulate pollution requires the same FGD scrubbers and baghouses irrespective of whether the plant is super or subcritical. In relation to energy produced, carbon emissions are reduced by about 14% but remain high in comparison with all non-coal technologies.[134]

Before coal can be burnt, it must be mined and all coal mining is dirty. It destroys good land, uses lots of water and pollutes more, fills the air with dust from trucks and blasting, and leaves behind massive discard coal heaps which frequently catch fire. Further, the latest World Energy Outlook from the International Energy Agency (IEA) shows massive methane leakage from mines. Methane is a potent greenhouse gas and the IEA puts the leakage from South African mines at 50 Mt/CO_2e a year. That makes a significant addition to the national greenhouse gas count.[135]

Eskom, like the IRP, claims that underground coal gasification (UCG) is an 'advanced clean coal technology' because it substitutes for mining and the gas is supposed to burn cleaner than coal at the power plant. UCG works by drilling two sets of holes into a coal seam, blowing oxygen into one side, setting fire to the coal underground, and extracting gas the other side.

There are two big problems with this story. First, UCG is only used where coal is un-mineable. So it does not reduce emissions, it expands the resource. As Eskom puts it, "Almost three quarters of the country's coal resources are presently regarded as conventionally un-minable, but could be extracted

134 Lauri Myllyvirta, *How much do ultra-supercritical coal plants really reduce air pollution?* Energypost. eu, 28 June 2017; Life After Coal, *The myth of 'clean coal'*, pamphlet, 2017.

135 Dave Jones, *Coal mine methane leaks are worse for climate change than shipping & aviation combined: New findings in today's IEA World Energy Outlook*, Sandbag blog 13th November 2019.

using UCG technology."[136] That could add up to 160 billion tonnes of additional carbon emissions. Eskom's favoured technology combines UCG with IGCC. For carbon emissions, the results are not very impressive. Eskom cites an IEA clean coal report showing the following emission factors for various fossil fuel power stations (CO_2 kg/MWh)[137]:

1. Conventional coal: 950
2. Supercritical coal: 850
3. Conventional IGCC: 750
4. UGC-IGCC: 700
5. Natural Gas CC: 450

Eskom's own coal-fired emission factor is 1 040 CO_2 kg/MWh.[138] Total life cycle emissions – including emissions from mining and transport of coal, power plant materials, construction and demolition and other processes – would bump that number up to 1 170 kg or more. In contrast, life cycle emissions from wind are between 14 and 21 CO_2 kg/MWh.

Second, the underground fire burns at 1 200˚C, leaving a burnt out cavity, collapsing the ground and rock layers above it, and polluting groundwater. In addition, 'wastewater' saturated with hydrocarbons, metals and salts also comes up with the gas through the extraction well. It is collected in a series of evaporation ponds and liable to spill out into surface water.

In Australia, three UCG projects have all ended with charges laid against the companies for groundwater pollution. In the case of Linc Energy, the supposed industry leader, methane gas from the cavity saturated the ground above. Government told farmers not to dig any holes deeper than two metres in an 'excavation exclusion zone' covering 314 square kilometres. And workers suffered "heart palpitations, stinging eyes and headaches, and

136 *http://www. eskom. co. za/Whatweredoing/ElectricityGeneration/UCG/Pages/StrategicDrivers. aspx* at 14 April 2016.

137 *http://www. eskom. co. za/Whatweredoing/ElectricityGeneration/UCG/Pages/StrategicDrivers. aspx.*

138 Eskom 2011, CoP 17 Fact Sheet: Air quality and climate change.

sometimes had to drive a number of kilometres off site before their personal gas detector would stop registering" [Monk et al 2016: 31].

In South Africa, Eskom has a UCG project at Majuba where the coal proved un-mineable. It initially hoped to provide 30% of the power station's energy (equivalent to 4.5Mt of coal a year). The coal seam was lit in January 2007 and, in 2014, Eskom said that the 'first pilot' was producing 15 000m^3 of gas per hour. It was intended that this would be ramped up to 75 000m^3 an hour to co-power one of Majuba's six units.[139] However, the initial test firing in 2014 was very brief – scarcely an hour on one account – and the rest of the gas was flared. In its 2015 Integrated Report, Eskom reported a R1.05 billion impairment on the UCG project and the site was all but abandoned.[140]

Year's end

As 2019 drew to a close, the country and the President were "surprised and shocked" to discover that loadshedding could go beyond stage 4. In two days, it went from Stage 2 to Stage 6 – meaning that Eskom supply was 6 000 MW short of demand. Of its 46 000 MW capacity, it had planned for 5 000 MW being offline for maintenance but lost an additional 15 000 MW. Eskom said that exceptionally heavy rain on the Highveld caused flooding at the Kriel colliery and power station, interrupting coal supplies, while the turbine hall at Camden was flooded. Far away from the Highveld, however, the conveyor belt at Medupi failed and the entire plant was shut down. Ramaphosa returned in haste from a conference in Egypt and claimed that a boiler at Tutuka had been sabotaged. This claim was almost immediately contradicted and was met with incredulity from across the media spectrum as reporters recalled that government claimed sabotage in 2006 when Koeberg broke down.[141]

139 Eskom has a series of UCG web pages at: *http://www. eskom. co. za/Whatweredoing/ElectricityGeneration/UCG/Pages/* accessed at 14 April 2016. These pages do not appear to have been updated since 2014.

140 A more detailed account is given in The groundWork Report 2016.

141 Marelise van der Merwe & Lameez Omarjee, *Flooding a major factor in move to stage 6 load shedding – Eskom*, Fin24, 9 December 2019; Ed Stoddard and Marianne Merten, Medupi down because of 'electrical supply panel burn-out', say sources, Daily Maverick, 10 December 2019; Sikonathi Mantshantsha, *"Surprised and shocked" Ramaphosa repeats the excuses of the last twelve years on Eskom*, Daily Maverick, 12 December 2019.

In November, Eskom appointed a new CEO, Andre de Ruyter, to replace Hadebe who resigned in June citing ill health due to stress. De Ruyter will be the 13th CEO since 2007. He was previously CEO of Nampak and before that a Sasol executive. His appointment was not well received, first because he is white, second because Nampak is on the ropes, and third because he is not an engineer – a fact taken as evidence by some that government is intent on destroying Eskom so as to privatise it. The NUM is due to stage a protest on his first day at work in mid-January. Energy coordinator Paris Mashego said government had instructed De Ruyter to break up Eskom – into Transmission, Generation and Distribution – but the union would work with him only if he joined it in resisting that agenda. "It is an instruction. If he follows it, he will have our support."[142]

142 Khulekani Magubane, *Eskom's De Ruyter must either toe government's line or ours – NUM*, Fin24, 18 December 2019; Sikonathi Mantshantsha, *New Eskom CEO is no stranger to turnaround projects*, Daily Maverick, 19 November 2019.

5 Coal on the skids

The central coal basin is in decline and the coal lobby is looking to the Waterberg as its next frontier. There are many reasons to be sceptical of this vision, as detailed in the 2018 groundWork Report, *Boom and Bust in the Waterberg*. This chapter looks at an industry in decline. It then looks at the jobs that are on the line in the mines and in Eskom. Amongst other things, we emphasise the continuation of labour migrancy and briefly comment on the impacts of the neo-liberal labour regime on settlement and unsettlement on the Highveld.

Big coal at the exit door

The oil shocks of the 1970s opened up the export market for coal and transformed the local industry. This fixed the pattern of the coal economy for the next four decades: the coal majors developed big mines paid for by Eskom to supply cheap low quality coal at cost plus a slim margin. The coal companies, led by Anglo and Gencor (later Billiton, then BHP Billiton), could then make a handsome profit on the export of higher quality coal, first to Japan and then to Europe.

The coal miners – now operating as transnational corporations listed in London and Sydney – similarly benefited from rising oil prices in the 2000s. The price of coal rose sharply from $35 a tonne in 2003 to $65 in 2006. Then, as the financial market bubbles burst on Wall Street, panicked investors crowded into commodities. In the first half of 2008, the coal price spiked at $200 in European markets before crashing. At the same time, the international coal market was changing as China and India started importing coal of a much

lower quality than the Europeans. Eskom claimed that the coal majors then diverted cheaper coal into this more lucrative market. It thus saw competition from exports driving up the cost of coal previously reserved for itself.[143]

Uncertain exports

Following the crash of 2008, the export coal market did revive briefly to trade at $130 in 2011 before taking a long slide down to $50 at the end of 2015. Since then, the price has twice spiked above $100 before crashing again to about $70 – the mark at which it is trading in late 2019. In 2015, Anglo said it was getting out of coal altogether but, when the price recovered, it decided to sell the Eskom tied mines but keep the mines focused on exports. In 2019, it is again considering a total exit from coal. South 32, successor to BHP Billiton, is also selling out of its existing coal mines.

Meanwhile, exports to China collapsed almost to nothing after 2014. India is the leading destination for South African coal, taking nearly half of the exports from Richards Bay. India, however, says it wants to import less and dig more of its own coal. Coal of India, the state owned miner, has announced plans to expand production by about 400 Mt/y to over 1 000 Mt/y.[144] Demand for electricity, however, was falling in late 2019 and demand for coal-fired power was falling even faster as more power was supplied from renewables.[145] So, whether or not Coal of India expands production, this market is highly uncertain and could collapse as suddenly as the Chinese market did.

Alternative export markets are also being squeezed as global demand for coal-fired power declined in 2019, with sharp reductions in Europe, South Korea and Japan. Europe and South Korea together take about 20% of South Africa's coal so this will have a direct impact. At the same time, the declining market makes for increased competition between exporters, as Nicholas and Buckley observe [2019]. Russia's exports to Europe are now being diverted to Asia and are jostling for space with the two leading exporters, Australia and Indonesia.

143 Eskom revenue application 2012: MYPD3. P.20.

144 *CIL to develop 55 new coal mines in next 5 yrs: Minister*, The Hindu, 20 November 2019.

145 Lauri Myllyvirta, Dave Jones and Tim Buckley, *Analysis: Global coal power set for record fall in 2019*, Carbon Brief, 25 November 2019.

Richards Bay Coal Terminal already has spare capacity, having unwisely expanded in 2006 just ahead of the meltdown on Wall Street. Capacity on the coal railway line has lagged behind that of the terminal, limiting exports to 75 Mt/y, but Transnet has plans to expand capacity all the way to the Waterberg and beyond to Botswana. This project is supported by government's grandiose Strategic Infrastructure Plan One (SIP 1) to "unlock the mineral wealth of the Waterberg". If it is carried through, it will create a new monument to folly to follow Medupi and Kusile and leave the Waterberg littered with bankrupt mines.

Coal to Eskom

The failure of exports is not necessarily good news for Eskom. Reduced export profits will have an impact on the viability of mines supplying Eskom. Glencore's Optimum mine, for example, was selling coal to the Hendrina power station at below cost in 2015. This was viable as long as the export price held up: to produce more for profitable exports, the mine had to produce more low quality coal that had nowhere to go but Hendrina. When the export price slumped, Optimum tried to renegotiate its fixed price contract with Eskom. Incoming Eskom CEO Brian Molefe blocked the negotiations so as to force the sale of the mine to the Gupta's Tegeta.

The prospect of failing exports and stranded assets has also deterred investment in new mines. In 2013, the South African Coal Roadmap – produced by industry with the collaboration of DMR – confidently predicted increasing demand and said 40 new mines were needed to supply: four billion tonnes of coal to Eskom through to 2050; a proliferation of privatised independent power producers (IPPs); and the export market. The investment for those mines has not materialised. According to the Minerals Council of South Africa (MCSA), "Since 2009, net investment in the coal industry has declined at a rate of 10% per year – from R7.3 billion to R3.8 billion in 2017."[146] Amongst other things, in 2015 Eskom refused to reinvest in the big old tied mines. In 2017, it reversed this policy, apparently to no effect as it again reversed the policy in

146 https://www. mineralscouncil. org. za/sa-mining/coal at 28 November 2019.

2019.[147] Sasol, on the other hand, has invested heavily in replacing the mines that supply the Secunda coal-to-liquids plant.

Under pressure from the climate movement, more big investors are divesting from coal or defining policies that limit coal funding. It may be noted, however, that most of them – the African Development Bank and Standard Bank stand out – are investing heavily in oil and gas. Nevertheless, it is more difficult for coal miners to raise money and they are increasingly reliant on support from state owned institutions. In particular, neither the Public Investment Corporation (PIC) nor the Industrial Development Corporation (IDC) has more than a fig leaf for a climate or environmental policy and both are heavily invested in carbon and energy intensive industries. The IDC's funding for mining is focused on "energy minerals with several large coal mining projects aimed at securing coal supply to Eskom".[148]

On the Highveld, meanwhile, the cost of coal is rising for reasons independent of the international coal price. Eskom itself notes the following trends:[149]

- the Highveld coal resource is in decline;
- big old mines are reaching the end of life;
- more coal is coming from smaller mines;
- more is transported long distances;
- coal quality is declining;
- environmental impacts are increasing.

In this context of a resource in decline, the MEC is fragmenting. The cosy relationship between Eskom and the big mining houses gave way to mutual suspicion and then to rupture as the miners began to leave the scene and abandon their liabilities. In 2018, Anglo sold its Eskom tied mines to Seriti, a consortium of buccaneer BEE companies put together for the purpose of

147 Eskom Revenue Application FY2018/19, August 2017; Eskom Revenue Application MYPD4, September 2018; Charlotte Mathews, *Gordhan labels 17% coal cost hike "extraordinary" as he prepares for talks with mining industry*, MiningMx, 30 July 2019.

148 IDC, Integrated Report 2018, p.28; https://www. pic. gov. za/investment-philosophy-and-approach/environmental-social-governance at 29 November 2019.

149 See its Revenue Applications.

buying them. In a separate deal, Seriti also bought Anglo's New Largo – the mine that is still to be developed to supply Kusile. In the meantime, 400 trucks a day are running coal from small mines on the upper Wilge River near Delmas to burn in the three units that have been fired up at Kusile.

BHP Billiton left the country altogether in May 2015 when it split off a portfolio of assets to form South32. South32 itself is a transnational corporation which is now also exiting the South African coal business. Seriti is buying that too – becoming the biggest coal miner in the country in little more than 18 months.[150] Seriti is touting clean coal. It is at the centre of a lobby that looks for a long-term future for coal, in South Africa and in the broader region. Participants at a Coal Industry Day in July noted that it is increasingly difficult to fund coal mines. Nevertheless, based on Eskom's schedule for decommissioning power stations through to 2050, R20 billion must be invested in new mines to meet Eskom's declining coal demand.[151] Apart from the IDC, Seriti itself is looking to the big mining equipment makers to help fund New Largo.

Seriti's major competitor is Exxaro, established in 2006 from a succession of BEE deals orchestrated by Anglo. In the process, Exxaro inherited Iscor's coal mines, notably the Grootegeluk mine in the Waterberg which supplies both Matimba and Medupi and is one of the biggest mines in the world. The corporation also has major operations on the Highveld. Nevertheless, it sees coal as a declining industry with increasing costs and is looking to "extract as much value as quickly as possible" while it repositions itself in other markets, including renewables.[152]

The coal corporates are not the only players extracting as much and as fast as possible as the coal industry starts running out of road. Kusile was designed to get coal on a conveyor belt from New Largo. The chaos of coal trucks is partly due to the fact that they are delivering to makeshift facilities. It is also because they are delivering sub-quality coal which has to be taken back. More

150 David McKay, *South32 concludes binding sale of 91.8% stake in SA Energy Coal with Seriti Resources*, EnergyMx, 6 November 2019

151 Nadine James, *Despite assertions coal mining is on the brink, some argue it will be a key sector for SA for decades*, Engineering News, 30 August 2019.

152 Paul Burkhardt, *South African Coal Miner Plans New Climate Change Strategy*, Bloomberg, August 22, 2019

broadly, management has lost control of the site. Everyone is on the make – top Eskom managers, major construction contractors, coal suppliers, workers and a bandit population demonstrating real innovation in thievery.[153]

Table 4 shows the Eskom power stations due for closure by 2030 together with the mines that were supplying coal to them in 2013. This is the latest date for which we have the information but it does serve to illustrate the corporate jostling on the coal fields. In the six years since then: Xstrata has been taken over by Glencore; Glencore has been elbowed out of Optimum by the Gupta's Tegeta; Exxaro's Arnot mine was forced to close to give Tegeta's Optimum an additional market; Tegeta has been placed in business rescue; Arnot has been bought by Wescoal in partnership with retrenched workers; Keaton has been taken over by Wescoal; Shanduka has been taken over by Phembani which also holds Umcebo; and Anglo has sold Kriel to Seriti.

Coal jobs

Mine jobs

There are about 87 000 people employed on coal mines, up from about 77 000 in 2016, according to the Minerals Council of South Africa [MCSA 2019]. It should be noted that, just as coal prices are volatile, so are job numbers. With prices falling, and likely to fall further as global economic bubbles deflate in the next year, the MCSA employment figure may decline.

However, Burton et al [2018] note that job numbers are influenced by other factors too. First, there are more skilled workers relative to unskilled workers, although the latter still make up about 55% of the workforce, leading to a reduction in the number of jobs. Second, open cast mines employ fewer, but generally more skilled, people than underground mines. Third, the workforce is increasingly casualised with 43% of workers – about 37 000 – now on

153 Pieter-Louis Myburgh, *Ex-Eskom bosses, Tubular Construction executives charged over R30m Kusile kickbacks saga*, Daily Maverick, 19 December 2019; Kevin Davie, *Power stations truck up Eskom's image*, 25 October 2019.

Table 4: Eskom power stations for closure by 2030 and mines supplying them (in 2013)

Plant	Closure	Coal burn tonnes pa	Mines / source
Grootvlei	2018-2020	3 279 640	Palesa; Liketh – South Witbank, Tweefontein; Umlalazi; Keaton – Vanggatfontein; Eyethu – Mooifontein; Xstrata – ATC, Tavistock; Duvha Stockpile.
Komati	2018-2021	2 382 642	Shanduka – MTC; Keaton– Vanggatfontein; Xstrata – Goedgevonden; Exxaro – NBC, Kleinfontein.
Hendrina	2018-2022	5 763 637	Glencore – Optimum; Liketh.
Camden	2020-2023	4 958 689	Sudor; Mooiplaats; Woestalleen; Vunene; Umcebo – Klippan; Kuyasa – Delmas; Eyethu – Mooifontein; Stuart Coal.
Arnot	2021-2029	6 705 593	Exxaro – Arnot, Mafube, NBC; Umthombo – Hakhano; Shanduka – MTC, Graspan; Eyethu – Mooifontein; Xstrata – Blesboklaagte, Boschmans; Just Coal – Bankfontein, Homelands.
Kriel	2026-2029	8 902 897	Anglo – Kriel; Shanduka – MTC, Graspan; Umcebo – Kleinfontein, Strathrae, Middelkraal; Liketh.
Total		**31 993 98**	

Source: Closure: Eskom IRP 2018 comment; Coal burn and mines: Eskom general plant information (2013)
ATC = Arthur Taylor Colliery; MTC = Middelburg Town Colliery; NBC = Northern Block Complex.

contract. This obviously makes it easy to hire and fire in response to the ups and downs of the market – which is precisely the intention.

To this, we would add that the casualisation of labour is overlaid on outsourcing operations to contract mining companies. They typically get the underground mines, which are more labour intensive, more dangerous and less profitable. The point of outsourcing is to cut costs and they work under tight budgets imposed by mine owners.

Using 2017 figures, Michelle Cruywagen [forthcoming] puts total employment at 82 200. Of these, 28 800 are over 45 years old and 1 400 reach the retirement age of 65 every year. This, of course, assumes that coal miners do actually reach that age and are still fit to work. Many do not and are not. As former mineworker Vusi Mabaso tells it, a job on the mines is a death sentence and many are indeed sent home to die.[154]

Leaving that aside, over a period of 20 years 35% of workers will retire. If a transition away from coal resulted in the labour force being halved in that period, then 12 000 younger people – 600 a year – would need to find other work. Cruywagen does not contemplate a reduction of more than 60% of the workforce. However, if there was a complete phase out of coal in twenty years, then 53 000 younger people – 2 700 a year – would need to find other work.

That would imply the end of the export market and the phase out of industrial and metallurgical coal, used in steel making, and of Sasol's coal-to-liquid process as well as of steam coal used in power stations. As noted above, the export market is volatile and may change very quickly. Hence, if things are left to the market, it is unlikely that there will be a smooth and orderly phasing down of the industry. Rather, mines will be shuttered or abandoned piecemeal as companies go bankrupt or abscond.

The phase out of coal supplying Eskom should, in theory, be more predictable and hence more easily managed. Supplying Eskom, according to the MCSA, accounts for 37 800 mineworker jobs – a bit less than half the total number of jobs. On the basis of IRP 2018, MCSA calculates that this number will decline

154 Community meeting on just transition, Middelburg, 11 February 2019.

to 34 200 in 2030, 20 000 in 2040 and 12 500 in 2050. In addition, there are between 2 000 and 4 000 coal truck drivers.

IRP 2018 is not, of course, an adequate response to the climate crisis. And it should be kept in mind that the climate crisis itself will likely upset these plans. The coal fleet is vulnerable to extreme weather and, by the 2030s if not before: regular summer heatwaves will reduce or interrupt production; drought will compromise Eskom's water supply, as well as put it in competition with basic human needs; and floods will turn the coal to slurry, as already happens. Hence, the ageing coal fleet will become even more unreliable than it is at present.

A 2°C emission reduction pathway modelled by Burton et al shows that all Eskom power stations must be closed by 2040. Of the mineworkers employed to supply Eskom, about 13 300 will be older than 45 and due for retirement in the next 20 years. So about 24 500 younger mineworkers – 1 225 a year – will be looking for other work on account of the power plants closing down. However, this assumes that Sasol's Secunda plant is closed by 2035. If Secunda is allowed to run to 2040, Eskom plants must close "between 2 and 6 years earlier" – that is, as early as 2034 [2018: 26]. Adding Sasol to the job count makes for an even more challenging jobs scenario as it employs 28 000 people including coal miners.

Eskom jobs

The job count at Eskom itself is opaque. The utility employs 46 600 people according to its latest annual report, down from 48 600 in 2018. This includes 39 300 employed directly by Eskom and 7 300 people employed at its Rotek subsidiary. The divisional breakdown is: 11 700 employed by Generation; 2 000 in Transmission; and 17 700 in Distribution. The remaining 8 900 people are employed in various support functions.[155] In a transition from fossil fuels to renewables, only the jobs at the power stations are on the line. Transmission and Distribution would need to employ more people as both the national and local grids – municipal and Eskom – would need to be upgraded to smart grids.

155 Eskom AR 2019, p.133.

In response to a PAIA application from CER, Eskom released figures showing how many people it employed directly at each of the coal-fired stations. The total comes to 7 928. However, this does not include workers employed by Eskom contractors, including Rotek and original equipment manufacturers (OEMs). Rotek manage bulk materials, including coal, ash and water, as well as doing maintenance both for power stations and for Transmission. OEMs do maintenance on equipment such as turbines and boilers that they originally manufactured.

Responding to questions on employment at Hendrina, Eskom told us that they employ 620 people directly and that Rotek and the OEMs employ "approximately 937 employees".[156] But some of those people are on site all the time – for example, Rotek workers providing 'bulk materials services' – and some are there for specific maintenance work done during plant shutdowns and will rotate between power stations.

In addition, Eskom employs contract workers, particularly during maintenance shutdowns. They told us that the number fluctuates according to need but did not give us any ballpark figures. Previously, SWOP researchers were told that they employed 2 000 contract workers. We have not been able to verify that number. But it seems likely that it would include workers employed by Rotek and the OEMs as well as smaller sub-contractors who circulate around industrial plants doing particular tasks. And finally, it would include local people who get temporary work from sub-contractors arriving to do maintenance, particularly during shutdowns. As Menzi Mbata told us in 2016, local people organised to get those jobs. Previously contractors came with their own workers but workers living locally demanded that they include at least some locals on their work crews and developed a database of workers with their CVs. Most of these locals were men who had taken up residence in Pullens Hope because "you have a better chance of work here than elsewhere".[157]

156 Eskom, written response to groundWork questions, 21 August 2019. This seems a very precise approximation.

157 Interview Menzi Mbata, 7 March 2016.,

Unequal work, unequal transition

The neo-liberal labour regime is increasingly unequal, as we observed in the 2016 groundWork Report following Webster et al [2008]. That inequality is being replicated in the transitional process now in train as power stations start shutting down. Workers directly employed by Eskom and its subsidiaries are among the 'core zone' of permanent workers with good wages and conditions and the protection of post-apartheid labour laws. As plants are shut down, Eskom says it will take responsibility for its own employees and those of its subsidiaries. It has previously stated that workers will be "absorbed" elsewhere in the company. This strategy may be viable in the short term but is possibly already reaching its limits as Eskom seeks to reduce its workforce.

Permanent OEM employees would also fit into the core zone of the labour regime. Eskom will clearly take no responsibility for them so they will rely on the OEM taking responsibility. The OEMs may be forced to downsize as Eskom plants close and may or may not survive. Workers with 'portable' skills may find work elsewhere. Others will find themselves evicted from the core zone into the more precarious zone of outsourced labour. This is where people working for sub-contractors, together with contract workers, already find themselves. It is the place of nearly half of coal mine workers. And the Pullens Hope locals had to fight their way in to get a tenuous toehold on the edge of this zone. They are otherwise part of the 'peripheral zone' of unemployed people and informal sector workers. This is the place of the food sellers and other street traders who sell to passing workers.

This labour regime puts people on the move. Contrary to the official view of government, corporations and labour unions, a high proportion of coal workers are still labour migrants. They no longer come on the 'coal trains' organised and paid for by the industry, but by taxi. And they do not, for the most part, live in hostels. Marais and Cloete [forthcoming] show that a high proportion of people renting formal backyard accommodation in eMalahleni are single men who work on the mines. Others live in shack settlements next to mines and power stations. At Masakhane, sandwiched between Duvha power station and the Mooifontein and Wolvekrans Collieries, many dwellings are constructed as

rows of single rooms to house men from KwaZulu-Natal who have organised themselves in a migrant labour network.

In the 1990s, the unions negotiated living-out allowances as they looked for parity with white workers. And they supported the post-apartheid government's policy of 'normalisation' – of workers buying and settling in their own homes with their families – and thus ending migrant labour. This also worked for the corporations who abandoned responsibility for migrant transport and worker housing and cast workers onto the market. Some mineworkers have indeed bought their own homes but many have not. By renting, they retain the mobility necessary for migrancy and minimise the risks of mine closures. Home owners, by contrast, take on substantial risks with mortgages and the likelihood of falling house prices when mines close as well as the loss of rent from the migrants [Marais and Cloete forthcoming]. The effect is to trap them in place, as is happening in the Eskom villages such as Pullens Hope and Rietkuil. They will also lose medical aid and money to pay school fees and loans for household goods and cars.

The normalisation policy passed responsibility to municipalities as well as to workers, as Marais and Cloete observe. They then "had to plan for booms and busts" but did not have the capacity to do so. Besides, the policy did not envisage the bust. Thousands of mineworkers then came into the towns and municipalities were expected to provide the necessary town planning and housing and associated municipal services and infrastructure – for transport, electricity, water, drains, sewage and waste. The municipalities did not cope and the policy contributed to the broader failure of services and of the municipalities themselves. As Eskom closes the old power stations, the municipalities are also being handed the responsibility for services in the Eskom villages.

Migrant workers will go home or look for work elsewhere. Thus far, the debate on a just transition has ignored the fact of migrancy. This perhaps reflects the official fiction that the mines hire local people. The effect is to make the sending areas invisible to government, corporations and trade unions – in much the same way as mineworkers who are sent home to die are made

invisible. It bears noting that these areas are mostly rural. In South Africa, they are in the former bantustans but there are also many migrants from neighbouring countries, particularly Lesotho, Swaziland and Mozambique. The most immediate and obvious impact will be the loss of remittances and the money to invest in the family home or livelihood as well as medical aid and other benefits. In most of these areas, the rural economy was crushed under the burden of subsidising the mines with cheap labour throughout the twentieth century. Now it seems that the MEC has found a way to forget them just as the impacts of climate change intensify and are taking a heavy toll on rural people throughout southern Africa.

6 Chaotic Transition

This chapter presents a window on the transition from coal that has already started on the Highveld and is being driven by uncertainty in the coal markets and the closure of Eskom power plants. Eskom's decommissioning schedule was given in the 2010 IRP and was noted by Numsa in 2012 when it organised debates on the just transition. Thereafter, it was largely forgotten until the coal truck bosses' siege of Pretoria in 2017 when the news of anticipated plant closures was greeted with shock [see Chapter 4]. This chapter focuses on what is happening around Arnot and Hendrina, two of the six power stations slated for decommissioning before 2030. The first part looks at how a group of workers has been abandoned and documents the effort to forge green-red links on the ground – between trade unions, workers, communities and environmental justice activists. The second part is concerned with the fate of the Eskom villages – Pullens Hope next to Hendrina and Rietkuil next to Arnot – left in the shadow of massive toxic legacies in the form of the power station ash dumps. The chapter concludes with observations about the nature of the real and unplanned transition out of coal now under way.

A reluctant and rough end to coal

The power plants are scheduled for decommissioning at the end of their 50-year life span. The associated events, processes and debates are not officially recognised as part of a transition from fossil fuels – despite the fact that government frequently invokes the idea of a just transition. But these events shine a harsh light on the actors in the transition and foreshadow arguments and decisions relevant to whether or not it will be a just transition.

First, the events taking place show that Eskom has no plan – as it has acknowledged publicly – to properly decommission its old power stations. It is already switching off units at several power stations but has yet to initiate a single environmental impact assessment as required for decommissioning. This may be cheaper for Eskom in the short term, but will leave the areas they are withdrawing from with significant ongoing social and environmental risks, in particular the giant ash heaps that loom over the villages. Can we expect this lack of planning and participation for decommissioning to be characteristic of the transition?

Second, the mines that supply these power stations will close down – or are closing down – for reasons unrelated to the climate crisis: 1) The power stations have reached the end of their life; 2) The central coal basin is in decline and several mines are exhausted; 3) The coal business model is collapsing as the synergy of low quality Eskom coal and high value exports breaks down; 4) Dodgy dealings, involving corporates, politicians and the DMR, have led to several mines being shuttered. The Guptas' takeover of the Optimum and Koornfontein mines in 2015 – with the very active help of Mosebenzi Zwane, the minister appointed by Zuma for that purpose, and Eskom's CEO, Brian Molefe – is the most notable example. The DMR's collusive regulation allowed the Guptas to plunder the rehabilitation funds to buy the mines. Similarly, Eskom forced the closure of Exarro's Arnot mine in December 2015.[158]

In addition, Eskom says it will cost too much to comply with minimum emission standards and some plants will shut down early if the standards are enforced. According to present regulations, power stations that will be decommissioned before 2030 will not have to comply with new plant standards that come into force in 2020 but they must comply with existing plant standards in force since 2015. However, Eskom can also apply for an 'alternative emission limit' if ambient air quality standards are met in the local area. The Highveld air does not meet ambient standards, largely because Eskom's plants pollute it.

158 https://www. parliament. gov. za/storage/app/media/Links/2018/November%202018/28-11-2018/Final%20Report%20-%20Eskom%20Inquiry%2028%20NOV. pdf

With the exception of Kusile, none of Eskom's coal plants meet the 2020 standards. The Department of Public Enterprises (DPE) has put the capital costs of compliance at about R187 billion. Eskom has given a higher estimate of R300 billion – a figure that is widely thought to be inflated in order to deter enforcement.[159] Eskom is also applying for alternative limits for several plants despite ambient standards not being met. This is consistent with Eskom's long-term strategy to avoid spending money on environmental care. This orientation is also evident in another dimension of the still growing pollution legacy built into the Eskom coal-fired power system. The mountainous ash heaps are still growing and Eskom's myopic coal ash strategy is aimed only at easing up landfill space to save costs, as discussed below.

Coal slowdown on the ground

In the bleak coal landscapes of Hendrina and Arnot, the transition from coal – not stated, not planned and certainly not just – is already arriving. In midwinter, July 2019, the groundWork research team met with 11 coal workers in the yard of a house in kwaZamokuhle township outside Hendrina town. The workers had lost their jobs as a result of the machinations of the Zuma administration, Eskom and the Guptas. As the sun set over the township, the cold Highveld wind picked up intensity. The house behind us remained dark. Our host explained that he had no electricity to light the house, no water and nothing he could offer us, so it was better for us to sit outside.

Our host was one of around 200 workers at the Sandile and Sethemba shafts, part of the Optimum complex of mines, who were last paid in September 2018. They told us that they kept on working in the mine assuming that their wages were delayed, as had been the case with erratic payment for much of 2018, with wages sometimes arriving on the 10th, 15th or even 20th of the following month. When this happened, said the workers, the management company JIC would shift the blame to the Optimum mine, owned by the Guptas but under business rescue, saying the mine was not paying monies over to JIC in time.

159 Reuters, *Eskom needs over R180 billion to comply with new emissions laws*, EWN, 20 November 2019; *Ailing Eskom faces emissions violations, could shut plants*, Times Live, 4 September 2019.

The miners were kept working until the first week of December 2018. It is not clear whether the workers walked out when they realised their pay was not coming, if management shut the mine, or if it closed for the Christmas break and never reopened. The Business Rescue Practitioners, meanwhile, "have been swamped with litigation" – with 44 cases brought against them – by Gupta associates.[160] The intention appeared to be to obstruct the business rescue process and discredit the BRPs, and ultimately to force payment of debts claimed by one Gupta company against another.

JIC meanwhile was liquidated and the JIC miners were left in limbo. They were abandoned by their employers who used a clever company structure designed to dodge responsibilities to workers. The JIC liquidators said they had no obligation to the workers as JIC employed only management staff. So it seems that the workers were not employed by JIC as they thought, but by the labour brokers going under the names of Sandile Coal and Sethemba Coal. It is not clear what the status of these companies is. They are clearly not going concerns – and their auditors have all resigned – but they have not been liquidated and it is not clear that they are part of the Optimum business rescue. Oakbay is their immediate parent company and similarly does not have auditors or a bank, necessary for being in business. It nevertheless has survived an application to the courts by the Tegeta business rescue practitioners (BRPs) to have it liquidated because it owed Tegeta money which it could not pay. Oakbay dragged the matter out for about a year but then somehow settled the debt with the BRPs in July 2019. So it is a kind of corporate ghost, not exactly in business but not exactly out of business. Oakbay's directors, put in place as the Guptas fled the country, are also the directors of Sethemba and Sandile.[161]

The mineworkers also believe that the BRPs have failed them. They believe the BRPs have been slow to conclude their business because they are getting very well paid for every day they are there. They think that viable offers to buy the

160 Potteril J, judgement, Oakbay v Tegeta, Pretoria High Court, 30 August 2019.

161 Jan Cronje, *Blow to Gupta-owned Oakbay: Court dismisses its bid to have business rescue practitioners fired*, Fin24, 30 August 2019; Sethemba Coal, Company Information, Lexis SACompany at 8 December 2019. The Gupta empire included four mines: Brakfontein (where two scientists were dismissed for refusing to falsify coal quality results), Koornfontein and Optimum coal mines (including the Sethemba and Sandile shafts) and Shiva Uranium mine.

mines have been turned away and this is delaying the settlement of their claim for unpaid wages and their return to work.

Nor did they get any help from the local municipality. Once they no longer had incomes, the municipal electricity and water supplies to their houses had been turned off. They have had to take their children out of school in Middelburg as they could no longer afford the fees or the transport. It would be a wasted year of schooling. Debt collectors for furniture shops were phoning and chasing them. The mine gave them letters saying their wages were delayed and asking their creditors to be patient. The letters proved useless. It's a nightmare.

The miners have made many attempts to get their money. In January 2019 they joined a NUM march on the Union Buildings in Pretoria to petition the Minister of Mineral Resources, Gwede Mantashe. At the march by around 2 000 workers, NUM threatened a mining sector shutdown if the demands of the Koornfontein and Optimum miners were not met, as well as plans to "mobilise the community in Mpumalanga". NUM regional secretary Tshilidzi Mathavha said government should leave no stone unturned to keep the coal mine running and protect jobs, and should in fact take over the mine to continue running it through the state owned mining company African Exploration, Mining and Finance Corporation (AEMFC).[162]

The demands included that workers should be paid their salaries. But, say the workers, "the minister chased us away. He said 'don't travel from Mpumalanga to Pretoria and tell me nonsense'." However, the miners did not give up:

> Shop stewards went to parliament and we thought our matter would then be dealt with immediately. But nothing happened. So we then organised another delegation to Pretoria to take a memorandum to President Cyril Ramaphosa. Cyril did not respond but sent Aaron Motsoaledi to receive a memo on his behalf. Motsoaledi said he would email the memo to Ramaphosa, and he would respond. The Business Rescue Practitioners (BRPs) called an urgent meeting with

162 Khulekani Magubane and Sibongile Khumalo, *NUM march to Union Buildings for Optimum coal miners stuck in limbo*, Fin24, 16 January 2019; Khulekani Magubane, *NUM challenges government to save jobs at Optimum mine – even if that means buying it*, Fin24, 16 January 2019.

> the shop stewards the next day, but the shop stewards did not tell us what happened in the meeting. There has been no response. [The] chairperson of NUM branch did not report back. We are all still members of NUM. We are no longer paying membership dues, but NUM says they recognise us. We get some feedback sometimes and other times not.

In March 2019, NUM repeated the workers' suspicion that the Optimum BRPs were delaying a solution because they see it "as an opportunity to make money because the longer the rescue process the more money they make as they are earning close to R17 000.00 per day".[163] In April 2019 the miners went to Pretoria again, to the BRP office. Under pressure from them, BRP Chris Monyela made a sworn statement at the Brooklyn police station to the effect that all the issues will be resolved and all their monies would be paid to them. The miners have a copy of the statement.[164] But the affidavit in fact refers to the sale of Koornfontein, another Gupta mine, and is of no use to the Sethemba and Sandile miners.

The miners feel desperate. "We have protested, we have taken the memorandum, we got the affidavit, we don't know what to do next." The miners followed up, through the NUM regional secretary, with the JIC liquidator who initially failed to respond but finally disclaimed any responsibility for the workers.

The slippery corporate web of Gupta companies

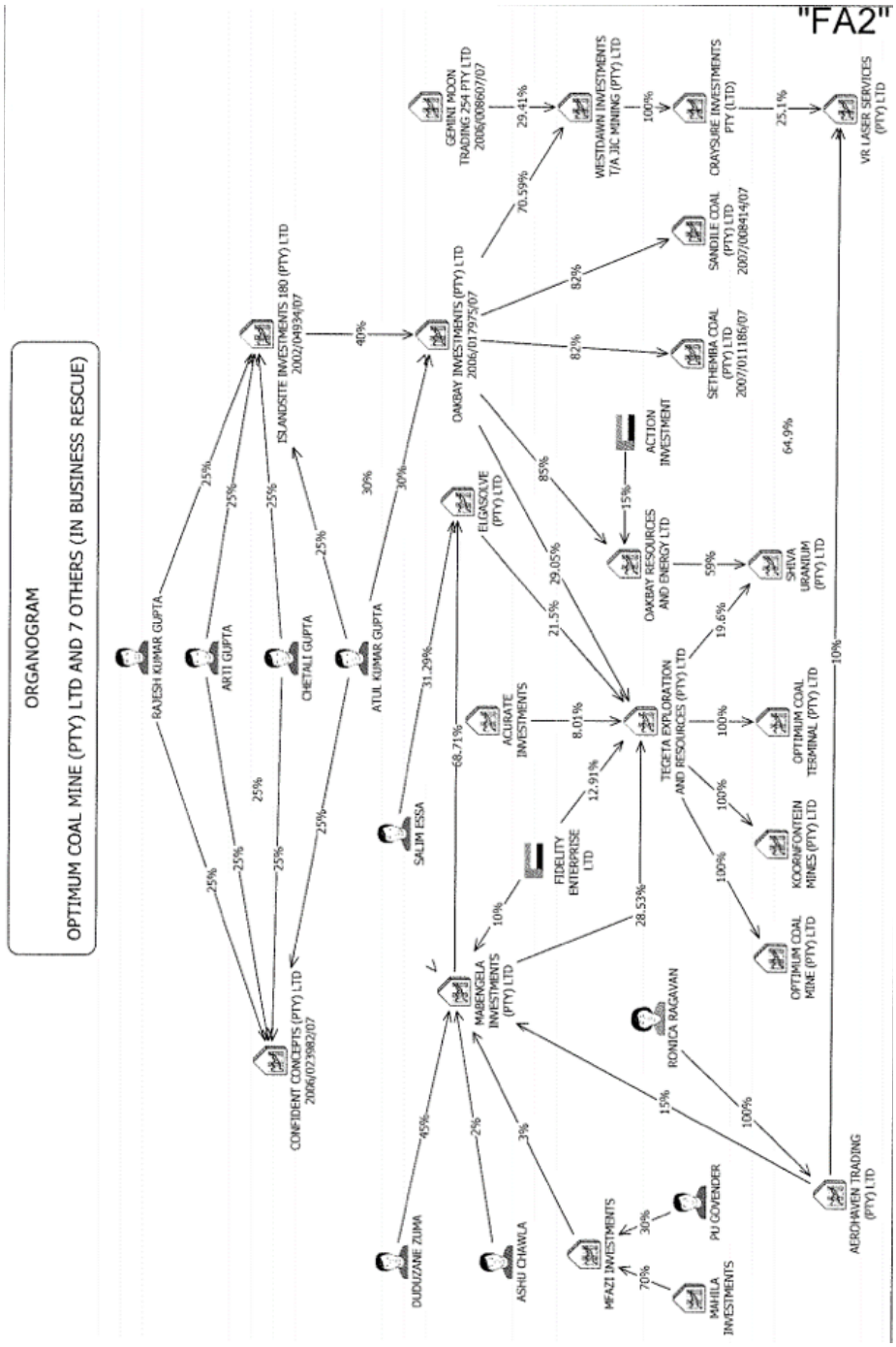
The workers we met with in kwaZamokuhle were part of a total of 200 workers who officially worked for Sethemba Coal and Sandile Coal, subsidiaries of Oakbay, as explained in a complicated organogram filed as part of Case 5921/2019; Tegeta Exploration and Resources (Pty) Ltd and Oakbay Investments (Pty) Ltd (see diagram on the next page).[165]

163 ttps://num. org. za/News-Reports-Speeches/ArticleID/924/NUM-is-concerned-that-its-members-at-Kroonfontein-mine-have-not-received-their-salaries-since-November-2018.

164 They have kept copies of all the documents they refer to in this interview.

165 This case was, on the surface, about one Gupta company – Tegeta – wanting another Gupta company – Oakbay – to be liquidated for failing to pay rent – to Tegeta – for office space (at Tegeta). The case failed.

Figure 1: Gupta companies diagram



Source: Court files – Case 5921/2019.

Sethemba Coal and Sandile Coal are described as labour brokers. They were subcontracted by JIC, another Oakbay subsidiary, who operated the mine shafts known as Sandile and Sethemba. JIC was contracted by Optimum owned by Tegeta. Tegeta in turn was owned by Oakbay and several other Gupta companies, notably Mabengele in which Duduzane Zuma had a major interest.

This arrangement has apparently allowed Oakbay to escape responsibility for the miners and allowed Gupta companies to be paid out of business rescue funds as there are amounts owing between them. The NUM press release of the 27th of March 2019 shows that the arrangements were also opaque to NUM:[166]

> Workers are angered and concerned that Koornfontein and Optimum were all operations of Tegeta when these two operations were placed under the BRPs. During trying times when there was production at Koornfontein its profits [were] used [to] pay salaries of both Koornfontein and Optimum employees with the understanding that the two operations are one entity. Recently BRPs sold a Dragline Machine to Glencore at an amount of R80 million and decide[d] to pay only Optimum employees and it was [at] this point where NUM was told that the aforementioned operations are detached from each other.

NUM itself also had problems getting responses from Eskom, the DMR and the ministers of Public Enterprise and Mineral Resources:

> The NUM has been in engagement with Eskom without fruitful results. The Minister of Public Enterprise has not been available to deal with this delicate matter even after COSATU … on behalf of NUM tried to reach out to his office. After the march on the 16th of February 2019 at Union Building in Pretoria, DMR started to convene sessions with all affected parties, at that time it appears that parties were to find a solution. It is, however, perturbing that the department has abandoned this program and NUM is left [in] the dark without any updates making it difficult to

166 ttps://num. org. za/News-Reports-Speeches/ArticleID/924/NUM-is-concerned-that-its-members-at-Kroonfontein-mine-have-not-received-their-salaries-since-November-2018

> interact with members. Workers are calling for the Minister of Mineral Resources Gwede Mantashe to intervene and resolve the challenges and problems that they are facing at Koornfontein Mine.

Now the miners are suspicious even of the NUM shop stewards as well as the branch chair. They observe what type of cars the shop stewards drive and come to their own conclusions. This may be worsened by the fact that the shop stewards are at the main Optimum mine, and the satellite mines (or shafts) feel distanced. It is part of a pervasive suspicion on the declining coalfield that no-one is to be trusted.

Report to parliament but no action

It was not only company law that allowed the Guptas to cheat the mine workers out of their hard earned money and other benefits. They were also failed by the DMR who did not take urgent action following an inspection in March 2018 when they observed dire conditions at all the Gupta mines – Optimum, Koornfontein, Brakfontein and Shiva Uranium – including multiple transgressions by its management.[167]

For the Optimum mine specifically, the DMR inspectors reported that, of the total workforce of 2 488 at the mine, 550 were permanent and 1 933 contract workers. Tegeta did not provide Adult Education and Training, implemented no learnerships and did no training after it took over from Glencore. Consequently, workers were operating machines without proper training. A training budget of R11 million was approved for 2017/18, but it was diverted at the instance of the CEO. Career progression, and mentorships and portable skills training programmes, were not implemented and the company could not report on the provision of bursaries. No explanation was provided for the reduction of the human resource development budget from R64 032 000 to R1 257 000.

The DMR reported a total disregard for Social and Labour Plans (SLPs). The community Health Care Centre in KwaZamokuhle was inspected on the 15th

167 Advocate Thabo Mokoena, DMR report to the Parliamentary Portfolio Committee on 30 May 2018 at https://pmg. org. za/files/180530dmr. pptx

of March 2018. The centre was 99.9% complete when Tegeta took over from Glencore, but Tegeta did not complete the project and the service provider was not paid. Hence, the facility could not be handed over to the community and the Department of Health. The centre was constructed on the community sport field and Tegeta has not honoured a commitment to identify alternative land for another sports field. Nor did they attend to a complaint from the community that those with communicable diseases (TB) infect others as they wait for health services at the temporary clinic.

The company's SLP expired in 2017 and the Department has not received a revised SLP for 2018-2022. Tegeta has not promoted home ownership at the mine, and there is no improvement of living conditions of mineworkers. The company does not have a functional future forum, and organised labour was not part of the inspection meeting in March 2018. Despite these clear warnings, nine months later the workers were dumped without the DMR making any intervention.

Dangerous breakdown

As the MEC coal regime breaks down, the Highveld coal mining area has become dangerous terrain. Between the Optimum mine main gate and the old, abandoned Woestalleen prison, where an informal settlement is home for workers and work seekers, five coal trucks were set alight and burnt in April 2019. In September 2019, coal conveyer belts between the Optimum mine and the power stations were burnt. Elsewhere, several kilometres of conveyor belt was rolled up and stolen. In November 2019, six trucks were burnt in Hendrina, Arnot and Kriel.[168] Coal truck drivers sleep in their trucks for security but, in one case, a truck was jacked up and the expensive tyres stolen while the driver slept.[169] The violence also reached into management ranks: just before midnight on the 1st of December 2018, Jagannath Arora, the CEO of JIC, the company that operated the Sethemba and Sandile mines,

168 Riaan Grobler, 6 trucks torched in Mpumalanga, suspects still at large, News24, 6 November 2019.
169 Kevin Davie, Power stations truck up Eskom's image, Mail & Guardian, 25 October 2019.

was ambushed in Midrand and killed in a spray of bullets. He was said to be planning to return to India.[170]

The havoc on the ground reflects the shenanigans at corporate level. We told the story of how the Guptas acquired Optimum and Koornfontein mines in groundWork Report 2016. In short, Zwane, the newly appointed minister, and Brian Molefe, Eskom CEO, strong armed Glencore into selling the mine to the Guptas for R2 billion. The DMR then enabled the Guptas to use the Optimum rehabilitation funds of R1.7 billion to help buy the mine. These funds were later subject to a preservation order.[171] As the Gupta's role in state capture became clearer, public pressure led South African banks, in February 2018, to stop doing business with the Gupta companies. The Optimum and Koornfontein mines went into business rescue while JIC was liquidated. The business rescue process, and the search for buyers for the mines, has been drawn out, partly because of the 44 cases brought against the BRPs by Gupta surrogates.[172] In November 2019, a second attempt to sell Koornfontein mine was stalled, this time because the losing bidders took the matter to court. Workers protested outside the court at this further delay in reopening the mine.[173]

Box 8: Worker, trade union and community dialogue

The laid off mineworkers joined environmental justice activists, local trade union officials from NUM, Numsa and the Transport and Allied Workers Union (Satawu), and Cosatu research group Naledi, to exchange views on a just transition in July 2019. This meeting followed the 'coal exchange', the meeting of activists from communities affected by coal mining described in Chapter 3. It was hosted by groundWork to open an on-the-ground dialogue on a just transition between workers, their organisations and community

170 David McKay, https://www. miningmx. com/uncategorized/35318-ceo-of-gupta-company-jic-mining-assassinated-in-drive-by-shooting/

171 Ernest Mabuza, https://www. timeslive. co. za/sunday-times/business/2018-04-19-gupta-owned-mine-rehabilitation-funds-case-postponed-to-may-31/

172 For example http://www. saflii. org/za/cases/ZAGPPHC/2019/411. html

173 Lesetja Malope, *Communities dread third bleak festive season as mine sale halted again*, City Press, 5 December 2019.

groups. This follows from various commitments by labour and communities to the creation of local level united fronts in the struggle for justice.

The meeting opened with short inputs on: the community experience of living with coal [see Chapter 3]; the climate crisis [Chapters 1 and 2]; international and national coal transition research [Burton et al 2018]; and Naledi's reflection on Cosatu's policy on climate and just transition. And it confirmed several broad areas of agreement between worker and community constituencies: people in the communities are made sick because of the pollution from Eskom and the coal mines; workers also live in the community and suffer the same impacts as well as pollution at work; the coal economy faces major challenges; and workers and community activists should work together to develop an agenda for a just transition to a socially owned clean energy system.

There were also sharp differences, notably on the future of coal and the meaning of clean energy. NUM regional secretary Tshilidza Mathavha, who led the union response to the layoffs at Optimum and Koornfontein, took offence at warnings that coal will soon come to an end, saying, "You green activists take a delight in ending coal, but coal means jobs and life for us". He argued that the international experience of coal transitions and the jobs potential of renewables was not relevant to South Africa. "Our members are not skilled like those in developed countries. We have no confidence that these calculations will work for us." He also questioned why "we should move to other things when we have an abundance of coal? Can't we rather deal with emission controls and keep on exploiting coal? In Waterberg, it is full of coal for 100 metres down."

These views reflect the position taken by NUM in various national forums. They do not deny climate change but, in common with Mantashe, the minister, appeal to clean coal to avoid energy system change [see Chapter 4 on clean coal]. They also assume that the Waterberg coal resource can be easily and economically mined. The groundWork Report 2018 shows that it cannot. Further, shifting the coal economy from the Highveld to the

Waterberg might be as disruptive for workers as a transition to renewable energy.

And if that means jobs for coal workers, new mines threaten the dispossession of local communities. In Somkhele, KwaZulu-Natal, where a large open cast mine has been developed in the last decade, local people experience it as an invasion. Their land is removed and "people are drinking contaminated water and breathing in coal dust," said Phillip Zwane of the Mfolozi Community Environmental Justice Organisation.

But Mathavha's core issue is jobs and this is shared by all the unions. Numsa's Nkosinathi Makhanya said closing a coal mine is not victory. "We will be plunged into poverty. … We need to move to RE but in such a way that there are no negative impacts … [but] as much as we support RE, it will never make sense that you close 100 000 jobs in Mpumalanga and create 20 000 in Northern Cape." He argued that the closure of coal mines hurts everybody, including the street traders. "Eskom is closing three power stations and, if they close, the mines will close and the towns will close. We don't need to celebrate that." He emphasised that workers are part of the community. "We don't get any special treatment or medication at work to make us immune. We eat and sleep in the community … Most of the community are provided for by the coal workers … We should not be divided. We are all the working class."

Community activists made it clear that they are protective of workers, since workers are part of their communities. But they noted a difference in institutional power. "Most of your national leaders are sitting in Nedlac, but they don't come back to us to report back." And they don't seek a community mandate before speaking for the working class.

They also noted that, whereas coal and power workers get medical aid, other people in the community do not. Their health suffers in the same way but they cannot afford treatment.

They were also concerned for working class unity. As Khanyiso Mthombeni of the Newcastle Environmental Justice Alliance put it, "What I know about coal mine owners is this: what they need from workers is your power and

your blood, but when you go back home they don't care what happens to you. I hope that this is a platform that can unite us. There is one enemy – the owner of the mine." Community participants also observed that government supports industry and is complicit in dividing the working class. According to Lucky Shabalala of Sisonke, "when we try to address our concerns about pollution, workers see us as enemies because they say we want to kill their jobs. We need to be careful not to be divided by owners who take the coal to India and leave us with the mess."

These themes were taken up by Livingstone Gwantshu from kwaZamokuhle. "We are in a catch 22 situation. When the mine is operating, people die, and when it is not working, people die as well. We have been put on special leave for the past ten months and are not getting paid. This is because our government decided to bring in the Guptas ... As I am speaking, most of us are already dead. We are in debt, we have lost our properties, our cars have been repossessed, we cannot put food on the table and the medical insurance has lapsed. Is that not death?" In that time, their union had not given them material support. "Why did they not at least come with food parcels?" asked John Gule.

While differences were articulated, there is a shared conviction that a just transition is necessary and that workers, trade unions, communities and environmental justice activists need to come together to develop a shared and influential agenda. Sam Lukhuleni of Numsa emphasised that the union has a long standing resolution for a just transition. "But our major duty as trade unions is to protect our members. People say power stations and mines will close without giving us an assurance that one renewable power station or factory will be built in Mpumalanga. And we have seen no training for a transition conducted by our government or anybody else."

Coal miners are well paid compared to other workers with similar skills, earning around R11 000 per month. Trade unions would not be willing to move before there is a convincing just transition plan to accommodate their members in "new jobs, decent jobs" not only in energy but in jobs created through a regional economic plan. Further, Lukhuleni agreed that the mines

have exposed workers and communities to diseases. "They must take responsibility for what they did before they close."

"We all know the transition is coming," said Promise Mabilo of Vukani Environmental Movement. "We are not boasting when we say the mines and power stations will close. It is no victory. But we need to plan on what happens when those power stations close. Mpumalanga should be a focus area for a just transition, and we and labour need to be in dialogue to understand each other and create a common agenda." And because the health of "workers is also affected when they go back home, it is critical that we collaborate with the unions to ensure that industries comply to the pollution regulations now."

The meeting agreed that there needs to be further dialogue and participants called for broader representation of community organisations, of trade unions and of 'rank and file' workers. The next opportunity would be a workshop to be organised by Naledi. Sizwe Tyiso of Naledi observed that there is agreement that renewable energy can create jobs and improve the environment. He said, "I have been listening to everyone and what I hear is that we have a common voice on rehabilitation. We must organise a campaign to start the rehabilitation of Mpumalanga. We can come together as unions and community organisations as a first step, and then we walk the road together. This is something that can create jobs and address the environmental degradation that we see. There are rehabilitation funds somewhere and we must find them and campaign to start the rehabilitation process."

Blowing in the wind: ash heaps and dying towns

It is not only the mine workers who are facing the end of coal. People in the small company towns are also wondering if there is life after coal. These towns include Rietkuil next to Arnot and Pullens Hope next to the Hendrina power station. What happens there foreshadows what will happen in the Highveld region as a whole if the unplanned transition is left to gather momentum.

Rietkuil

Rietkuil village was established next to the Arnot Eskom power station which was built in the middle 1960s and was fully operational by 1975.[174] The power station was mothballed in 1992, and recommissioned in 1997. It already complies with the new 2020 minimum emission standard for particulate matter (PM), according to Eskom, but not with the new standards for sulphur dioxide (SO_2) and nitrogen oxides (NO_x). Eskom says Arnot will be decommissioned before 2030 and it is therefore applying for a suspension of these standards, meaning that Arnot will never be required to comply with them.

Coal was supplied from Exxaro's Arnot mine until December 2015, when Eskom refused to provide capital for the extension of the mine.[175] Recently, Wescoal and former Arnot mine workers have entered into a partnership to buy the mine and expect to open it again at the end of 2019.[176] This deal was initiated by a group of eight ex-miners who are set to own 25% of the shares in the mine, the other 1 200 ex-miners will get another 25%, and Wescoal will get the remaining 50%.

A lifetime on a mine

Obed Mabuza has spent a lifetime working for the Arnot mine next to the Arnot power station:

> First it was an Anglo mine, then Eyesizwe, then Exxaro. I started in 1976, first as a fitter assistant, then a boiler maker assistant, then a bus driver, then a mobile crane operator. I had qualified and was working as an artisan boiler maker when, in July 2016, before my time of retirement, I was retrenched ... I worked on the washing plant, so I was part of decision making, such as letting Eskom know if there is a problem at

174 http://www. eskom. co. za/Whatweredoing/ElectricityGeneration/PowerStations/Pages/Arnot_Power_Station. aspx

175 Lameez Omarjee, https://www. fin24. com/Companies/Mining/eskom-overlooked-exxaro-to-benefit-tegeta-inquiry-hears-20180215

176 Lesetja Malope, https://city-press. news24. com/Business/mine-workers-go-from-being-jobless-to-owning-a-colliery-20190503

> the washing plant, if perhaps the machine had broken down, telling them, "it will be raw coal", they will switch on their magnet to pull out pieces of steel. But we artisans were good at our jobs, we could fix the washing plant quickly and get it going again.

From 1976, he stayed in the mine hostel, which was the only place you could stay as a black man. In 2003 he came to live in the Rietkuil village. The hostel is still there, but it has no people except some security guards who live there. At the time of the retrenchment many mine workers went back to KwaZulu-Natal or Swaziland or elsewhere.

> There is still coal in the mine, and it can still last for 20 years.[177] The mine was selling to the Arnot power station via a conveyer belt. At some time long ago, we also put coal on the train, to Richards Bay. … That was when Anglo had it. When Eyesizwe came, they stopped the exporting. For Exxaro, Arnot power station was the only market.
>
> After the retrenchment, life was bad and everything is getting worse. All payments are higher, for clothes, even for food. For me the retrenchment was not fair, I would have liked to work until my pension came. My pension would have been more.

Mabuza feels short changed by his provident fund and SARS for reducing the payouts he had expected. Now he is struggling. "I try to do things, buy some steel and fabricate something and sell it." He gets a government pension and hopes his wife will get it next year. They have grandchildren living with them, as the parents have died, but don't get child support grants. And Rietkuil no longer benefits from Eskom's free electricity. "Even yesterday I went to the municipality. I can't afford electricity, it is high here. They are always increasing the price of electricity. It is not less than R800 a month. I don't get any free basic electricity." The power station does still supply clean water to the village although that will be taken over by the municipality.

177 According to Exxaro in 2016 there was 70 Mt left, enough for 10 years.

He likes staying in Rietkuil – it does not have *tsotsis* like Johannesburg – but he worries about what will happen if the power station and the mine close down for good. "The bank ATM was closed down but re-opened again, but the petrol station is closed down for good. There are some shops and businesses. But we don't have a clinic, only a mobile clinic once a week from Middelburg. There is a private doctor. Schools are still running up to Grade 7, then you must take your child to Middelburg. Eskom security used to patrol the area. There was a fence and a boom gate and you had to report to enter. Now there is no fence and no security. If the police are needed, you must call them from Hendrina." There are many empty houses and they are going cheap – for between R600 000 and R900 000. A house listed at R1 million "has come down to R850 000, but it has not been sold."

Stuck in Rietkuil as the power station powers down

Gerda Geldenhuys[178] has lived in Rietkuil since 1999, when her husband started working at the Arnot mine. There was generous provision for people living in the town until a little more than a year ago. "Then they decided to shut down the swimming pool that Eskom used to look after. The club has closed, the petrol station run by Eskom was closed. Residents did discuss the changes, but it was no use … The Eskom bigshots no longer live in Rietkuil, they now live in Middelburg. The quality of life is better in Middelburg. To this day, there are Eskom buses that take kids to schools in Middelburg."

Her husband was retrenched from the mine before he reached retirement age, with the result that his pension is less that it would have been. If she could, she would move out to be closer to her children but they can't afford to. Still, she has no complaints: "the Lord is good to us". She spends her time looking after old people, phoning them every day to check that they are okay, and visiting them if needed. Most of them are retired – in fact some of them moved to Rietkuil to retire because houses in the town are becoming cheaper. Geldenhuys adds that more black people are now buying houses here, "including a pastor who bought two houses here which I think he plans to rent out."

178 Not her real name.

Ash in the air

But what will make Rietkuil an unsuitable place for anybody to retire, says Geldenhuys, is the fine dust from the ash heap. “It is very dusty, especially when the wind blows. It’s terrible, it looks like mist over the town. Coal dust also comes from the weighbridge and there is what comes out of the power station chimneys. This results in health problems.” Driving past the ash heap it is clear that it is not covered and only scantily vegetated on the lower part of the side slopes, and that ash would blow off.

Mabuza has a similar view to Geldenhuys, having lived in Rietkuil for more than 16 years. He says: “Previously, they used to spray water on it. Now when the wind blows, especially in August, you can’t even see the street.” He said the proper management of the ash heap stopped in around 2010. Bringing coal to the power station on trucks rather than the conveyer belt also results in a lot more coal dust blowing about. Nobody has a food garden because the vegetables would be smothered in dust. It is urgent, says Mabuza, for the ash heap to be properly covered with topsoil and grass. “Eskom must decommission. They must clean up before they leave.”

Eskom’s ash plan

Every one of Eskom’s 15 coal-fired power stations has produced an enormous ash heap, sometimes more than one. Only two power stations have liners separating their coal ash heaps from groundwater underneath, namely Medupi and Kusile which were built after the new Waste Act of 2008 was passed. This means that 13 coal-fired power stations have ash heaps that are leaking toxins into the groundwater. This situation has not been addressed, in fact – as we show below – Eskom’s ‘ash strategy’ is limited to a plan to sell some ash from existing heaps for brick and cement making and so free up space in order to avoid building new – and lined – ash heaps. In other words, its ash strategy is aimed at continuing to dump ash on unlined ash heaps and therefore to continue to pollute ground water.

The Mail and Guardian has called Eskom's fly ash "the largest solid waste stream in South Africa",[179] but aggregate figures that would tell us what the total amount of ash is in all the Eskom ash heaps are hard to come by. Eskom produces around 33 million tonnes of coal ash per year from all its power stations.[180] A rough calculation for the Arnot power station's accumulated ash – the result of burning coal for over 43 years, interrupted by five years in mothballs – comes to around 65 million tonnes. Hendrina's dump has accumulated about 77 million tonnes.[181]

Eskom has not revealed its decommissioning strategy – if it has one. It does have a coal ash strategy, which it presents as a development opportunity. A paper by Reynolds-Clausen and Singh, two Eskom employees, says the strategy "could allow for improved business development, increased infrastructure development, job creation, create social upliftment and allow for skills development" [2019: 10]. But it soon becomes clear that the strategy is aimed at "cost avoidance rather than a revenue recovery model" [2019:11]. It aims at savings in capital and operational expenditure and is limited to dealing with less than 20% of the ash produced because around 80% is needed to absorb highly polluted power station water at the end of several cycles of re-use.

What costs do they want to avoid? The starting point for the strategy is that ash handling costs are currently high because coal ash "is classified as a hazardous waste, which in turn creates negative perception and evokes legislative constraints because anyone who wants to utilise ash would have to apply for a waste management licence", at a cost of R200 000 and a two-year wait. "Additionally, the hazardous nature of the ash requires the installation of Class C liners, an extremely costly requirement" [2019:11].

A Class C liner involves several layers with the waste body on top of:

- A 300 mm thick finger drain of geotextile covered aggregate;
- 100 mm protection layer of silty sand or geotextile equivalent;

179 Tamsin Oxford. https://mg. co. za/article/2018-06-29-00-washing-water-clean-with-waste-ash-from-coal

180 Eskom Annual Report 2019.

181 Calculation based on http://www. eskom. co. za/news/Pages/Feb20. aspx; http://www. rotekindustries. co. za/productsandservices/EskomASH/Pages/default. aspx as well as General Information for Arnot and Hendrina power stations.

- 1.5 mm HOPE geomembrane;
- 300 mm clay liner;
- Under drainage and monitoring system in the base preparation layer.

Through its coal ash strategy, Eskom hopes to divert some of the new coal ash to the market, or sell ash from its dumps, thus creating more space on the dumps. This will enable it to avoid building new lined ash dumps, or lined extensions to existing dumps. While Eskom may make some savings, the environmental costs of its ash handling will escalate, as ash will continue to be dumped on unlined facilities, some dating from the 1970s, rather than on new lined facilities. The strategy may also serve to extend the lifetime of some of the older coal-fired power stations, in both cases externalising the costs of coal-fired electricity onto people and the environments they live and work in.

In order for this plan to work, coal ash will have to be declassified as a toxic waste, despite the dangerous concentrations of heavy metals and other coal-derived toxins in it.

The ash strategy paper shares the general Eskom perspective that environmental legislation in South Africa is too strict, as witnessed in Eskom's ongoing refusal to install pollution abatement equipment for SO_2, and its ongoing legal battles to be exempted from complying with minimum emission standards.

Implausibly, the paper argues that "the hazardous classification of ash in South Africa is unique worldwide, and … the strictest in the world". It argues that the main elements present in the ash that trigger the classification of coal ash as hazardous (namely arsenic, barium, copper and lead) "are just over the thresholds" in the applicable tests, and that it is because of the testing method that the presence of arsenic, boron, chromium, manganese, molybdenum, selenium and vanadium trigger the hazardous classification. It says that Eskom has undertaken new tests of their ash's toxicity, which will be used "to advise DEA on the possible leaching risks of ash in non-acidic environments and will be compared with international results and associated risks, leading to a possible exclusion of coal combustion products from the waste classification"

[Reynolds-Clausen and Singh 2019: 16]. Due to its high transport costs and low value, however, the ash would be used close to the power stations and coal mines mostly in the Highveld. Since this area is characterised by uncontrolled acid mine drainage, it is questionable whether the ash will in fact be used in non-acid environments.[182]

Nevertheless, an important part of Eskom's coal ash strategy is to persuade the DEA to declassify ash from hazardous substance to useful resource. Currently, the focus for use of coal ash is in brick and cement making, but Eskom's application wants to expand this to road construction, soil amelioration and mine backfilling. The paper notes that from international experience other uses are possible: "rare earth metal extraction from ash, mine backfilling, [acid] mine drainage treatment, soil amelioration, land reclamation, road construction, paint, rubber, zeolite production and geopolymers" [13].

There are issues with all of these uses, but maybe the biggest concern is one identified by the Centre for Environmental Rights (CER) in their objection to Eskom's application to declassify coal ash.[183] The entire ash waste stream will be released from DEA supervision and placed in the hands of Eskom, who will then have the responsibility to see that those who 'buy' the ash – it will practically be given away if this plan works – use it in a responsible way. Buyers will include small and big enterprises, none of whom can be expected to put a high price on the environment. And given Eskom's environmental record and its cavalier attitude to environmental regulation, this amounts to liberating the whole coal ash stream for dispersion into the surrounding environment – an extra toxic burden that the Mpumalanga Highveld cannot afford.

Arnot's ash heap is not currently capped with topsoil and vegetation. When the wind blows, it blows clouds of ash across Rietkuil. The Eskom paper does not ask what conditions will be like when bakkie operators start loading ash.

182 The more acid the environment, the bigger the propensity for heavy metals present in the ash to be mobilised – i. e. to separate out from the ash and enter the environment as dangerous pollution.

183 CER correspondence with DEA; https://cer. org. za/wp-content/uploads/2018/02/CER-comments-on-Draft-Waste-Stream-Regulations-12-2-18. pdf

Ash and health

But does Eskom have a case? Is coal ash really that hazardous? It is noticeable, but not surprising, that none of Eskom's arguments address any of the health issues. However, in a meta-review of 30 years of health studies on the impact power stations and ash dumps on the health of neighbouring communities in the USA, researchers found that

> … over the past 30 years, scientists reported that the people living in close proximity to coal-fired plants had higher rates of all-cause and premature mortality, increased risk of respiratory disease and lung cancer, cardiovascular disease, poor child health, and higher infant mortality. The elevated health risk was associated with exposure to air pollutants from the power plant emissions and to a spectrum of heavy metals and radioactive isotopes in coal ash. [Kravchenko and Lyerly 2018: 289]

Further:

> Fly ash[184]… represents a significant health hazard: it includes small, spherical particulate matter (PM10 and PM2.5) [that] could escape emission control devices, remain suspended in air, and upon inhalation penetrate deep into the respiratory trace and deposit in the lungs… Fine particulates of fly ash deposited in the respiratory system could be enriched up to 10 times in metals compared to bulk ash… The mechanisms of injury to the respiratory tract from PM include inflammation, direct cytotoxicity, and cell death. [2018: 291]

The meta-study shows that water and soil contamination from ash is "another potent hazard". A number of studies showed that "deposition of fly ash in structurally inadequate impoundments can contaminate ground and nearby surface water with leaking toxins" whose metal concentrations can be "4 to 10 times higher than that of the parent coal". The toxins noted in these studies include arsenic, mercury, lead, cadmium, vanadium, chromium, nickel and zinc,

184 Fly ash makes up the major portion of coal ash.

as well as polycyclic aromatic hydrocarbons (PAHs) "that have been shown to be associated with neurotoxic, carcinogenic, teratogenic, and mutagenic effects" [2019: 292]. The study provides much finer detail on these health impacts, but it is clear that the health effects of coal ash, through air as well as water pollution, need to be taken seriously before embarking on a scheme that will mean the more or less uncontrolled dispersion of ash into environments where people, water and soil are already seriously polluted by emissions from coal-fired power stations and careless coal mining.

A very recent report from Environmental Justice Australia warns that:

> … toxic heavy metals and other pollutants in coal ash can enter groundwater, surface water bodies, soil and air, risking human health, aquatic life, birds, wildlife and water quality… In Australia, many of the aquifers underneath ash dumps are contaminated, including beneath the ash dumps of the Loy Yang (Victoria), Yallourn (Victoria) and Muja (Western Australia) power stations. [2019: 15]

Once in the groundwater, the pollution can flow for several kilometres through aquifers and end up on rivers and streams. The report points out that, "In the United States, tens of thousands of kilometres of rivers are polluted by coal ash and heavy metals from ash dumps. The US EPA identified more than 250 individual instances where ash dumps have contaminated groundwater or surface waters." [2019: 15]

Box 9: What to do about Coal Ash

The report from Environmental Justice Australia [2019] makes the following recommendations, which should resonate in the South African situation:

1. Legislators need to initiate inquiries into coal ash dumps to understand the full extent of the toxic threat and make strong recommendations to protect human and environmental health.
2. Government should impose an immediate obligation on ash dump owners and operators to prepare best practice rehabilitation, closure

plans and post-closure plans in consultation with the communities who live near these toxic sites.

3. Regulators who oversee ash dumps should immediately develop and implement actions to clean up and manage ash dumps causing groundwater contamination, including re-siting operational ash dumps to thoroughly rehabilitate existing sources of contamination to best practice standards.[185]
4. Government should impose immediate obligations on ash dump owners and operators to convert wet dumps to dry ash emplacements.
5. Government should immediately impose a bond or financial assurance on ash dumps to protect communities from bearing the cost burden of poorly managed or poorly rehabilitated ash dumps.
6. Government should develop and ensure the implementation of enforceable national best practice guidelines for ash dump management, rehabilitation, and closure and post-closure management… to mitigate as far as practicable the future threat of contamination of land, groundwater, and surface water and prevent harm to human health.
7. Government should make access to information about ash dumps transparent and available to the community, including all existing management plans, details of financial assurance, rehabilitation plans, pollution incidents, fines and other enforcement actions taken by regulators, monitoring data, hydrogeological assessment, predictions for future contamination and predictions for future land-use planning.

Families from behind the ash heap

In September 2017, eight families who lived behind the Hendrina power station ash dump were offered houses away from the dump in the Eskom village of Pullens Hope. They were also afforded a business opportunity "to

185 The re-siting of mining dumps has been very controversial in South Africa.

help us pay for the new houses", as one of the family representatives put it during an interview in September 2019.

Earlier, in 2017, we talked to the Phoku family who had lived next to the Hendrina ash heap for more than 40 years and kept cattle there [groundWork Report 2017]. When they arrived, the ash heap was small and not fenced. It has since grown into a flat top mountain, the result of nearly 50 years of burning high ash content coal. When we visited in 2017, the Phoku parents were in their nineties and their daughter Rika, who stayed in Pullens Hope, was worried about them as there was no transport if they needed to get to a hospital. Her father had worked for Eskom and Spoornet before he settled behind the ash heap.

Living close to the ash heap is a nightmare. It is not so bad in summer as the rain keeps it wet, but in winter, said the Phokus, the ash blows off the dump in thick white clouds. "You can't go out when it blows. And it comes into the house and blocks your eyes, nose and mouth. The dust makes you cough – sometimes a dry cough, sometimes a wet cough." The public clinic only tests for TB. If something else is wrong with people's lungs, they can't tell. Rika's brother, Johannes, developed asthma and died at 45. He worked at Eskom's Hendrina power station. Then his eyes got sore and they transferred him to work on the ash dump. But the dust affected him badly. The workers have masks but that did not help. When Johannes could no longer work, he lost his job. At that time, management did not worry about dust. They just told him to go to the clinic. In 2017, people were still dying. Just a month before our interview, the Phoku family went to the funeral of someone with the same symptoms as Johannes. Another ash dump worker had mouth ulcers and sore eyes. But people were scared to talk about it because they thought they would be chased off the land.

Originally, they had water from their own well which her father dug. But Eskom's ash dump manager told them the groundwater was not right and the household was then supplied with piped water from Eskom. Subsequently, however, Eskom turned off the water for several weeks. The families living there believed this was in retaliation because they had called on CER to help

them in a complaint about the dust. That provoked a further complaint and the water was turned on again.

There were three mines across the valley from the family house: Tumelo underground mine – which was already closed; Klipbank, also underground; and the open cast Optimum mine. The main impacts were from Optimum. When the mine blasted, a thick dust would blow across the farm and sometimes they were showered with rock rubble – enough to puncture the roof. And the cracks were bad – they had rebuilt parts of the house three times.

New business in injury time in Pullens Hope

With the arrival of new Hendrina Eskom power station environmental manager, Justice Ramagoma, things changed for the eight families living behind the ash heap. According to Ramagoma:

> Since around 2012 there had been no environmental manager here. When I arrived here in 2015, I found correspondence from NGOs (groundWork and CER) as well as the Department of Environmental Affairs, to the effect that there were people exposed to pollution from the ash heap. I also realised that in removing them there would be a livelihood issue, and we – Eskom – would need to support them.
>
> We helped them to open a service provider co-operative. Household leaders became directors. We had to build their skills, so we put them in a position to work under an existing company, and learn how to invoice, how to tender, how to manage a project.
>
> There is a mandate, approved by head office, for this relocation. Relocating them is very expensive, the cheapest house is R450 000. We hired independent evaluators. The most expensive property where they were living … was worth around R1 000. Eskom – we are doing maintenance for them, they only pay water and electricity. They will receive title deeds. And each family has compiled a list of defects, which Eskom will fix. If there is no stove, we install one.

According to the families, "Eskom called us, to say we should move. We had to be relocated because the ash is affecting our health." In a group interview in 2019, family members criticised the way Eskom had managed the ash heap:

> In the past, Eskom used to put soil and plant grass to cover the dust. But recently, they just put ash without any form of trying to suppress the dust. Eskom said the soil is expensive. The grass planting … has not happened for a long time, it was since they appointed Roshcon to take care of the facility… By 2013, it had been a while that Eskom was no longer growing grass on the ash heap. Children got sick from the ash dump dust.

They are also ambivalent about life in Pullens Hope:

> Eskom said they will assist us in getting employment to be in a position to pay the (extra) costs of living in Pullens Hope. The jobs would be to do 'horticulture', to cut grass, clean up the leaves, cut trees, pick up papers all over the place. It is work every day. This is a contract for two years from December 2018.

The jobs went to one person per family. There were many meetings. The original plan was to look for farms in the Komati area, or to use a part of the Optimum mine land, but Eskom said that this was not possible. This created a problem as the people were moved from one life to another:

> There are still cows there, but we have a problem selling them, because we are living far from our cows, especially when there is need for money. We have to pay people to look after them. Some of the things here are not the same as the farm. Everything here is expensive and we have to buy everything. The way of living around Pullens Hope is not the same. We have to pay for water, electricity, for most of the food. We were more or less self sufficient with food but now have to buy food.

They are also not entirely happy with the houses in Pullens Hope. There are problems with the roofs, with things like door handles and taps, but Ramagoma complains in return that they are asking Eskom to do routine maintenance.

Asked what will happen when the power station closes down, representatives of the eight families responded: "Eskom says they don't know when exactly they will close the plant and they cannot talk about that." But Ramagoma is confident. "We can't close everything, not the water system, and the two Eskom sewerage plants, the village dump site, the horticulture of this place. Even if we scaled down to zero units in operation, we want to continue to work here. We also want them to start to grow their business so they can tender with the municipality, other stations, the mine … They are preferred providers for services that will still be required at the station."

This leaves us with two conclusions: first, the alternative that Eskom offered the families from behind the ash heaps forced them into an Eskom contractor model, for which they would have to learn many new skills; and second, Eskom says it will hand over the running of Pullens Hope to the municipality – circumstances that will likely make it difficult for them to "grow their business".

First consequences of a chaotic transition

How exactly this will play out in the turbulent context of a still unplanned transition remains to be seen. The consequences of the absence of a planned end to coal are already visible on the ground. They are mixed in with other factors – particularly the Gupta rip-off of the coal industry – but the Gupta strategy would not have worked without the profound and ongoing weaknesses of regulatory practices and the active participation of bad politicians and their predatory networks. And while the unions are trying to respond to the decline of coal on the Highveld, it is not clear that they name it as such as they are confronted by the symptoms, the dodgy corporate deals (not only the Guptas), the confusing politics of business rescue, new forms of collusive regulation and old forms of regulatory neglect. The unions have been calling for a just transition for a decade or more and might question where to invest their energies: in fighting for a just transition or in defending coal. The latter choice would deny them, and the workers they represent, the opportunity to

influence the debates and decisions about coal mining regions as coal quickly nears its end.

The Eskom coal ash strategy stands as a symbol of the corporation's wilful misrepresentation of the ecological realities it has created. The strategy fails to deal with the urgent and important question of the legacy of these ash dumps. These dumps are unlined and are therefore leaching their heavy metals and other toxic constituents into the groundwater. They are also inadequately 'rehabilitated' – they should be capped with clay to prevent water ingress, covered with soil and planted with grass and trees – so that the fine ash, including $PM_{2.5}$ that can be absorbed through the lungs into the blood stream, blows in the wind and adds to the health burden on the Highveld.

Eskom, together with politicians and government officials, point to the high costs, in money and in scarce natural resources like water, of environmental compliance, particularly with the minimum emission standards governing air pollution. While unwittingly presenting an argument against production of electricity from coal, and against 'clean coal' in particular, they in practice externalise and postpone the costs of dealing with Eskom's growing environmental legacy. It is only one part of the mess that the coal economy will leave to the people of the Highveld, imposing serious constraints on how they can use the land after coal.

We see an unusual Eskom environmental manager who, with support of his head office, has gone to considerable effort to deal with the local legacy of people engulfed by an ash heap that has grown above them over the past forty years and who found themselves living in its unhealthy shadow. But all he could really offer them was housing in a dying company town, a two-year business deal, and skills training – in a coal economy that is already disappearing. Unfortunately, their wealth in cattle is still stuck behind the ash heap on land to which they have very tenuous claims.

Our conclusion is that a vigorous and generous debate about life after coal is in the interests of workers and community and should engage them in finding common ground on a just transition strategy that carries their interests forward. Failing in this will result in deepening poverty for workers and communities in a poisoned landscape.

7 To do

To conclude, we propose an urgent if incomplete agenda for 2020 – a to do list. This consists of issues we need to tackle immediately, as well as those that will take longer to work out. We present this as a starter checklist.

This agenda is urgent because the climate crisis is upon us. Millions of people are already dying every year and that number will increase. And the people who are made poor in this economy are the most vulnerable. In South Africa, that is around 60% of the population with another 20% on the edge. The failure to transition from a fossil fuel driven and extractive economy will result in the ultimate injustice. And it is urgent that this is a just transition. Otherwise it will fail as it collapses into violence, at different scales, over the control over resources – that is, into an intensified but ever more fragmented and disordered evolution of the present world order.

When we speak of 'the economy', we need to remember that we are really talking about a complex and changeable set of relationships between people and with the earth. Ultimately, we look for an egalitarian world where people live well with each other and with the earth. In very broad terms, we need to

- rapidly reduce fossil fuel burning and hence emissions to zero;
- look to the survival of the people through our democratic organisation and common control of resources;
- restore the land and its capacity to absorb and store carbon, including through the way we grow food; and
- claim the climate debt owed by north to south and rich to poor.

A just transition means a break with, and within, the present order. To achieve it, we need to create the necessary social power. We need first to build our confidence in ourselves, in our communities, to say what we mean by it – not as a final word but as a point of beginning. And we need to open that for discussion with other formations in society so as to create coalitions to carry it forward. That might involve developing shared visions of a different future – and how we bring together our questions on how we respond to climate change, create a democratic and participatory order and share our work and the wealth of the land. And it will involve immediate questions that confront us now, notably the energy transition.

A coalition may not necessarily be formal. It may be the common movement of people walking together, or it may be that constituencies act independently on a core consensus developed through dialogue and debate. In the dialogue of community and labour in eMalahleni, it was emphasised by all that workers are part of the community. Hence, an understanding between community and workers, based on ongoing dialogue and our common interest in an urgent response to the climate crisis as well as in everyone's means to a livelihood, must be at the core of a movement for a just transition. And it should be remembered that workers are not only those with formal jobs who belong to trade unions. They include street traders, waste pickers and food gardeners amongst others. There will be external pressures on the timeframe for such a process, particularly on the Highveld where multi-stakeholder dialogues involving government and business as well as labour and community are proposed for 2020. The Highveld has also been declared a REDZ and will attract IPP project proposals in the next bid round.

We need to deal with the impacts of climate change. These will include droughts, floods, sea level rise, sea storms and tsunamis, and the resultant social disruptions, health problems, streams of refugees and political challenges of migration. This will require solidarity and ingenuity, but it is also an opportunity to create a new society. It will include practical decisions that will reshape entire geographies – for example, the necessary retreat from the coastal line, including retreat of industry and infrastructure such as railway

lines running along the coast or the retreat of people from flood plains and the provision of more secure housing.

While climate change will exert extra and constantly increasing pressure, it is an opportunity to realise the urgency of the situation and transform our current dysfunctional systems – local government, water, health, agriculture and the like – into systems that enable and support, and indeed are integral to creating, a just society. Much of this work will be very practical – for example, upgrading infrastructure, restoring services, moving to new crops and food value chains, developing autonomy in food production. Dealing with dysfunctional systems requires a combination of high expectations, commitment and technical competence. Civil servants need to do their work, whether they are interacting with people on the ground in a helpful way, or managing the delivery of services such as health for the maximum benefit of the people who need these services. We need to deal with corruption. This will require new strategies, including a popular insistence on open democracy and accountability and the re-municipalisation of the host of services put out to tender. At the same time, people cannot wait for government nor should they leave it up to government. Alongside municipal services, people need to develop autonomous systems such as for energy and food sovereignty and zero waste.

We will need to deal with the strategies of the rich and powerful, as they plan and plot to abandon the majority of humanity, choose choice climate proof retreats and erect barricades and armies against climate refugees [Ayazi and Elsheikh 2019]. We will have to deal with changes in political systems as the elite desperately try to protect themselves. We need to be clear about false solutions, such as 'clean coal', or geo-engineering of the atmosphere to allow greenhouse gas emissions to continue, or the continuance of industrial agriculture in the guise of 'sustainable' solutions. But we also need to be aware of and confront, through democratic decision making, aggressive elite responses including – on a global level – increased military spending, harsher border security, new laws enabling the declaration of emergencies, and spying on climate activists and human rights defenders who work on a systems change agenda. Reports are bringing to light of day that an elite that appears

not to deal with climate change is in fact actively planning to preserve their privileges [Buxton and Hayes 2015].

In South Africa, we will see xenophobia stoked up by chauvinist politicians. It would be well to remember the extraordinary response of Abahlali basaMjondolo (AbM), the shack dwellers' movement, to the first wide scale violence against people identified as foreigners. The organisation emphasised that its membership, and indeed its leadership, includes "people born in other countries". They called meetings in response to the crisis and opened up the issue to discussion, concluding, "An action can be illegal. A person cannot be illegal. A person is a person wherever they may find themselves. If you live in a settlement you are from that settlement and you are a neighbour and a comrade in that settlement." At the same time, the AbM asked, "Why it is that money and rich people can move freely around the world while everywhere the poor must confront razor wire, corrupt and violent police, queues and relocation or deportation?"[186]

We need to square up to the coal lobby and get coal out of the way – but in processes that build a just transition. The coal lobby is defending coal and profiteering from the continued intensification of climate change with its negative effects on millions of people and on the planet's ecosystem. Sizwe Tyiso suggested that mine rehabilitation might be a good place from which to build common ground between communities and organised labour. In South Africa, coal dominates the energy sector but it is not only about coal. The south Durban community has been fighting the oil industry for decades – on and off shore. Government and industry are intent on opening a new oil and gas hub in Richards Bay with a massive refinery and a liquified natural gas (LNG) terminal. Offshore seismic exploration has already done immense damage to marine life and Total has announced a substantial gas find. The Karoo and high mountain watersheds, designated as strategic water source areas, are still threatened by fracking for shale gas, and – back to coal – underground coal gasification and fracking for coal bed methane were punted as 'clean coal' options in the IRP 2019.

186 Abahlali baseMjondolo, *Statement on the Xenophobic Attacks in Johannesburg*, Wednesday, 21 May 2008.

To do

The divestment campaign has had notable successes in curtailing the flow of money into coal mines and power stations from global and local capital. Some key fights are in progress, notably to head off investments to the coal IPPs Thabametsi and Khanyisa. That pressure needs to be maintained but institutions cannot be allowed to burnish their green credentials on coal while boasting about their oil and gas investments. However, South Africa's public investment houses – the PIC and IDC – are still backing coal and everything else in reckless disregard of the consequences.

We have no doubt that the best option for the people and the country is for a rapid transition to renewable energy starting with the power system. This will create more jobs than the mines and coal power stations and we believe that a substantial proportion of those jobs will be on the Highveld. There is also a skills base for manufacturing renewables in the area. Equally, we need to understand the pitfalls of the transition to renewable energies. At present, the renewable IPPs are all privatised. Will new plants be socially owned and will the system be reconceived to include small-scale embedded generation, including community energy? Or is it a continuation of capitalist enterprise in which the public sector will be drained and municipalities and poor people left with slum grids? What are workplace conditions at the privatised IPPs like? What is the relationship between transnational energy corporations and host communities – shaped, it should be noted, by a government determined to outsource all responsibility? And we need to look at the production chains, including mining and waste management, in what we expect to be a fast growing renewables sector.

In the meantime, we need to deal with the legacy of the coal economy. People have streamed onto the Highveld and other coalfields in search of jobs. Some have stayed, others are still part of a migrant labour regime that is transformed but not done. The cost of a job, for many of them, is the ruin of their health. But the income is critical to their families and to local and sending communities alike. Workers need to feel secure in the transition – either that they will get a fair pension or a decent alternative job. And we need a much better understanding of labour migrancy.

People in local communities, the neighbours of the mines and power stations, have also been injured by the pollution. The impacts of climate change on health are beginning to take their toll and will rise steeply. We need a health system that understands and responds appropriately to environmental health issues. We need to deal with what the coal economy destroyed: land, rivers and wetlands. This may well happen in a context of inadequate financing from under-funded rehabilitation funds, a dysfunctional regulator in the DMRE, and mining corporations that abscond and abandon their responsibilities. However, this work is necessary – socially and ecologically necessary.

We need to create – as we have done before in human history – new societies and new economies serving these societies. It is clear that capitalism is not there to serve us, and we need to fearlessly imagine and create a new way of working and using the resources of the planet. We need to take responsibility for how we live on this planet and relate to other living beings and ecosystems. Our mother earth is not only our life support but also our home and the source of our knowledge and understanding, the place of our work. We are part of nature and by killing it, we are killing ourselves [Cock 2007].

In order to rise to the challenges of this agenda, we need to commit to a period of intense listening, learning, dialogue, imagination and exploration of alternatives. We will need to talk to each other in earnest, and watch like hawks what decisions are being made where, how and by whom. And the core of this process is not only to build mutual understanding, but also political power through organising constituencies that, working together, will be able to fight for a just transition.

These are not easy tasks, but we have been prepared for them by the bitter political history of our country and the stalled transformation from mining colony to democracy. We are also not alone. Around the world millions of people are faced with the same issues and are busy figuring out how to respond to this crisis – and how to use what opportunities it presents.

References

Ally, R., 1994. *Gold and Empire. The Bank of England and South Africa's Gold Producers 1886 – 1926*. Wits University Press.

Alternative Information and Development Centre (AIDC) 2011. *One Million Climate Jobs. A just transition to a low carbon economy to combat unemployment and climate change.* AIDC. Cape Town.

Alternative Information and Development Centre AIDC) 2016. *One Million Climate Jobs. Moving South Africa Forward on a Low-Carbon, Wage-Led and Sustainable Path*. AIDC. Cape Town.

Ayazi, H. and Elsheikh, E., *Climate Refugees: The Climate Crisis and Rights Denied*, (Berkeley, CA: Othering & Belonging Institute, University of California Berkeley, December 2019), https://belonging. berkeley. edu/climaterefugees.

Bond, P. 2007. *What today's looting of Africa tells us about tomorrow's looting of Zimbabwe*, Centre for Civil Society, University of KwaZuluNatal.

Bonneuil, C. & Fressoz, J-P. 2015. *The Shock of the Anthropocene. The Earth, History and Us.* Verso. London. New York.

Bradford, J., 2019. *The Future is Rural: Food System Adaptations to the Great Simplification.* Post Carbon Institute. www. postcarbon. org/future-is-rural

Bundy, T., 1988 [1979]. *The Rise and Fall of the South African Peasantry.* James Currey. London.

Burton, J., Marquard, A., and Bryce McCall, B.,2019. *Socio-economic considerations for a Paris Agreement-compatible coal transition in South Africa*. Energy Research Centre, University of Cape Town, South Africa.

Burton, J., Caetano, T., McCall, B., 2018, *Coal transitions in South Africa: Understanding the implications of a 2°C-compatible coal phase-out plan for South Africa*, Energy Research Centre, University of Cape Town.

Buxton, N. and 2015. Hayes B, (eds). 2015. *The Secure and the Dispossessed: How the Military and Corporations are Shaping a Climate-changed World.* Pluto Press and the Transnational Institute.

Centre for Environmental Rights, 2019*. Full Disclosure. The Truth about Water Use Licence Compliance at Mpumalanga Coal Mines.* https://fulldisclosure.cer. org. za/2019/doc/Full-Disclosure-2019. pdf

Chersich M., Wright, C., Francois Venter, F., Erasmus, B. 2018. *Impacts of Climate Change on Health and Wellbeing in South Africa.* International Journal of Environmental Research and Public Health, 2018, 15, 1884; doi:10.3390/ijerph15091884

Cock, J., 2007. *The War Against Ourselves.* Wits University Press. Johannesburg.

Cock, J. 2016. *A just transition from fossil fuel capitalism*, Keynote paper at Global Labour University Conference, September 2016.

Cock, J., 2019. *Resistance to coal and the possibilities of a just transition in South Africa.* Society Work and Politics (SWOP) Institute, University of the Witwatersrand Working Paper.

Council for Scientific and Industrial Research (CSIR) 2017. [written by Jarrad G. Wright, Tobias Bischof-Niemz, Joanne Calitz CrescentMushwana, Robbie van Heerden, Mamahloko Senatla.] *Formal comments on the Integrated Resource Plan (IRP) Update Assumptions, Base Case and Observations 2016*

Davis, C., Engelbrecht, F., Tadross, M., Wolski P., and Archer van Garderen, E. 2017. *Future climate change over Southern Africa*. Chapter 3 in Mambo, J. and Faccer, K. (Eds). South African Risk and Vulnerability Atlas 2nd edition. Department of Science and Technology: Pretoria, South Africa.

Department of Environmental Affairs (DEA). Undated draft. *Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa*

Climate Change Adaptation: Perspectives on Urban, Rural and Coastal Human Settlements in South Africa. Report no. 4. Pretoria.

Department of Environmental Affairs (DEA) 2013agric. *Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. Climate Change Implications for the Agriculture and Forestry Sectors in South Africa.* Pretoria.

Department of Environmental Affairs (DEA). 2013bio. *Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. Climate Change Implications for the Biodiversity Sector in South Africa.* Pretoria.

Department of Environmental Affairs (DEA). 2013fish. *Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. Climate Change Implications for Marine Fisheries in South Africa.* Pretoria.

Department of Environmental Affairs (DEA). 2013health. *Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. Climate Change and Health.* Draft

Department of Environmental Affairs (DEA). 2013settle. *Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. Climate Change Adaptation: Perspectives on Urban, Rural and Coastal Human Settlements in South Africa.* Pretoria.

Department of Environmental Affairs (DEA). 2013water. *Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. Climate Change Implications for the Water Sector in South Africa.* Pretoria.

Department of Environmental Affairs (DEA). 2016. *The Economics of Adaptation to Future Climates in South Africa: An integrated biophysical and economic analysis*. LTAS Phase II, Technical Report. Pretoria.

Department of Environmental Affairs (DEA), 2019, *Draft National Climate Change Adaptation Strategy*, 6 May 2019.

Department of Public Enterprises (DPE), 2019, *Roadmap for Eskom in a Reformed Electricity Supply Industry*, 29 October 2019.

Engelbrecht, F., Adegoke J., Bopape, M., Naidoo M., Garland, R., Thatcher, M., McGregor J., Katzfey J., Werner, M., Ichoku, C., and Gatebe C. 2015. *Projections of rapidly rising surface temperatures over Africa under low mitigation.* Environmental Research Letters; Environ. Res. Lett. 10 (2015) 08500.

Environmental Justice Australia. 2019. *Unearthing Australia's toxic coal ash legacy. How the regulation of toxic coal ash waste is failing Australian communities.* Environmental Justice Australia. Carlton.

Environmental Monitoring Group (EMG). 2018. *EMG's Guide to the Cape Town Drought.* EMG. January 2018. Cape Town.

Escobar, l., 2019. *Food Sovereignty* in Kothari, A., Salleh, A., Escobar, A., Federico Demaria, F., Acosta, A., (eds). Pluriverse. A post-development dictionary. Tulika Books. New Delhi.

Fiil-Flynn, M., 2001, *The electricity crisis in Soweto*, in David McDonald and Patrick Bond, eds., Municipal Services Project, Occasional Paper #4.

Fioramonti, L. 2017. *Wellbeing Economy: Success in a World Without Growth.* McMillan. Johannesburg.

Fisher, M. 2009. *Capitalist Realism. Is there really no alternative?* O Books, Winchester UK, Washington USA.

Geels, F. 2010. *The multi-level perspective on sustainability transitions: Responses to seven criticisms.* Environmental Innovation and Societal Transitions 1 (2011) 24–40.

Graeber, D. 2011. *Debt, the first 5 000 years.* Mellville House. New York.

Hallowes, D. and M. Butler, 2005. *Whose energy future? Big oil against people in Africa,* groundWork. Pietermaritzburg.

Hallowes, D. and V. Munnik, 2016. *The Destruction of the Highveld, Part One: Digging Coal.* groundWork. Pietermaritzburg.

Hallowes, D. and V. Munnik, 2017. *The Destruction of the Highveld, Part Two: Burning Coal.* groundWork. Pietermaritzburg.

References

Hallowes, D. and V. Munnik,, 2018. *Boom and Bust in the Waterberg. A history of coal mega projects.* groundWork. Pietermaritzburg.

Hallowes, D. (ed), 1993, *Hidden Faces. Environment, Development, Justice: South Africa and the global context*, Earthlife Africa, Pietermaritzburg.

Hansen, J., M. Sato, P. Hearty, R. Ruedy, M. Kelley, V. Masson-Delmotte, G. Russell, G. Tselioudis, J. Cao, E. Rignot, I. Velicogna, E. Kandiano, K. von Schuckmann, P. Kharecha, A. Legrande, M. Bauer, Kwak-Wai Lo, 2015. *Ice Melt, Sea Level Rise and Superstorms: Evidence from Paleoclimate Data, Climate Modeling, and Modern Observations that 2°C Global Warming is Highly Dangerous*, Atmospheric Chemistry & Physics, Papers in open discussion, 23 July 2015.

Hansen, J., M. Sato, P. Kharecha, D. Beerling, R. Bernerd, V. Masson-Delmotte, M. Pagani, M. Raymo, D. Royer and J. Zachos, 2008, *Target Atmospheric CO_2: Where Should Humanity Aim?* Submitted at arXiv. org, April 7, 2008 and revised June 18, 2008 (ref: arXiv:0804.1126v2).

Hansen, J., M. Sato, P. Kharecha, D. Beerling, R. Bernerd, V. Masson-Delmotte, M. Pagani, M. Raymo, D. Royer and J. Zachos, 2008, *Target Atmospheric CO_2: Where Should Humanity Aim?* Submitted at arXiv. org, April 7, 2008 and revised June 18, 2008 (ref: arXiv:0804.1126v2).

Hartwig, M. 2007. *Dictionary of Critical Realism.* Routledge. London.

Hoegh-Guldberg O., D. Jacob, M. Taylor, T. Guillén Bolaños, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K. Ebi1, F. Engelbrecht, J. Guiot, Y. Hijioka, S. Mehrotra, C. W. Hope, A. Payne, H. Pörtner, S. Seneviratne, A. Thomas, R. Warren, G. Zhou, 2019, *The human imperative of stabilizing global climate change at 1.5°C*, Science, 20 Sep 2019: Vol. 365, Issue 6459, DOI: 10.1126/science.aaw6974

Holland, M. 2017. *Health impacts of coal fired power plants in South Africa.* Report to groundwork and Health Care Without Harm.

Intergovernmental Panel on Climate Change (IPCC),

– 2007: Fourth Assessment Report (AR4), *Synthesis Report*.

- 2013: *Fifth Assessment Report (AR5), Working Group 1 (WG1): The Physical Science Basis*.
- 2018: *Special Report on the Impacts of Global warming of 1.5°C (SR1.5)*
- 2019a: *Special Report on Climate Change and Land (SR CCL)*.
- 2019b, *Economic transformation, inclusive growth, and competitiveness: A contribution towards a growth agenda for the South African economy,* November 2019.
- 2019b: *Special Report on Ocean and Cryosphere in a Changing Climate (SR OCC)*

Diedhiou, A., R. Djalante, K. Ebi1, F. Engelbrecht, J. Guiot, Y. Hijioka, S. Mehrotra, C. W. Hope, A. Payne, H. Pörtner, S. Seneviratne, A. Thomas, R. Warren, G. Zhou, 2019, *The human imperative of stabilizing global climate change at 1.5°C*, Science, 20 Sep 2019: Vol. 365, Issue 6459, DOI: 10.1126/science. aaw6974

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 2019, *Global Assessment Report, Summary for Policymakers*, 6 May 2019.

International Labour Organisation (ILO), 2015, *Guidelines for a just transition towards environmentally sustainable economies and societies for all*.

Kothari, A., Salleh, A., Escobar, A., Federico Demaria, F., Acosta, A., (eds) 2019. *Pluriverse. A post-development dictionary.* Tulika Books. New Delhi.

Kravchenko, J. and Lyerly, K., 2018. *The Impact of Coal-Powered Electrical Plants and Coal Ash Impoundments on the Health of Residential Communities.* N C Med J. 2018;79(5):289-300. North Carolina Institute of Medicine.

Lang, J. 1995. *Power Base. Coal Mining in the Life of South Africa.* Jonathan Ball. Johannesburg.

Leahy, T. 2019. *Permaculture* in Kothari, A., Salleh, A., Escobar, A., Federico Demaria, F., Acosta, A., (eds). Pluriverse. A post-development dictionary. Tulika Books. New Delhi.

References

Lenton, T., J. Rockström, O. Gaffney, S. Rahmstorf, K. Richardson, W. Steffen & H. Schellnhuber, *Climate tipping points – too risky to bet against*, Nature Vol. 575, 28 November 2019.

Levitas, R, 2017. *Where there is no vision, the people perish: a utopian ethic for a transformed future.* Centre for the Understanding of Sustainable Prosperity. http://www. cusp. ac. uk/wp-content/uploads/05-Ruth-Levitas-Essay-online. pdf

Magdoff, F., and Foster, J. B. 2011. *What every environmentalist needs to know about capitalism.* Monthly Review Press. New York.

Maphumulo, W. and Bhengu, B. 2019. *Challenges of quality improvement in the healthcare of South Africa post-apartheid: A critical review.* Curationis 42(1), a1901. https://doi. org/10.4102/curationis. v42i1.1901 accessed 13/12/2019 at https://www. ncbi. nlm. nih. gov/pmc/articles/PMC6556866/

Marais, L. and J. Cloete, forthcoming, *Mine housing: Historical pathway or radical change?* Centre for Development Support, University of the Free State.

Marquard, A. 2006. *The Origin and Development of South African Energy Policy*. PhD thesis University of Cape Town.

McDaid, L. 2010. *Power to the People: Raising the Voice of Civil Society in Electricity Planning – Integrated Resources Plan 2010 Inputs and Departmental Responses.* Cape Town: Institute for Security Studies, September 2010.

Monk, F., D. Hallowes, K. Moore, L. Ross, 2016. *Fuelling the Fire: the chequered history of Underground Coal Gasification and Coal Chemicals around the world*, Friends of the Earth Scotland.

Mtero F., Gumede N., and Ramantsima K. *Elite capture and land redistribution in South Africa.* Research report 55, December 2019. Institute for Poverty, Land and Agrarian Studies (PLAAS), University of the Western Cape.

Munnik, V., In press. *The Reluctant Roll-Out Of Catchment Management Agencies : Assessing the key risks and consequences of delays in finalising institutional arrangements for decentralised water resource management.* Water Research Commission project K5/2943.

National Department of Health (NDoH). 2019. *Draft National Climate Change and Health Adaptation Plan 2020-2024.* Pretoria.

Nicholas, S. and Buckley, T., 2019. *South African Coal Exports Outlook: Approaching Long-Term Decline*, Institute for Energy Economics and Financial Analysis (IEEFA), September 2019

Nixon, R., 2011, *Slow violence and the environmentalism of the poor,* Harvard.

Otterbach, S and Rogan, M. (2019) *Exploring spatial differences in the risk of child stunting: Evidence from a South African national panel survey The Journal of Rural Studies.* 39: 65-78.

Oxfam 2014. [Written by Tsegay, Y., Rusare, M. and Mistry, R.] *Hidden hunger in South Africa. The Faces of Hunger and Malnutrition in a Food-Secure Nation.* Oxfam.

Oxfam 2017. [Written by Richards, J. and Bradshaw, S.] *Uprooted by Climate change. Responding to the growing risk of displacement.* Oxfam.

Oxfam, 2018, *Reward Work, Not Wealth*, written by Diego Alejo Vázquez Pimentel, Iñigo Macías Aymar and Max Lawson, Oxfam Briefing Paper, January 2018.

Rahmstorf, S. and A. Levermann, 2017. *Why global emissions must peak by 2020*, Preface to *2020: The Climate Turning Point*, Carbon Tracker, Climate Action Tracker, Potsdam Institute for Climate Impact Research, Yale University.

Reynolds-Clausen, K. and Singh, N. 2019. *South Africa's Power Producer's Revised Coal Ash Strategy Progress and Implementation.* Coal Combustion and Gasification Productions Journal 11 (2019). The University of Kentucky Center for Applied Energy Research and the American Coal Ash Association.

References

Rosemberg, A. 2017, *Strengthening just transition policies in international climate governance*, Policy Brief, The Stanley Foundation, April 2017.

Schlissel, D. and Wamsted, D., 2018, *Holy Grail of Carbon Capture Continues to Elude Coal Industry*, Institute for Energy Economics and Financial Analysis.

Schulze, R. E. 2016. *On Observations, Climate Challenges, the South African Agriculture Sector and Considerations for an Adaptation Handbook.* In: Schulze, R. E. (Ed.) Handbook for Farmers, Officials and Other Stakeholders on Adaptation to Climate Change in the Agriculture Sector within South Africa. Section A: Agriculture and Climate Change in South Africa: Setting the Scene, Chapter A1.

Schotte, S., Zizzamia, R., and Leibbrandt, M., 2017. *Social stratification, life chances and vulnerability to poverty in South Africa*, Southern Africa Labour and Development Research Unit, UCT.

Skowno, A. L., Poole, C. J., Raimondo, D. C., Sink, K. J., Van Deventer, H., Van Niekerk, L., Harris, L. R., Smith-Adao, L. B., Tolley, K. A., Zengeya, T. A., Foden, W. B., Midgley, G. F. & Driver, A. 2019. *National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report.* South African National Biodiversity Institute, Pretoria.

Sousa, P. et al 2018. *The 'Day Zero' Cape Town drought and the poleward migration of moisture corridors.* Environmental Research Letter. 13 12402

Steffen, W., Johan Rockström, Katherine Richardson, Timothy Lenton, Carl Folke, Diana Liverman, Colin Summerhayes, Anthony Barnosky, Sarah Cornell, Michel Crucifix, Jonathan Donges, Ingo Fetzer, Steven Ladea, Marten Scheffer, Ricarda Winkelmann, and Hans Joachim Schellnhuber, *Trajectories of the Earth System in the Anthropocene*, www. pnas. org/cgi/doi/10.1073/pnas.1810141115

South African National Biodiversity Institute (SANBI) 2018. *National Biodiversity Assessment 2018 The status of South Africa's ecosystems and biodiversity*. Pretoria.

Sweeney, S., and Treat, J., 2018. *Trade Unions and Just Transition. The search for a transformative politics.* Trade Unions for Energy Democracy. Working Paper no. 11.

Thorpe, V. 1993, *Solidarity first – environmental priorities for labour internationalism*, in David Hallowes ed., *Hidden Faces. Environment, Development, Justice: South Africa and the global context*, Earthlife Africa, Pietermaritzburg.

Toledo, V. 2019. *Agroecology* in Kothari, A., Salleh, A., Escobar, A., Federico Demaria, F., Acosta, A., (eds). Pluriverse. A post-development dictionary. Tulika Books. New Delhi.

Treasury 2019a, *Towards an economic strategy for South Africa,* August 2019.

United Nations Framework Convention on Climate Change (UNFCCC), *The Paris Agreement,* 12 December 2015.

Vitali, S,. J. Glattfelder, and S. Battiston, 2011. *The network of global corporate control*, Swiss Federal Institute of Technology, In: PLoS ONE, vol.6, no.10. http://arxiv. org/PS_cache/arxiv/pdf/1107/1107.5728v2. pdf

Watts, N., Markus Amann, Nigel Arnell, Sonja Ayeb-Karlsson, Kristine Belesova, Maxwell Boykoff, Peter Byass, Wenjia Cai, Diarmid Campbell-Lendrum, Stuart Capstick, Jonathan Chambers, Carole Dalin, Meaghan Daly, Niheer Dasandi, Michael Davies, Paul Drummond, Robert Dubrow, Kristie L Ebi, Matthew Eckelman, Paul Ekins, Luis E Escobar, Lucia Fernandez Montoya, Lucien Georgeson, Hilary Graham, Paul Haggar, Ian Hamilton, Stella Hartinger, Jeremy Hess, Ilan Kelman, Gregor Kiesewetter, Tord Kjellstrom, Dominic Kniveton, Bruno Lemke, Yang Liu, Melissa Lott, Rachel Lowe, Maquins Odhiambo Sewe, Jaime Martinez-Urtaza, Mark Maslin, Lucy McAllister, Alice McGushin, Slava Jankin Mikhaylov, James Milner, Maziar Moradi-Lakeh, Karyn Morrissey, Kris Murray, Simon Munzert, Maria Nilsson, Tara Neville, Tadj Oreszczyn, Fereidoon Owfi, Olivia Pearman, David Pencheon, Dung Phung, Steve Pye, Ruth Quinn, Mahnaz Rabbaniha, Elizabeth Robinson, Joacim Rocklöv, Jan C Semenza, Jodi Sherman, Joy Shumake-Guillemot, Meisam Tabatabaei, Jonathon Taylor, Joaquin Trinanes,

Paul Wilkinson, Anthony Costello*, Peng Gong*, Hugh Montgomery* *The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate.* Published online November 13, 2019 https://doi. org/10.1016/S0140-6736(19)32596-6

World Meteorological Organisation (WMO) 2019, *The United in Science Report of the Science Advisory Group of the UN Climate Action Summit 2019*, World Meteorological Organization, UN Environment, Global Carbon Project, the Intergovernmental Panel on Climate Change, Future Earth, Earth League and the Global Framework for Climate Services, at https://public. wmo. int/en/resources/united_in_science published on 22 September 2019.

Ziervogel, G. 2019. *Unpacking the Cape Town drought: lessons learned.* Report for Cities Support Programme, Undertaken by African Centre for Cities. ttps://www. africancentreforcities. net/wp-content/uploads/2019/02/Ziervogel-2019-Lessons-from-Cape-Town-Drought_A. pdf

Ziervogel, G., New, M., Archer van Garderen, E., Midgley, G., Taylor, A., Hamann, R., Stuart-Hill, S., Myers J., and Warburton M. 2014. *Climate change impacts and adaptation in South Africa.* WIREs Climate Change 2014, 5:605–620. doi: 10.1002/wcc.295

The climate crisis is upon us. It is the final expression of the extraordinary damage done to the earth by the system of imperial capitalism fired up by fossil fuels. This is the context in which people call for a just transition, knowing that a failed transition will result in the ultimate injustice of mass deaths, starting with the poorest people, if not extinction.

A just transition is not only about energy. It is about settlements, housing, water, sewerage, land, food, transport and pretty much everything else. It is about the workers in fossil fuel industries but also about communities polluted by those industries and about everyone whom the system makes poor. Most of all, it is about changing relations of power between people to create a more equal society where people can live well with each other and with the earth. This is the vision of environmental justice organisations on the ground: in the coal fields and on the fencelines of polluting industries in South Africa.

But it is all to fight for. There is indeed a transition under way in South Africa but it is unplanned and certainly unjust. It is driven by the breakdown of Eskom which is itself a symptom of the wider decline of the minerals energy complex that has shaped South Africa's unequal development for over a century. This groundWork Report picks a path through the politics of decline and takes a close up look at the chaotic transition now under way on the Highveld. It also looks at how the systems that people need to survive are failing along with the institutions of government meant to develop them.

It concludes with a to do list – an urgent if incomplete agenda for people to reclaim the power that will be essential for survival.

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