

COAL KILLS



**An analytical framework to support
a move away from coal and towards
a just transition in South Africa**

Working paper 12
by Victor Munnik
October 2019



**Society, Work
& Politics Institute**

'the making and unmaking of social order'

‘COAL KILLS’:

An analytical framework to support a move away from coal and towards a just transition in South Africa

by Victor Munnik
October 2019

Cover illustration with permission from groundWork

With thanks to the generous support of the Ford Foundation for this research.



**Society, Work
& Politics Institute**
'the making and unmaking of social order'

CONTENTS

| | | |
|----|---|----|
| 1. | A new analytical framework incorporating society and ecology | 1 |
| 2. | South Africa and the global turn against coal | 2 |
| | The uses of an analytical framework | 3 |
| 3. | Incorporating ecology and society | 5 |
| | Environmental Justice | 5 |
| | Participatory Action Research | 5 |
| | Political ecology | 6 |
| | Stretching mainstream approaches | 7 |
| | Socio-technical transitions | 7 |
| | The Minerals Energy Complex in South Africa | 8 |
| 4. | A critique of the dominant coal discourse | 9 |
| | The shrinking of nature and society | 9 |
| | Subordinating society to the economy | 9 |
| | Subordinating nature | 9 |
| | Creating mineable reserves, the social licence to mine and other ghosts | 10 |
| | Forming the future: the Chamber of Mines' scenarios | 11 |
| 5. | The turn against coal, and life after coal | 13 |
| | REFERENCES | 15 |



Photo: Earthlife Africa

It is obvious that the dominating economy involves a great deal of violence against people and nature. The gap between rich and poor is increasing, natural resources are ruthlessly exploited. Loss of biodiversity and climate change are examples indicating that nature's rhythm and balance are dramatically disturbed. In addition to that, the economy itself is in a bad condition... What we need is a reconstruction of economy (and society) based on a combination of imagination and a far deeper understanding of reality.

Fritjof Capra and Ove Daniel Jacobsen 2017

Negative views on coal and its impact on the environment have resulted in a precipitous decline in the use of coal by the major economies of the world. Because of coal's contribution to greenhouse gas (GHG) emissions, many jurisdictions including South Africa, have put in place strict environmental laws which have affected demand for coal.

SA Chamber of Mines 2018

*During the World Summit on Sustainable Development in 2002, when groundWork first started challenging Eskom and its fixation with coal, I was warned by Pallo Jordan, once Minister of Environmental Affairs, to "not **** with coal".*

Bobby Peek, Coal Kills. Introduction: Research and Dialogue for a Just Transition, 2018

1. A new analytical framework incorporating society and ecology

This report proposes a new analytical framework¹ to support activist, academic and policy work that incorporates social and environmental concerns in formulating a just transition from fossil fuels.² It draws on new perspectives and practices that are emerging from a strong turn against coal in civil society.

The new framework³ is rooted in the environmental justice (EJ) movement and local community struggles against the impacts of coal, and a global, increasingly urgent movement⁴ to deal with climate change and a transition from fossil fuels – of which coal is by far the most important in South Africa. Because the framework is

rooted in local community realities on the ground, it uses Participatory Action Research (PAR): building strength and knowledge on the basis of community agendas to tackle real, immediate issues. It recognises the crucial role of women both as shock absorbers of impacts and as leaders (Cock 2019). It is supported by political ecology which triangulates community insights and agendas with an analysis of the political economy, which aims to understand the agendas and tactics of powerful actors like corporates and governments; and ecology, which asks what are the impacts of coal on people and the landscapes they live in, the air we breathe, the water and soil we depend on. It uses the concept of reframing from social movement theory, discourse and narrative analysis. It shows how to use mainstream knowledges, in particular the approach of socio-technical systems, to deal with the scope of the transition, while extending this approach to argue for a perspective of wide-reaching societal transformation, including of the economic system. It

1 This work was undertaken with Jacklyn Cock and Dineo Skosana. We share fieldwork and discussions. The ideas, arguments and mistakes are my own responsibility. In addition, I am indebted to David Hallows with whom I co-authored a number of groundWork reports, and the participants in the Push Back Coal meetings over the past 5 years.

2 This phrase from Ford Foundation contract.

3 This is one possible framework among others. Its attraction is that it emerges from South African struggles for a just transition away from coal.

4 For example, the activism from Extinction Rebellion.

draws on mainstream resources in law, economics, health, environmental science and engineering, extending these and making them useful to environmental justice agendas. It challenges the exclusion of communities and activists from mainstream decision making through engagement in debates in public opinion, policy making, service delivery, and regulation. It fundamentally challenges the subordination of nature and society to economic decision making, on a practical as well as a deep philosophical and historical level. It grounds this framework in an understanding of South Africa's colonial past as a mining colony through the lens of the Minerals Energy Complex (Fine and Rustomjee 1996).

The report proceeds by first arguing the need for a new framework, based on a determined turn against coal, connected to local coal and climate change struggles, and profound shifts in energy realities and energy economies. These shifts have led to entirely new questions being asked about coal, necessitating a radical broadening of thinking about coal. It then introduces the new analytical framework as sketched above. Against this background it turns to a critique of the dominant coal discourse, and how it reduces the rich realities of society and nature, interwoven as they are, to a flat ontology of monetary evaluation (Fioramonti 2013, Norton 2003, Kovel 2002). It traces the results of this view as errors of thinking and practice in the 2018 Chamber of Mines' "National Coal Strategy for South Africa". It concludes by looking forward to the use and further development of this analytical framework in urgent debates around coal, climate change and the challenges of a Just Transition to life after coal.

2. South Africa and the global turn against coal

A new framework for understanding coal is necessary because of – and made possible by – the growing turn against the mining and burning of coal, because of the ecological and health damage it causes. On a global scale, this is driven by the increasingly dramatic and threatening trajectory of climate change towards a future on a planet that will be hotter by more than 2° Celsius. This would make life on the planet difficult if not unlivable for most people, and necessitates a major move away from coal. Closely related is the emergence of Renewable Energy (RE) technologies now cheaper than new coal (Burton et al. 2019). On a local scale, communities resist the impacts of the coal industry on their health, livelihoods, environments and social fabric, supported by increasingly knowledgeable and influential national and global activist coalitions (see for example the weekly bulletin *Coalwire*⁵).

On a global level, argue Colombian and Turkish coal researchers Cardoso and Turhan:

With the Paris Agreement at COP21, a progressive process of decarbonization of the global energy mix has been initiated, with the aim of mitigating changes in the global climate regime. This has had repercussions in the closure of thermal power plants and an apparent reduction in coal consumption in the US, the UK and the European Union (2018: ii).

In the South a new and contradictory politics of coal is on the rise. Cardoso and Turhan again:

This decline in coal in the Global North has led to the emergence of new energy geographies, characterized not by the extractive relationship between North and South, but by internal extraction and consumption in countries such as China and India, as well as by the emerging commercial relationships in the geopolitical and economic interests among the Global South. This includes countries such as India, South Africa, Colombia and Turkey, where the coal trade has increased in recent years (2018: ii).

South Africa is living through a highly contested end to coal. Its state-owned electricity producer, Eskom, which generates 90% of its electricity from coal, is in a death spiral (Hallows and Munnik 2018). It has a debt of R440-billion, amounting to 8% of South Africa's GDP. Part of its trouble is a sharp increase in coal costs – an average increase of 14.1% from 2017/18 to 2018/19. It is closing old power stations,⁶ while struggling to complete work on

5 endcoal.org/category/coalwire/

6 Not decommissioning them, which would entail rehabilitation, social responsibilities to company towns etc.

two new coal-fired power stations, Medupi and Kusile, whose costs escalated from R30-billion each in 2005, to R195-billion for Medupi and R225-billion for Kusile, and counting. European markets for South African coal have largely disappeared, and now the threat is that the closure of the Indian market will mean the end of the very successful South African business model for coal mining: export the good coal and sell the bad coal to Eskom⁷ (Burton et al. 2019). This creates the spectre of stranded assets, and a number of South African banks have already decided – in tandem with global finance – to not fund new coal.

Trade unions find themselves in a difficult space (Deedat 2018). On the one hand they have, since 2001, declared their commitment to a Just Transition, in tandem with global trade union positions (e.g. International Labour Organisation and International Trade Union Confederation). On the other, they are resisting job losses at both power stations and coal mines, where automation and outsourcing in both have meant that jobs have declined from a peak of around 135,000 in 1980 to less than 80,000 today (Burton et al. 2019).⁸ A fear of job losses feeds into a national debate about “a Just Transition” from coal, which includes issues of breaking Eskom into a grid operator and independent power production units. The unions insist renewables should be socially owned, but the existing large scale RE producers are international private companies.⁹ The contestation includes the scope of the “Just Transition” – is it a narrow energy transition or a thorough-going societal transformation? The debates are also increasingly framed by the more rapid than expected arrival of climate change impacts (Bendell 2018; Hallows and Munnik 2018).

There is growing resistance to coal – as will be shown below – from coal-affected communities and national and international NGOs in a lightly co-ordinated but increasingly co-operating Environmental Justice (EJ) movement, which has come together in the loose Push Back Coal alliance, as well as a tight Life After Coal alliance.¹⁰ These activists encounter the reality of coal dependence in communities on coalfields, and a deep ambivalence about the end of coal, caused by coal dependence and the resulting difficulties of imagining a life without coal.

The South African government response is schizophrenic. Its Department of Environment has developed a suite of climate change policies, while its mining and energy departments actively promote coal mining as part of the vision of mining as a “sunrise industry”. In a recent workshop,¹¹ officials intimated that they had to produce a South African low carbon emission strategy while avoiding the phrase “phasing out coal”! These processes of change, contradiction and contestation, have given rise to the need for and indeed the emergence of a new way of posing and answering questions about coal.

The uses of an analytical framework

Analytical frameworks not only shape academic work, but have broader influence due to the authority of academic work and its ability to formulate, validate, attack and circulate theories and concepts, inform public debates, policy making and decision making as well as the work of activists on the ground. Frameworks can be powerful, for example by defining what is relevant to the study of and decision making about coal, or not (see Lukes 2005 [1974]), and also by the way they “cut up the world” for description and analysis (Sayer 1988). This power of knowledge flows both ways: much of what is now academic knowledge, for example in political ecology, derives from activist work and thinking on the ground (Martinez-Alier et al. 2014). A view of knowledge work in struggle that is thoroughly democratic, is contained in Visvanathan’s notions of cognitive justice and “a parliament of knowledges” in which different knowledges are treated with equal respect, and encouraged to enter into productive dialogue under conditions of solidarity to achieve social justice (2009; 2005). In this study, the new analytical framework is traced as it emerges from urgent and intense struggles against coal on the ground, and in reaction to the dominant view of coal.¹² These struggles, consisting of both everyday resistance and movement building, reach into two other important spheres: public opinion and policy making, thereby showing what changes a new analytical framework could support.

Public opinion and everyday understanding play a crucial role in determining the political future of coal, and by

7 South African coal-fired power stations are designed to burn low-calorific, high-ash coal – leading to giant ash heaps next to the power stations and the company towns that serve them.

8 The Chamber of Mines Coal Strategy (2018) argues that in 2016, the coal industry employed 77 506 people, with a further 173 093 jobs mainly in the transport sector – an indication of the size of the shift of coal transport from conveyer belts and rail to coal trucks.

9 As a result of the high threshold for capital or financial guarantees set by South Africa’s neoliberal treasury, which excluded smaller firms (Baker 2016).

10 See lifeaftercoal.org.

11 8 August 2019.

12 Activists worldwide, for example Friends of the Earth, came to the conclusion some years ago already that climate change negotiations between states such as the Paris agreement are not likely to succeed, and therefore decided to fight climate change mine by mine, and power station by power station.

implication of environmental (in)justice connected to coal. This report recognises that there are broad discussions – in all social segments connected to coal – which may range from directly impacted communities to communities or people who (in the immediate term) only benefit from coal i.e. electricity or economic growth. For example, coal miners interviewed during participatory research in the Phola-Ogies-Arbor-KwaGuqa areas, spoke about “clean coal”, including carbon capture and storage, a (misleading) discourse presumably used in their workplaces. Building a shared and progressive understanding of coal issues – including an understanding of the mechanisms producing environmental injustices such as exclusion from decision making, enclosure of resources and externalisation of costs onto communities – can lead to informed action and agenda setting by community activists.

Some, but not all of this, becomes visible through public opinion, or in the media, which now includes social media,¹³ or in more general form as public discussions (Habermas 1996; Herman and Chomsky 1994). There is a strong, complex and dynamic relationship between everyday understanding and public opinion.¹⁴ Activists on the ground and national NGOs put much effort into connecting grassroots voices with the media, with legal cases, and policy making, developing perspectives with communities and buttressing these through research including international comparisons (see below). It is such activities that constitute the discursive turn against coal.

Policy making is best understood as an exercise of power through debates about the use of state power. It consists of the following, iterative six steps (following De Coning and Sherwill 2004), which (1) start with agenda formation in public opinion, proceed to (2) formulation of specific policies, based in expert opinion and (usually) open to public comment, which are then (3) turned into legislation, through which rights, obligations and liabilities are created.¹⁵ This legislation is the basis of activities by (4) institutions which may be newly established or repurposed, existing institutions of state, in the form of (5) programmes, projects and other interventions by the state, and/or other actors empowered by the legislation. The policy cycle ends in (6) monitoring and evaluation, which includes evaluation by communities and activists, which in turn gives rise to new agendas, debates, legislation, institutions etc, thus repeating the cycle.

Both public opinion and academic or expert knowledge play a crucial role in the policy cycle. And so do activist organisations. They have engaged in the policy cycle through parliamentary portfolio committees; through

interventions in government decision making, such as the climate change-based legal challenge by the Centre for Environmental Rights (CER) and activist organisation Earthlife Africa to the granting of authorisation to the Thabametsi power station in the Waterberg; through surveys of both capacity of local government to deal with air pollution (CER 2017) and the inadequacy of the Department of Water and Sanitation in dealing with water use licences on mines (CER 2019); through tracking of Social and Labour Plans (ActionAid 2018); and through participation in policy and legislative debates around air pollutant emission standards (Hallowes 2014). Direct interventions included participation in price determination hearings for Eskom through the National Energy Regulator. This area is important because of its direct decision making power. Debates in these areas rely on background empirical and analytical work of a broad, and interdisciplinary nature.

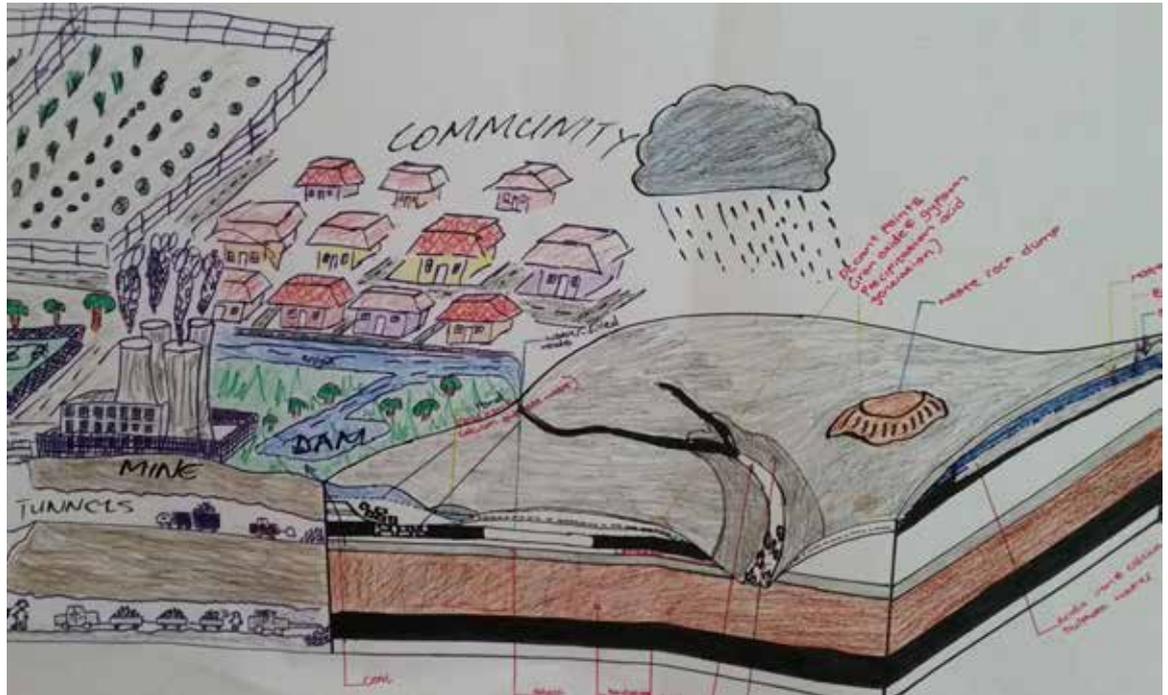
Most fundamentally, a new analytical framework is necessary because new, and many more, questions are being asked of coal. They go far beyond the questions asked to date in mainstream work, such as prominent energy analyst Anton Eberhard’s 2011 “The Future of South African Coal: Market, Investment and Policy Challenges”. The new questions are driven by an urgency about climate change and the need for an immediate transition away from coal in energy production, and by urgent and in many places militant questions about the impacts of the coal industry on communities and the environments in which they live. They question the exclusion of those outside the coal industry, but affected by its operations, from decision making about coal, whether in national policy processes or the opening and regulation of coal mines and coal-fired power stations. These questions add up to a turn away from coal and to a (just) transition. They demand new perspectives on the coal economy and the coal production chain. Most acutely, these questions demand that the frame for understanding and deciding about coal is broadened dramatically to include society and ecology. A new analytical framework, responding to these questions, is presented in the next section.

13 Anti-mining activists make extensive use of social media, including Facebook pages and blogs – e.g. Benchmarks Foundation voices, VEJA and many organisations. This is a new public sphere not foreseen by Habermas (1996).

14 This is not pursued further here, except to remark that activists, especially nationally, actively engage in public opinion making, e.g. contributions to *Maverick* and *The Conversation*.

15 I am indebted to Prof Tracy-Lynn Humby for this insight during our work on WRC Report K5.2355 (Munnik et al, 2017): Developing a multi-sectoral integrative licensing and monitoring framework to align and integrate biodiversity and environmental water quality in the coal mining development life-cycle.

Community mine map, groundWork Environmental Justice School 2017. Photo: Victor Munnik



3. Incorporating ecology and society

A thorough-going analysis of coal issues, capable of supporting activists against coal in all relevant dimensions, is an interdisciplinary endeavour in the sense that it goes beyond both disciplines and academia (Frodeman et al. 2010). This transdisciplinarity can be grounded in the integrating framework of critical realism (see Bhaskar et al. 2010), a philosophy of both natural and social science which also provides support for an environmental justice approach (Munnik 2016).

Environmental Justice

The departure point for this report – and for the activist turn against coal – is the environmental justice approach (Martinez-Alier 2002), in South Africa closely concerned with challenging both environmental racism and capitalism (Cock 2018). The South African version (see Hallows and Butler 2002), in active use in groundWork’s Environmental Justice School, and analyses in the groundWork reports, identifies three mechanisms that produce environmental injustice, namely

- **externalisation** of pollution costs (imposing costs on communities, such as cracking of houses through blasting by coal mines, livestock losses and air pollution which lead to loss of health and health costs), widely reported in the emerging literature;
- **exclusion** from decision making, which could occur in crude form like excluding people from processes

that lead to decisions, or in a more sophisticated politics of knowledge, e.g. “reticent science”, which intentionally understates the urgency of climate change in order to maintain an academic tone (Hansen 2016); and

- **enclosure** of resources, which points to the way in which coal mines dominate a landscape through land use (so that no other options are available to people living and working in the area), through contamination, and even to the enclosure of the imagination of what is possible without coal.¹⁶

Participatory Action Research

Participatory Action Research (PAR; Babbie and Mouton 2012) is the broad framework for research in which communities occupy a central place:

PAR is a powerful approach to research which supports people’s organising and action to change their lives. It is a form of knowledge construction that is collective, rooted in people’s experiences and lives, and respectful of the knowledge that people hold. PAR empowers people by assisting them to understand the world through their efforts to collectively change it. It shifts power in the research process by deeply involving those who would otherwise normally be the subject of the research (Ntswana and Hargreaves 2017: 7).

Such approaches can be seen in research where local activists participate in formulation of questions, choice of

¹⁶ Both forms of enclosure are illustrated in the coal-dominated Phola area where most economic activity depends on coal, either as work in coal mines or as informal trade dependent on incomes from coal.

sites and in conducting and analysis of interviews for the groundWork reports; in WOMIN's study of Somkhele led by 10 community women researchers; in current SWOP work with community researchers in the Phola-Arbor-KwaGua area; in ActionAid's 2018 "Mining in South Africa"; and in the Benchmarks' Foundation support to community activists in researching the problems they confront. These organisations work closely with communities in producing reports on the nature, community understanding and response to coal impacts as well as the use of citizens' or more accurately people's science (Ferrial Adam, personal communication). From this work an emphasis on dispossession of communities has emerged. This is most dramatically illustrated in the trauma of grave relocations – where dispossession reaches into the spiritual realm and demands answers about coloniality in the mining industry (see Skosana 2019).

Political ecology

Political ecology is a field of study which is closely aligned to environmental justice, and ideally placed to support environmental justice (Holifield 2015). Political ecology is in itself interdisciplinary, as

"...a historical outgrowth of the central questions asked by the social sciences about the relations between human society, viewed in its bio-cultural-political complexity, and a significantly humanized nature. It develops the common ground where various disciplines intersect." Two major streams of work have most influenced political ecology: "...political economy, with its insistence on the need to link the distribution of power with productive activity and ecological analysis, with its broader vision of bio-environmental analysis" (Greenberg and Park 1994: 1).

The groundWork reports on coal (Hallowes and Munnik 2016, 2017, 2018) integrate political economy in the form of corporate histories, and political ecology, for which the ecology part required integrating air quality, soil science, geology and meteorology (Lurie 2013, Hancox and Goetz 2014, Dreyer 2012, Tyson et al. 1988). In reframing the understanding of coal, a number of existing knowledges need to be used, and often subjected to a practice of cross-reading¹⁷, specifically for the understanding of impacts on ecosystems. In the groundWork reports, research on water quality for the Water Research Commission (Ashton et al. 2001) and Coaltech (Maree et al. 2000), as well as academic work

for or with Eskom, were cross-read to understand their implications (e.g. Pretorius 2015, Makgato and Chirwa 2017, Singleton 2010). As illustration, an analysis of the quality of coal in the Waterberg coalfield, buttressed by geology and management histories, enabled the authors, and by implication local activists, to predict that further coal mines in the area are unlikely – with the possible exception of extensions of the Grootegeluk Exxaro mine, as a result of apartheid subsidies including extensive geological knowledge (Hallowes and Munnik 2018).

A growing focus in political ecology is an interest in discursive power, or how issues are represented, and how power arises from the way they are represented (Leff 2015). These approaches emphasise how the way we think and talk about social and material reality influences the way that reality is changed in practice. Martinez-Alier, for example, points to the close relationship between ecological distributional conflicts (who receives the benefits and who carries the burdens of, for example, coal mining) and the different "languages of evaluation" in which these distributions are contested (2002).

The contestation of mainstream views on coal has resulted in a civil society-driven reframing of such views. The theory on reframing is a long-standing and well known approach to social movement studies (e.g. Snow et al. 2019, McAdam et al. 2001, Snow and Benford 1988), which explores how activists reframe contentious issues to cast them in a new light and thereby encourage activism and change. Discourse analysis comes in many varieties (Santos 2014; Qadar 2009; Fairclough 1992, 1989), but as a work addressed to activists and policy makers in the mode of public sociology (Burawoy 2007), the most current concept would be "narratives" (Peek, personal communication, 2019; Third World Network 2019). Narratives assign roles to actors and explain their agendas, and analysing them draws attention to the languages of contestation and what is foregrounded and what is left out in these descriptions.

... political ecology [has] a concern with tracing the genealogy of narratives concerning 'the environment', with identifying power relationships supported by such narratives, and with asserting the consequences of hegemony over, and within, these narratives for economic and social development, and particularly for constraining possibilities for self-determination (Adger et al. 2001: 682).

17 The term was inspired by an approach used by discourse analyst Jan Blommaert (2001) in his reading of official reports on refugees, reading against the original purpose for which it was intended (bureaucratic decision making) and recovering refugees' realities distorted by the bureaucratic purpose. In this case, the purpose of cross-reading is to remove scientific reticence (see Hansen 2016), or to make plain what is hidden behind scientific obfuscation.

Stretching mainstream approaches

Contestations also lean heavily on authoritative bodies of knowledge for public legitimacy. Many mainstream approaches are useful supports for this work, dealing with economics, law, public health and socio-technical transitions. In addition, these approaches allow for the use of mainstream information and engagement with policy debates in terms that are understood by the majority of policy makers and mainstream researchers. The examples below show how analysts have engaged with mainstream approaches and “stretched” them to support struggles against coal and for a just transition.

Socio-technical transitions

An important perspective on the current transition away from fossil fuels is provided by the theory of socio-technical transitions which built on the original insights into how social dynamics shape technology, developed by Bijker (1997) to formulate the Multi-Level Perspective on social transitions (Geels 2010; Sorrell 2017). This perspective enables us to see the social structures (institutions, laws, conventions etc) in addition to hard infrastructure such as powerlines and water pipes associated with and supporting a specific technology. This in turn allows us to analyse the politics of incumbency and disruption, which is useful for debates about the scope of the sociotechnical transition(s) and the dynamics involved in moving away from fossil fuels.

But while this approach expands the view beyond a simplistic description of an energy system (without its social support), it suggests that we are concerned with an energy transition – not a wider transformation of society. The analysis of Cardoso and Turhan of the coal chain between Colombia and Turkey considerably broadens the scope of analysis by showing:

“... how the exploitation and consumption of coal for the production of electric energy are deeply interconnected by interactions in different layers (commercial, physical and socio-environmental) and scales (local, national and global). The political ecology approach allows us to address trading conditions between the two countries, as well as the asymmetries and injustices in the distribution of the costs of pollution, access to natural resources, and sacrifices made in favor of the extraction and consumption of resources, as a result of the strongly pro-coal policies of Colombia and Turkey (2018: ii).

The perspective is broadened further in the final section of the report dealing specifically with just transition debates.

From mainstream to activist law, health studies and economics

Law plays a crucial role in coal struggles and hence in coal research. Law creates rights, obligations, standards and transgressions, and so forth. Work in legal arenas, from precedent setting court cases to legal letters creating paper trails on regulatory issues, is important. The emergence and work of a number of activist legal organisations part of or aligned to the EJ movement has also given detailed attention to what is required by the law, such as implementation of air quality plans and the capacity to do it, and due process in awarding and monitoring water use licences for mines. Activist lawyers in the Centre for Environmental Rights (CER) have created publications which apply environmental law to the reality of coal mining and coal-fired power stations (CER 2016, 2017). The implication of this work is that civil society is now able to engage with the details of regulation and compliance, and to evaluate the role of actors in it: government, environmental assessors and the mines (CER 2019).



Photo: Earthlife Africa

In the economic arena the reframing is of a different kind: centres like the Energy Research Centre (ERC) at the University of Cape Town (UCT) have built a strong platform to intervene in specific processes, such as the Integrated Resource Plan 2018, which prescribes the mix of energy sources – e.g. coal, nuclear, renewables – to be used in generating electricity. Using in-house modelling, they have been able to challenge government calculations on energy futures. They have also provided a bridge to international research, including research on the capital-intensive nature of current RE investments in South Africa (Baker 2016, Burton et al. 2019). A strong point of this research is comparative studies into success factors in (energy) transitions in other countries (see Zinecker et al. 2018).

Public health is another crucial knowledge field. The environmental right in section 24 in the South African constitution is formulated as a right to live in an environment not harmful to your health and wellbeing. While there is an extensive mainstream literature on health impacts from burning coal on the Mpumalanga Highveld, it has in general been cautious if not reticent. In theory and in practice this literature has blamed victims of energy poverty for the use of coal and ground level impacts, through the indoor use of coal. The health studies by Holland (2017) and Myllyvirta (2014) have directly challenged prevailing views, or filled in missing information enabling activists to make arguments about the impacts of air pollution. It has provided dramatic figures – like 2,200 deaths per year attributable to air pollution from Eskom pollution (groundWork 2018). This information becomes more potent when shared in the public domain, through the media, and strengthen the efforts of activists to establish and maintain reasonable emission standards (Hallowes 2014).

Established NGOs not so close to the grassroots have also played important roles in the reframing of coal issues. One example is the arguments around protecting “strategic water source areas”, the 8% of the surface area of South Africa in the east part, that “produces” (catches and filters through wetlands) 50% of the country’s surface water (WWF 2011). This argument was crucial in the effort, including a court case (by CER and allies) to prevent the opening of a coal mine in the Mabola area. Other studies have pointed to the extensive externalities of coal-fired electricity (Blignaut et al. 2001) for Greenpeace, and the impact of coal on food security (Bureau for Food and Agricultural Policy 2012), and have been incorporated into activist arguments.

History and philosophy

For a thorough reframing of perspectives on coal, a final two fundamental moves are necessary. One is to anchor a new analytical framework within South Africa’s colonial past as a mining colony, aptly described as the Minerals Energy Complex (MEC; Fine and Rustomjee 1996), the mechanism of accumulation (and dispossession) at the centre of the South African economy. The other is a critique of the thinking at the base of the dominant coal discourse – that is the subordination of nature (ecosystems) and society to “the economy”. The MEC as history shows both the consequences and the roots of this perspective.

The Minerals Energy Complex in South Africa

The concept of the MEC provides scope and means to expand our analytical framework into a historical understanding of the roots of the dominant coal discourse. Fine and Rustomjee introduced the MEC as “a system of accumulation... (which has) exercised a profound influence upon socio-economic and political life generally” (1996: 241), inviting other researchers to use this concept. A socio-ecological historical exploration of the role of coal in the MEC could focus on how the role of coal as a cheap support to gold mining (Lang 1995), resulted in a practice of “cheap and dirty” coal mining, which continued in the mandate of electricity parastatal Eskom to provide electricity that was the cheapest in the world until recent times – at the cost of major environmental and health externalities (Munnik 2009). The social externalities are well known, in particular, but not only, the migrant labour system that persists to this day in various forms, e.g. the Zulu “homeboy” network of coal miners in Masakhane, next to Duvha power station outside Witbank, Mpumalanga. The MEC has been responsible for the perpetuation of racism inherited from slavery in the Cape Colony (see Magubane 2007, Nkosi 2010). In specifically ecological terms, such exploration would produce a history of how the landscape of the Mpumalanga Highveld coalfields was changed by the MEC, creating a coal-based acid mine drainage crisis equal in impact and rehabilitation cost to that of the gold and uranium mining crisis by polluting the upper reaches of the Olifants, Vaal, Usuthu and Inkomati rivers (Hallowes and Munnik 2016, McCarthy and Pretorius 2009, Coetzee et al. 2010). A precondition of the MEC was ignoring the impacts of its activities on both society and nature, a hallmark of colonial practice (Polanyi 1957). Recently, the MEC has been positioned at the core of Black Economic Empowerment, creating a complex political situation for the politics of the Just Transition (Freund 2009).

4. A critique of the dominant coal discourse

The shrinking of nature and society

Fundamental to the new analytical framework in this report, is the emphasis on seeing coal issues through a lens that makes visible the elements of society and ecology. This means we need to understand and undo a noticeable feature of the dominant coal discourse, namely the way it subordinates both nature and society to economic considerations. As a result of this erasure, the formal, monetised economy is parasitic on and dependent on often forced “gifts” from society and nature¹⁸ (Graeber 2011, Fioramonti 2017). The coal industry – as will be illustrated in more detail below – talks and behaves as if the economy is independent from and encompasses both nature and society, or economy > society > nature. This is important because in South Africa it has largely been left to the coal industry to define coal policy (Eberhard 2011) – so that these errors in thinking translate into practices that are unjust to people and injurious to the environment.

Subordinating society to the economy

The first error involves giving “the economy” an existence separate from its material and social components. This is absurd because “from a sociological or systemic point of view there is no such thing as ‘the economy’: merely a complexity of social institutions and practices considered from an ‘economic’ point of view” (Levitas 2017: 10). This “complexity of institutions and practices” relies on society, sometimes called the “reproductive” or “care” economy when it is framed in this role (Henderson 1996). Karl Polanyi, almost seven decades ago, described how “the economy” emerged from and then dominated both society and nature under economic liberalism since the 1820s in England. It was a violent process: “To separate labour from other activities of life and to subject it to the laws of the market was to annihilate all organic forms of existence and to replace them by a different type of organisation, an atomistic and individualistic one” (Polanyi 1957 [1944]: 162). This process was particularly clear in the colonies, like South Africa, where people had first to be dispossessed of their means of subsistence to force them to sell their labour. And so was the reduction,

in concept and in practice, of nature to the economic concept of “land”:

What we call land is an element of nature inextricably interwoven with man’s institutions. To isolate it and form a market out of it was perhaps the weirdest of all undertakings of our ancestors... the economic function is but one of many vital functions of land. It invests man’s life with stability; it is the site of his habitation; it is a condition of his physical safety; it is the landscape and the seasons... And yet to separate land from man and organize society in such a way as to satisfy the requirements of a real-estate market was a vital part of the utopian¹⁹ concept of a market economy (1957: 178).

Polanyi not only recorded the push-back against economic thinking, but also observed that this change in thinking and description led to new practices which entrenched the dominance of “economics”, in particular economic decision making, thus reshaping society.

Subordinating nature

In turn, the subordination of nature by the economy (in the dominant Western paradigm) was made possible by a pre-existing epistemological “break between nature and society... constructed in the nineteenth century” in which the then emerging human and social sciences played a crucial role (Bonnieuil and Fressoz 2015: 19). Human history and the questions of society were seen as separate from those of nature, and nature was seen as impervious to human influence. The advent of the Anthropocene is changing that, as it becomes clear that there is “a double relation of internality” between nature and society:

Natures [are] pervaded by the social, by the thousand and one socio-technical interventions that are historically situated... above all a ‘second nature’ fostered by powerful institutions (the great networks of capitalism, technological systems, military apparatuses, etc.) which does not rule out the alterity of nature nor the fact that the Earth is not just a social construct.

Societies [are] pervaded by nature, in which social relations and cultural norms are structured and rigidified by mechanisms that organize metabolisms of matter and energy, and that govern the social uses of nature. Far

¹⁸ This section is underlaboured by the critical realist analysis of a “compromise formation”, in which obvious errors in thinking or fundamental philosophy are taken to enable unjust social and material practices (Norrie 2010).

¹⁹ Polanyi uses the term “utopian” here in the sense of a shallow ontology, or thought disregarding material realities. Levitas (2017) uses the term in a very different sense, namely an ethical vision of the future which is crucial to a Just Transition from fossil fuels.

from surrounding the social, the environment traverses it, and the history of societies, cultures and socio-political regimes cannot ignore the flows of matter, energy and information that frame them. (Bonneuil and Fressoz 2015: 36)

The notion of complex social-ecological systems is an attempt by mainly natural scientists to bridge this divide (the main works in this tradition can be seen on the website resilience.org). This is a powerful perspective supporting the epistemological reintegration of nature and society, but it has been questioned for both its neglect of already available social science insights and a naïve treatment of power issues (Cote and Nightingale 2012).

Creating mineable reserves, the social licence to mine and other ghosts

The logic of subordinating nature and society to the economy can be seen in practice in the process by which mineral resources (such as coal) become mineable reserves. In this process the realms of nature and society are stripped of their rich ontologies – their existence as entwined ecosystems and civilisations – to feature as mere adjuncts, supports or preconditions for the exploitation of coal. The process starts with the largely geological identification of a geological deposit as a resource, which is defined²⁰ as:

a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling. (SAMREC 2016: 18)

To move from resources to reserves, “competent persons”, working within the coal industry, develop increasing certainty about the quantity and quality of the coal, as well as market, regulatory and other conditions that would affect bringing the coal to market. These ‘modifying factors’ include mining and processing technologies and their costs, marketing, legal, environmental, infrastructure, social and governmental factors. In other words, this is a process through which the economic, regulatory and, to some extent, social aspects must be taken into account for the limited purposes of mining coal profitably. In

practice, these calculations form the basis for business plans that invite or persuade investors to put money into coal mining (as well as regulators such as the Department of Mineral Resources to license mines).

There are other examples of the consequences of such thinking. Social and Labour Plans are put forward by the mining industry as the equivalent of “the social licence to mine”. One would think that the social licence to mine would rest on a social process in which mining is selected as the best option by all involved, but there is still debate about whether communities have the right to say “no” to mining. Environmental management – often perfunctory, limited or misleading exercises in the politics of knowledge via constrained participation processes – shrinks the rich ontologies of society and nature into a “yes” for mining. This basic epistemological configuration imparts double-speak and profound frustration around processes of coal mining.

The results of these errors in thinking, or irreal thinking, are very clear on the ground. Social and ecological considerations, once shrunk into adjuncts of economic thinking, are given short shrift and ignored in the development of mines and power stations. For example, in the 1970s, government health officials argued that no more coal-fired power stations could be built in the Highveld because of the intense pollution and the adverse atmospheric conditions – inversions that trap the pollution from coal-fired power station chimneys (Ballim 2017; Hallows and Munnik 2017; Tyson et al. 1988). Yet, more power stations were built, thus overriding health considerations as well as the clear realities of atmospheric science. In 2006, Eskom commissioned a study that compared numbers of people that would die under different pollution control scenarios (Scorgie and Thomas 2006) – in other words, calculating numbers of deaths as part of strategic choices. It remarked that “current emissions from Eskom and other sources²¹ quantified during the study were predicted to result in 550 deaths per year and around 117,200 respiratory hospital admissions per year” (2006: 6-3). The analytical points to note here are (1) that death and disease were subordinated to an economic logic, and (2) that such logic may make sense to those making decisions behind closed doors, but appears macabre when revealed to the public whose deaths are under discussion.

20 In the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (the SAMREC code). This section is based on the SAMREC description.

21 More than 90% of emissions in the Highveld Priority Area are ascribed to Eskom’s emissions.

Forming the future: the Chamber of Mines' scenarios

We now turn to a more sustained example of this type of narrow and unreal thinking about coal. The Chamber of Mines has represented mining capital in South Africa since its founding in 1887. It has invented and overseen the migrant labour system, the digging up of gold, the creation of the uranium disaster on the Rand, the Anglo-Boer War, and a history in which cheap and dirty coal served the extraction of gold, later the expansion of the railways and steel industries. It could rightly be called the nerve centre of the Minerals Energy Complex. Its final report on coal under the “Chamber of Mines” banner²² is frankly presented as a response to the turn against coal – in South Africa and globally (Chamber of Mines 2018). What interests us here is to see how it understands the turn against coal, that is, the urgent necessity to stop mining and burning coal. In this report, the coal industry is portrayed as a victim of newly emergent “negative views on coal and its impact on the environment”:

The Chamber of Mines Coal Leadership Forum, consisting of coal executives, commissioned a report to determine what needs to be done to increase the profile of the coal mining industry in the face of seemingly ineluctable negative public opinion around the use of coal in industrial processes. Negative views on coal and its impact on the environment have resulted in a precipitous decline in the use of coal by the major economies of the world. Because of coal's contribution to greenhouse gas (GHG) emissions, many jurisdictions including South Africa have put in place strict environmental laws which have affected demand for coal.

Titling this publication “A National Coal Strategy for South Africa” – when it was commissioned by “coal executives” (2018: 1) – is a continuation of the exclusion of many other groups affected by coal, from decision making about it. One needs to ask: what would a national coal strategy look like if formulated outside the coal industry, for example by communities affected by coal, or by climate change experts? So this is not a strategy for South Africa, it is a strategy for the coal industry to continue despite the constraints imposed by a turn against coal. Its aim is to provide tactical advice by sketching four scenarios and “[c]orresponding to each scenario, actions that need to be taken by stakeholders to either mitigate the impact or take advantage of the opportunities presented by each future” (2018: 2). Such actions include direct lobbying against carbon tax (thus retarding the move from a carbon-intensive economy), against the “strict application” of environmental regulations (that is, working against the protection of public health, for example by fighting to drastically lower air pollutant emission



Johannesburg, 20 September 2019. Photo: Victor Munnik

standards), and against the expansion of renewables (thus denying South Africa energy alternative to coal). It also includes a stubborn defense of “clean coal” although these technologies are completely unlikely to work in South Africa, thus reducing them to rhetorical devices intended to buy time to profit from coal for longer (see below).

The scenarios reflect the understandings of the captains of the SA coal industry of the challenges they face as the result of the growing turn against coal. Five “key uncertainties” underlie the scenarios (2018: 19): **policy and regulation** (primarily environmental regulation and carbon tax); **access to capital** (the strategy does not directly mention divestment campaigns but refers to decisions e.g. of the World Bank not to invest in coal); **inadequate infrastructure** (by which the authors lobby for investment in rail expansion and inter-basin water transfers particularly in the Waterberg, to support the expansion of coal, which will result in both coal lock-ins and stranded assets); (clean coal) **technologies** developed on time and at low enough cost to be competitive; and **access to land** (competition with agriculture and manufacturing and not, as one may expect, refusal of mining by affected communities).

The Chamber of Mines scenarios are closely concerned with influencing public opinion. In one scenario, coal falls out of favour with the public (and coal use declines), in another, “a shift (in public opinion) to other economic, social and political issues tends to favour coal”: in other words, public opinion is distracted from climate change, air quality and related issues. Is the Chamber suggesting that the coal industry should actively intervene in public opinion to orchestrate such distraction, for example through denying the urgency of climate change? The strategy also hopes for a slow development of renewable energy technologies, and a turn in public opinion against renewables.

22 It now calls itself the Minerals Council South Africa.

#Scenario 1: Coal extinguisher (-1%)

This is a nightmare scenario for the coal industry, in which it is “disenfranchised to the point of near obsolescence”, as the result of public opinion turning against coal, environmental and water regulations that “stifle coal use”, renewable energy technologies that “improve to the point of offering base load, in particular CSP (Concentrated Solar Power)²³ technologies”, a quantum leap in battery technologies for renewables, and an escalation in water scarcity while no new infrastructure (inter-basin water transfers) is developed. In this scenario, it is subsidies that ensure that renewables industry surpass coal in power generation. Further: “Since renewables are capital intensive, with no proper and well-implemented localisation strategy, the loss of jobs in the coal industry has not been accompanied by equal or more jobs created in the renewables industry.” The results are a “two thirds” decline in national consumption, while “coal prices collapse endangering the continued survival of many producers. Under this scenario, coal mining communities suffer the most as people lose jobs and companies close. This causes not just economic and social strife, but political stability is at risk as supplier industries for the coal industry collapse and jobs are shed.”

What this scenario describes is a mindless, unplanned transition from coal. Several assumptions do not hold, however: the coal industry receives more subsidies (directly and in terms of negative externalities including pollution, health costs, massive investment in transport and water infrastructure) than renewables, there is no reason not to plan and localise the renewables industry – a renewables industry zone is planned for Mpumalanga, and there is good reason as well as political pressure to initiate an industrial strategy for renewables of which an important focus would be providing jobs for workers exiting the coal industry.

The job losses argument does not recognise the history of decline in jobs: employment peaked in 1981 and declined as the sector mechanised in the 1990s (Burton et al. 2019: 9). Coal-affected communities complain that they are excluded from jobs, as jobs became more specialised on open-cast mines, and because they fail health tests (“red tickets”) as a result of growing up in polluted areas. Most of all, this scenario ignores the need for renewables as an alternative to climate change – unless the acknowledgment of a powerful public opinion is an almost imperceptible nod in that direction. It leaves out the reason why it is reasonable and urgent to move away from coal use, namely climate change!

#Scenario 2: Trudge along (1%)

This is a “mixed bag” scenario in which coal demand and production slows down but remains positive. Renewable technologies lose political support. They develop more slowly than expected, especially battery technology, although a carbon tax is introduced and access to land becomes a “contentious issue” (mainly from competition from agriculture). However, the Waterberg inter-basin transfer²⁴ is built, a massive scheme that would pollute not only the Waterberg but also the entire Limpopo river, government refrains from criticising coal while abiding by international commitments “by way of introducing the carbon tax”.

What is the thinking behind the possibility that renewables would lose political support? Does the coal industry “win” political support? Does this rest on climate denialism (the denial of climate science)? What would be the effects of the coal lobby winning a policy battle for continued use of coal in the face of climate change? At a minimum, it shows a disregard for the impacts on ecosystems and people of rising climate change. The authoritative IPCC report on a 1.5 degree climate change future indicates an earth that is almost uninhabitable with rising sea levels, floods, droughts, hurricanes, mass migration of climate refugees and breakdown of social and economic systems.

#Scenario 3: Status quo (2.3%)

Between 1980 and 2015, growth in coal production averaged 2.3%. This scenario assumes that clean coal technologies gain ground while everything else remains the same. For example, there is no carbon tax and Eskom’s procurement policy does not change.

There is already a carbon tax, albeit a low one. The question is about the likelihood of clean coal technologies, such as carbon capture and storage (CCS) and high efficiency, low emissions (HELE). CCS under South African conditions would require at least a third of the energy produced by the coal burnt – making any investment in new coal wildly uncompetitive with new renewables²⁵. Even the CoM coal strategy itself states that “CCS is not a commercially-viable technology to employ at the moment” (2018: 15), and that “most HELE coal power plants make use of higher grade coal (than South African exports)”. Eskom’s power stations burn a lower quality coal than is exported, so HELE in practice in South Africa would require extensive retrofitting if not new build, which would also not meet the official “least cost” requirement of current South African energy planning.

23 Concentrated Solar Power resembles coal power in terms of scale, i.e. delivering large quantities of electricity from a huge, single point installation.

24 Mokolo Crocodile Water Augmentation Project (MCWAP). See Hallowes and Munnik (2018).

25 ee.co.za/article/the-myth-of-clean-coal-why-coal-can-only-ever-be-dirty.html.

Scenario 4: Firefighter (5%)

This scenario assumes a major leap in clean coal technologies and an increase in export demand leading to increased investment. Government policy is also assumed to be supportive of the industry. This is a more intense form of scenario 3. Clean coal technologies are unlikely to the point that they appear as mere rhetoric, although it is possible that government policy could remain supportive of the industry.

There are other signs of a turn against coal – the current and future change in export markets (especially India), the SA Integrated Resource Plan 2018 (and the debates around it), all pointing to a reduced role for coal, as well as the troubled electricity parastatal Eskom, facing collapse of the distribution system, financial collapse, construction and operational problems with its two last coal-fired power stations, Medupi and Kusile, depletion of coal in the central basin, and the challenges of a just transition in a current National Development Plan process contemplating and consulting on a low-carbon future. There are also important shifts in energy economics, not acknowledged in this strategy, including that new renewables have become cheaper than new coal (see Burton et al. 2019).

The most troubling aspect of the Chamber of Mines' discursive strategy is the complete absence of any understanding of the environmental and social costs of coal – in other words, of why the coal industry has run into trouble. A number of other aspects show how the coal industry deals with nature and society as ghostly figures. The "social licence to mine" and SLPs are impoverished figures for society. Maybe the largest – and most long-lasting – sign of such impoverishment is the treatment of closure plans, the legacy of destroyed and unrehabilitated landscapes and river catchments that the mining industry will leave behind. Finally, the coal industry is no passive participant. It not only actively fights to prolong the life of coal, it also exercises control over knowledge of coal, for example in the research done by Coaltech (funded by a mixture of public and coal industry funds) which keeps the knowledge so produced inaccessible to its critics (Hallows and Munnik 2016).

5. The turn against coal, and life after coal

As in other unreal²⁶ discursive formations, that which is repressed, returns – in this case as climate change and anti-coal activism. In April 2014, a group of communities affected by coal came together with activist NGOs in a forum called Push Back Coal, aimed at sharing information and co-ordinating action resisting coal and working for a transition away from fossil fuels²⁷. It included groundWork, Earthlife Africa, CER, Greenpeace, WWF, ActionAid, Mining Affected Communities United in Action, Women Affected by Mining United in Action, WOMIN, Vaal Environmental Justice Alliance, Highveld Environmental Justice Network, Southern African Green Revolutionary Council, 350.org, some representatives from labour (mostly researchers, for example from Naledi) and academics. In September 2018, groundWork, one of the convenors, produced a collection summarising research work done by participants, amounting to more than sixty publications. It was entitled "Coal Kills: Research and Dialogue for a Just Transition". Much of what is described as the activist turn against coal can be read in these publications, and much of the work for environmental and climate justice has been done by these organisations. In the process they have produced the components for the new analytical framework described in this report.

A core alliance emerged as the "Life After Coal" campaign, driven by groundWork, Earthlife Africa and CER. "Life after Coal" poses the question of how to move from resistance against coal, to a just transition. This poses a series of new questions that are treated here as the provisional conclusion of the report²⁸. A fundamental question frames this debate, and calls for new knowledges and ways of thinking, way beyond the framework of the coal industry and its supporters in the mainstream: what is the scope of the Just Transition? Is it an energy transition that can rely on new technologies to proceed with a largely untransformed social and economic system? Does it include social transformation, and if so, what is its nature? Much of this is treated elsewhere, and there is a flood of discussion on this topic.²⁹

A framework based on environmental justice will first ask what community agendas for a just transition may be. It will start from a commitment to cognitive justice; that is the recognition and respect of different knowledges (Visvanathan 2009; 2005). It is not as if community voices

26 Irrealism denies or suppresses necessary aspects of reality (Engholm in Hartwig (ed) 2007)

27 Activism against mining and climate change is not new in South Africa, see Abugre 1993, Clarke 1991 and Earthlife Africa 2002.

28 A full account of the knowledge work that is needed is not possible within the scope of this report, but is the topic of ongoing work at SWOP.

29 See for example the Just Transition page on the Life After Coal website lifeaftercoal.org.za/about/just-transition.

have to be created: activists grapple with these issues on a daily basis. The depth of involvement was clear from an unforgettable play scripted and performed by Mpumalanga Youth Against Climate Change. In this play, climate change, the fate of the mine-polluted Olifants river, environmental decay and corrupt politicians were melded into a powerful and haunting performance. The question is really to strengthen such voices and support their access to transition debates, and to make available – or create from scratch – knowledges that support community agendas. Thinking about the future can and should be “utopian”, in the technical sense of engaging the task “to imagine alternative ways of life that would be ecologically and socially sustainable and enable wider and deeper human happiness than is now possible” (Levitas 2017: 10), or in the language of the World Social Forum “Another Future is Possible”.

For an analytical framework the question is also: what perspectives and knowledges are needed for strong community voices? What does it have to deal with? At a recent national coal exchange meeting (Middelburg, July 2019) the following building blocks emerged. They require us to think in new ways about not only energy, but also society, economics, food, how we relate to soil ecosystems etc. A Just Transition requires a transition to a democratic order supported by an economy based on economic, social and environmental justice, not growth. Resources for 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 is 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, require new ways of thinking about production and consumption.

The coal economy will leave extensive damage behind, which will require the rehabilitation of mines and mining regions. In the current fight for the phase-out of coal, the damage that mining has done appears in the form of an argument against coal, and intense debates about financial provisions made by coal companies and the government for rehabilitation. During and after the transition, the focus will be on means of rehabilitation, such as agro-ecology which can provide not only food but farming systems that rebuild the soil. Such as approaches have long-term potential for absorbing excess carbon from the atmosphere, although not nearly enough to allow for continued CO₂ emissions (Scholes et al. 2015). Communities argue that the transition should start where coal has done the most damage. Communities whose opportunities have been destroyed by coal – for example contamination of water resources – need to benefit first. This implies developing a geography of coal damage. It is urgent to protect people’s health through improved

public health care, and deal with coal regions coal-related health burdens.

The end of coal will happen in a context of increasing climate change. Reconstructing settlements (infrastructure and services) to deal with climate change-intensified storms and droughts will call on all the resources of architects, planners and ordinary people. Some writers forecast a collapse of governance and production systems, especially those in cities, and a resulting “reruralisation” of economic and food systems (Bradford 2019). New demands will be made on national, provincial and local governments, who are already failing to provide services such as drinking water, waste management, health and environmental protection. Already weak South African local governments and national departments will need to look to increased community participation to make systems work, for example in water, where new approaches such as Multiple Use Systems offer possibilities of more integrated planning and local participation (see Van Koppen et al 2009). A healthy food system based on ecological agriculture and enough food for all, should be the objective of building knowledge in agriculture. It should be based on diverse landscapes and polycultures (Altieri et al. 2015).

The future depends crucially on building a new energy system, accompanied by a new approach to ownership, namely socially owned renewables. Community-owned renewables can provide energy or income from the sale of energy. Renewables will require economic thinking that supports this approach, including strategies to create jobs in manufacturing them, in the places where these jobs are needed. Managing the transition will include protecting the incomes of retrenched workers. But the transition is not only about energy. The future will need energy efficient homes e.g. with solar heaters, and people comfortable with minimal energy use. It will need a new spatial order: there will need to be planning to put work and amenities within people’s reach, make walking and cycling easy options, with safe reliable public transport for longer trips.

These are the first building blocks for alternative futures emerging from community dialogues and research that supports them, a process that is just beginning. For our ongoing task here is nothing less than to support the imagination and realisation of “alternative ways of life that would be ecologically and socially sustainable and enable wider and deeper human happiness than is now possible” (Levitas 2017: 9).

REFERENCES

- Abugre, C., 1993. Introduction – Perspectives on the Earthlife Conference. In Hallows, D. (ed). *Hidden Faces. Environment, Development, Justice: South Africa and the Global Context*. Earthlife Africa. Pietermaritzburg.
- ActionAid, 2018. Mining in South Africa 2018. Whose benefit and whose burden? ActionAid South Africa. Johannesburg.
- Adger, W.N, Benjaminsen, T., Brown K. and Svarstad, H., 2001. Advancing a Political Ecology of Global Environmental Discourses. *Development and Change* Vol 32 (2001), 681-715. Institute of Social Studies. Blackwell Publishers, Oxford.
- Altieri, M., Nicholls, C., Henao A., Lana, M., 2015. Agroecology and the design of climate change-resilient farming systems. *Agron. Sustain. Dev.* (2015) 35:869-890.
- Ashton, P., Love, D., Mahachi, H. and Dirks, P., 2001. An overview of the impact of mining and mineral processing operations on water Resources and water quality in the Zambezi, Limpopo and Olifants catchments in Southern Africa. *Mining, Minerals and Sustainable Development*. (MMSD). Pretoria and Harare.
- Babbie and Mouton, 2012. *The practice of social research*. Oxford University Press. Cape Town.
- Baker, L., 2016. *Post-apartheid electricity policy and the emergence of South Africa's renewable energy sector*. United Nations World Institute for Development Economics Research. Helsinki.
- Ballim, F., 2017. *The Evolution of Large Technical Systems in the Waterberg Coalfield of South Africa: From Apartheid to Democracy*. PhD Thesis, University of the Witwatersrand. Johannesburg.
- Bendell, J., 2018. *Deep Adaptation: A Map for Navigating Climate Tragedy*. IFLAS Occasional Paper 2. mahb.stanford.edu/...pdf.
- Bhaskar, R., 2010. Contexts of interdisciplinarity: interdisciplinarity and climate change. In Bhaskar, R., Frank, C., Høyer, K. Næss, P and Parker, J. (eds). *Interdisciplinarity and climate change. Transforming knowledge and practice for our global future*. Routledge. London.
- Bijker, W., 1997. *Of Bicycles, Bakelites and Bulbs. Toward a Theory of Sociotechnical Change*. MIT Press. Cambridge, Massachusetts and London, England.
- Bignaut, J., S. Koch, J. Riekert, R. Inglesi-Lotz and N. Nkambule, 2011. *The external cost of coal-fired power generation: The case of Kusile*, Report by Business Enterprises at University of Pretoria, for Greenpeace Africa and Greenpeace International. Johannesburg.
- Blommaert, J., 2001. Investigating Narrative Inequality: African Asylum Seekers' Stories in Belgium. *Discourse and Society* 12(4):413-449. November 2001.
- Bonneuil, C. and 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. postcarbon.org/future-is-rural.
- Burawoy, M., 2007. Open the social sciences. To whom and for what? *Portuguese Journal of Social Science*. 6 (3) 137-146
- Bureau for Food and Agriculture 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. Pretoria.
- Burton, J., Marquard, A., McCall B., 2019. *Socio-economic Considerations for a Paris Agreement-Compatible Coal Transition in South Africa*. Energy Research Centre, University of Cape Town.
- Capra, F. and Jakobsen, O.D., 2017. A conceptual framework for ecological economics based on systemic principles of life. *International Journal of Social Economics*, Vol. 44 Issue: 6, pp.831-844. doi.org/...
- Cardoso, A. and Ethemcan Turhan, E. 2018. *Political ecology of the new geographies of coal: the coal chain between Colombia and Turkey*. Rosa Luxemburg Foundation. Bogota.
- Centre for Environmental Rights, 2019. Full Disclosure. The Truth about Water Use Licence Compliance at Mpumalanga Coal Mines. fulldisclosure.cer.org.za/...pdf
- Centre for Environmental Rights, 2017. Broken Promises. How the declaration of the Highveld Priority Area for air pollution has failed to protect health, environmental rights and justice on the Highveld. cer.org.za/...pdf.
- Centre for Environmental Rights, 2016. Zero Hour. Poor Governance of Mining and the Violation of Environmental Rights in Mpumalanga. cer.org.za/...pdf
- Chamber of Mines, 2018. National Coal Strategy for South Africa. mineralscouncil.org.za/...
- Clarke J., 1991. The Insane Experiment. Tampering with the Atmosphere. In Cock J., and Koch, E. 1991. *Going Green. People, politics and the environment in South Africa*. Oxford University Press. Johannesburg.
- Cock, J., 2018. How the environmental justice movement is gathering momentum in South Africa. theconversation.com/...
- Cock, J., 2019. *Resistance to coal and the possibilities for a just transition in South Africa*. SWOP, University of the Witwatersrand.

- Coetzee, H. Hobbs, P.J., Burgess, J.E., Thomas, A., Keet, M., Yibas, B., Van Tonder, D., Netili, F., Rust, U., Wade, P. and Maree, J., 2010. Minewater management in the Witwatersrand goldfields with special emphasis on acid mine drainage. Report to the inter-ministerial committee on acid mine drainage. December 2010. Council for Geoscience. Pretoria.
- Cote, M. and A.J. Nightingale, 2012. Resilience thinking meetings social theory: Situating social change in socio-ecological systems (SES) research. *Progress in Human Geography*. Volume: 36 issue: 4. Pp. 475–489. August 1, 2012
- De Coning, C. and Sherwill, T., 2004. An Assessment of the Water Policy Process in South Africa (1994 to 2003). Water Research Commission, WRC Report No TT232/04. Pretoria.
- Deedat, H., 2018. The mining-energy nexus, climate change and prospects of a just transition: Reflections of a labour educator. In Valiani, S., *The Future of Mining in South Africa: Sunset or Sunrise?* MISTRA. Johannesburg.
- Dreyer, C., 2012. The Waterberg Coalfield. Addendum C. In *Council of Geoscience, 2012. Coal Resources and reserves of South Africa*. Pretoria.
- Eberhard, 2011. The Future of South African Coal: Market, Investment and Policy Challenges. Working Paper 100, Freeman Spogli Institute for International Studies. fsi-live.s3.us-west-1.amazonaws.com/...pdf
- Fairclough, N., 1989. *Language and Power*. London: Longman.
- Fairclough, N., 1992. *Discourse and Social Change*. Polity Press. Cambridge.
- Fine, B., and Rustomjee, Z., 1996. *The Political Economy of South Africa: From Minerals Energy Complex to Industrialisation*. Witwatersrand University Press.
- Fioramonti, L., 2013. *Gross domestic problem: The Politics Behind the World's Most Powerful Number*. Zed Books. London and New York.
- Fioramonti, L., 2017. *Wellbeing Economy: Success in a World Without Growth*. McMillan. Johannesburg.
- Freund, B., 2009. The significance of the mineral-energy complex in the light of South African economic historiography. *Transformation* 71 (2009) 3–25.
- Frodeman, R., Klein, J.T. Dos Santos Pacheo, R. 2010. *The Oxford Handbook of Interdisciplinarity*. Oxford University Press. Oxford.
- 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*. Melville House. New York.
- Greenberg and Park, 1994. Political Ecology. *Journal of Political Ecology*, 1, 1–12. journals.uair.arizona.edu/...
- GroundWork, 2018. Coal Kills. Research and Dialogue for a Just Transition. Pietermaritzburg.
- Habermas, J., 1996. *The Structural Transformation of the Public Sphere*, MIT Press. Cambridge, Massachusetts and London, England.
- Hallowes, D., 2014. *Slow Poison: Air Pollution, Public Health and Failing Governance*. groundWork. Pietermaritzburg.
- Hallowes D and Butler, M., 2002. Power, Poverty, and Marginalized Environments: A Conceptual Framework, in MacDonald, D. (ed). *Environmental Justice in South Africa*, Cape Town: UCT Press. Pp 51–77.
- Hallowes, D and Munnik, V., 2016. *The Destruction of the Highveld, Part One: Digging Coal*. groundWork. Pietermaritzburg.
- Hallowes, D and Munnik, V., 2017. *The Destruction of the Highveld, Part Two: Burning Coal*. groundWork. Pietermaritzburg.
- Hallowes, D and Munnik, V., 2018. *Boom and Bust in the Waterberg. A history of coal mega projects*. groundWork. Pietermaritzburg.
- Hancox, J. and Goetz, A., 2014. South Africa's coalfields – A 2014 perspective. *International Journal of Coal Geology* 132 [2014] 170–254.
- Hansen, J., 2016. Dangerous Scientific Reticence. Blog, 23 March 2016. csas.ei.columbia.edu/...
- Hartwig, M., 2007. *Dictionary of Critical Realism*. Routledge. London.
- Henderson, H., 1996. *Creating Alternative Futures. The End of Economics*. Kumarian Press. West Hartford, CT.
- Herman, E.S. and Chomsky, N., 1994. *Manufacturing Consent. The Political Economy of the Mass Media*, Vintage Press. London.
- Holland, M., 2017. Health impacts of coal fired power plants in South Africa. Report to groundwork and Health Care Without Harm. Pietermaritzburg.
- Holifield, R., 2015. Environmental justice and political ecology. In Perreault, T., Bridge, G., McCarthy, J. (eds). *Routledge Handbook of Political Ecology*. Routledge. London.
- Kovel, J., 2002. *Enemy of Nature*. Zed Books. London and New York.
- Lang, J., 1995. *Power Base. Coal Mining in the Life of South Africa*. Jonathan Ball. Johannesburg.
- Leff, E., 2015. Political Ecology: A Latin American Perspective. *Encyclopedia of Life Support Systems (EOLSS)*. revistas.ufpr.br/...
- 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. cusp.ac.uk/.../05-Ruth-Levitas-Essay-online.pdf.

- Lukes, S., 2005 [1974]. *Power: A Radical View*. Palgrave MacMillan. Basingstoke.
- Lurie, J., 2013. *South African Geology. For Mining, Metallurgical, Hydrological and Civil Engineering*. Lupon Publishing. Johannesburg.
- Makgato S and Chirwa, E. 2017. Waterberg coal characteristics and SO₂ minimum emissions standards in South African power plants. *Journal of Environmental Management* 201 (2017) 294 -302.
- Magdoff, F and Foster, J.B. 2011. *What Every Environmentalist Needs to Know about Capitalism*. Monthly Review Press. New York.
- Magubane, B.M. 2007. *Race and the construction of the dispensable other*. University of South Africa Press, Pretoria.
- Maree, J., Van Tonder, G., Van Niekerk, A. and Naidoo, C., 2000. *The collection, treatment and utilization of water accumulated in the coal mines located in the Upper Olifants River Catchment*. The South African Institute of Mining and Metallurgy, 2000. Paper first published at SAIMM Conference, Coal—The Future, 12th International Conference on Coal Research, September 2000.
- Martinez-Alier. 2002. *The environmentalism of the poor*. World Summit on Sustainable Development, UNRISD & University of the Witwatersrand. Paper prepared for the conference on The Political Economy of Sustainable Development: Environmental Conflict, Participation and Movements. unrisd.org/.../MartinezAlier.pdf
- Martinez-Alier J., Anguelovski I., Bond P., Del Bene D., Demaria F., Gerber J.-F., Grey L., Haas W., Healy H., Marín-Burgos V., Ojo G., Porto M., Rijnhout L., Rodríguez-Labajos B., Spangenberg J., Temper L., Warlenius R. and Yáñez, I., 2014. Between activism and science: grassroots concepts for sustainability coined by Environmental Justice Organizations. *Journal of Political Ecology* 21: 19–60. jpe.library.arizona.edu/.../Martinez-Alier.pdf.
- McAdam, D, Tarrow, S and Tilly, C., 2001. *Dynamics of Contention*. Cambridge University Press. Cambridge.
- McCarthy T., and Pretorius, K., 2009. Coal Mining on the Highveld and its implications for future water quality in the Vaal River system. *Proceedings of the International Mine Water Conference 19–23 October 2009*. Proceedings ISBN Number: 978-0-9802623-5-3. Pretoria, South Africa
- Munnik, V. with G. Hochmann and M. Hlabane, 2009. *The social and environmental consequences of coal mining – A South African case study*. Environmental Monitoring Group. Cape Town.
- Munnik, V., 2016. Steel Valley and the absence of environmental justice in the new South Africa: Critical realism’s kinship with environmental justice. In Price, L. and Lotz-Sisitka (eds). *Critical Realism, Environmental Learning and Social-Ecological Change*. Routledge, London.
- Munnik, V., Humby, T., Van der Waals, J., Houdet, J., Thompson, G., Keighley T., Cobbing, B., and Palmer, C.G. 2017. Developing a multi-sectoral integrative licensing and monitoring framework to align and integrate biodiversity and environmental water quality in the coal mining development life-cycle. WRC Report K5.2355 Water Research Commission. Pretoria.
- Muthige, M., 2013. *Ambient air quality impacts of a coal-fired power station in Lephalale area*. MSc Thesis, University of the Witwatersrand.
- Myllyvirta, L., 2014. *Health impacts and social costs of Eskom’s proposed non-compliance with South Africa’s air emission standards*. Greenpeace International. Amsterdam.
- Nkosi, M., 2011. *Mining Deep. The Origins of the Labour Structure in South Africa*. DavidPhilip. Cape Town.
- Norrie, A., 2010. *Dialectic and difference. Dialectical critical realism and the grounds of justice*. Routledge. London.
- Norton, B.G., 2003. *Searching for Sustainability: An Interdisciplinary Philosophy of Conservation Biology*. Cambridge University Press. Cambridge.
- Ntswana, N. and Samantha Hargreaves, S., 2017. ‘No longer a life worth living’. *Mining impacted women speak through participatory action research in the Somkhele & Fuleni communities, Northern Kwazulu Natal, South Africa*. WOMIN. Johannesburg. womin.org.za/...pdf.
- Peek, B. 2018. Introduction. In *Coal Kills. Research and Dialogue for a Just Transition*. groundWork, Pietermaritzburg.
- Polanyi, 1957 [1944]. *The Great Transformation*. Beacon Press. Boston.
- Pretorius, I., 2015. *Impacts and control of coal-fired power station emissions in South Africa*. PhD Thesis Northwest University. repository.nwu.ac.za/...
- Qadar, N., 2009. *Catastrophe Narratives*. New York: Fordham University Press.
- SAMREC 2016. *The South African code for the reporting of exploration results, mineral resources and mineral reserves (the SAMREC code)*.
- Santos, de B.S., 2014. *Epistemologies of the South: Justice Against Epistemicide*. Boulder: Paradigm Publishers.
- Sayer, A., 1984. *Method in Social Science: a realist approach*. Hutchinson. London.
- Scholes, B, Scholes, M, and Lucas M., 2015. *Climate Change. Briefings from Southern Africa*. Wits University Press. Johannesburg.

Scorgie, Y. and Thomas, R., 2006. Eskom Mpumalanga Highveld Cumulative Scenario Planning Study. *Air Pollution Compliance Assessment and Health Risk Analysis of Cumulative Operations of Current, RTS and Proposed Eskom Power Station Located within the Mpumalanga and Gauteng Provinces*. Report No.: APP/06/ESKOM-05 Rev 1.0. October 2006. Eskom. Johannesburg.

Singleton, T., 2010. *The decision to install flue gas desulphurisation on Medupi power station: identification of environmental criteria contributing to the decision making process*. MSc thesis, University of the Witwatersrand. core.ac.uk/...pdf.

Skosana, D., 2019. *Grave Matters: Dispossession and the desecration of ancestral graves by mining corporations in Tweefontein (Ogies), South Africa*. SWOP, University of Johannesburg.

Snow, D.A., and Benford, R.D., 1988. Ideology, frame resonance and participant mobilisation. *International Social Movement Research*, Vol. 1. pages 197–217. In Klandermans, B., Kriesi, H., and Tarrow, S., (eds) *From structure to action: comparing social movement research across cultures*. Jai Press. Greenwich, Connecticut.

Snow, D., Vliegthart, R., and Ketelaars, P., 2019. The framing Perspective on Social Movements: Its Conceptual Roots and Architecture. In *The Wiley Blackwell Companion to Social Movements*, Second Edition. Snow, D. Soule, S. Kriesi, H. and McCammon, H., (eds) John Wiley & Sons.

Sorrell, S., 2017. *Explaining Sociotechnical Transitions: A Critical Realist Perspective* (June 14, 2017). SWPS 2017-11. Available at SSRN: ssrn.com/... or dx.doi.org/...

Swilling, M., Musango, J., and Wakeford, J., (eds) 2016. *Greening the South African Economy. Scoping the Issues, Challenges and Opportunities*. UCT Press, Cape Town.

Third World Network Info Service on Climate Change. Great work of the Climate Fund should be narrative for doubling resources. 12 July 2019. Third World Network. Penang. twn.my/...

Tyson, P. D., Kruger, F. J. and Louw C. W., 1988. *Atmospheric Pollution and its implications in the Eastern Transvaal Highveld*, South African National Scientific Programmes, Report No. 150, CSIR, Pretoria.

Van Koppen, B., Smits, S., Moriarty, P., Penning de Vries, F., Mikhail, M., and Boelee, E., 2009. *Climbing the Water Ladder. Multiple-use water services for poverty reduction*. IRC, International Water Sanitation Centre and IWMI. The Hague.

Visvanathan, 2009. The Search for Cognitive Justice. In *Seminar Magazine # 597* May 2009, Knowledge in Question. A symposium on interrogating knowledge and questioning science. Online at india-seminar.com/...

Visvanathan, 2005. Knowledge, Justice and Democracy in Leach, M. and Scoones (eds). *Science and Citizens, Globalization and the Challenge of Engagement*. Zed Books.

WWF 2011, *Coal and Water Futures in South Africa. The case for protecting headwaters in the Enkangala grasslands*. WWF Report. awsassets.wwf.org.za/...pdf.

Zinecker, A., Gass, P., Gerasimchuk, I., Jain, P., Moerenhout, T., Oharenko Y., Suharsono A., and C. Beaton. 2018. *Real People, Real Change – Strategies for just energy transitions*. International Institute for Sustainable Development. Winnipeg, Manitoba.