Facing coal: changing conceptions of South African coal-based pollution, with special reference to the Witbank coalfield, 1906-1978

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African Studies Centre
African Studies Collection, Vol. 31

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Changing conceptions of South African coal-based pollution, with special reference to the Witbank coalfield, 1906-1978

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Cover design: Heike Slingerland
Cover photo: "Residents collect pieces of low-grade bituminous coal found along the ash heap of abandoned mine dumps of the old Coronation Colliery, Witbank" [Michal Singer]

Printed by Ipskamp Drukkers, Enschede

ISSN: 1876-018X
ISBN: 978-90-5448-103-4

Preface

This book is the winner of the Africa Thesis Award 2010. The jury's report included the following comments:

> "Michal sketches a historically informed picture of how perspectives of coal and coalmining in particular have changed over the years, from a source of wealth and comfort to a major polluter. (…) Interesting in Michal's approach is that she tries to locate and contextualise the concept of 'pollution' both in the domain of the general public as well as in the domain of the production of scientific knowledge on pollution. The perspectives of the general public were particularly informed by literally seeing, smelling, hearing the physical evidence of air pollution, destruction of land, and underground fires. (…) The jury of the Africa Thesis Award was unanimous in their opinion that Michal Singer's thesis is of the utmost societal relevance, not only in South Africa, but actually worldwide. (…) To conclude: the thesis is solidly structured, well-written, lavishly referenced, and has a clear scientific point to make as the above makes clear. On this basis the jury was unanimous in its decision to award Michal Singer the Africa Thesis Award 2010."

For all the arts of peace coal is needed;
if war breaks out it is needed all the more. In time of revolution the miner must go on working or the revolution must stop, for revolution as much as reaction needs coal.

– George Orwell, *Down the Mine*

*

Obtain at last that the reward of your toil may come to you in its entirety
…
Yes! That all the sweetness of the air, all the rays of the sun and all the invitations of happiness may be at last allowed to reach you.

– Andre Gide, *Fruits of the Earth*

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Acknowledgements

This book would have neither been conceived nor completed without the invaluable supervision of Professor Peter Delius, whose belief in my work has been a profound inspiration. Thank you for guiding me along this bewildering journey with so much understanding and patience. I am indebted to Dr Muchaparara Musemwa for taking a keen interest in my work so far along the way, and for reminding me of the sublime joy that can be gained from the study of nature, even in its most abject form. Dr Musemwa originally suggested I submit my thesis to the African Studies Centre in June 2010. If it was not for the efforts of him and his wife, Doreen, none of this would have happened.

Thank you to the 2010 jury of the Africa Thesis Award, including Dr Harry Wels (Free University, Amsterdam) (chair), Dr Jan Kees van Donge (African Studies Centre), Dr Jan-Bart Gewald (African Studies Centre), Alice Kubo, MA (Child Helpline International) and Dr Bridget O'Laughlin (International Institute of Social Studies). Winning the Africa Thesis Award was something I could never have anticipated. Upon my arrival in Leiden, I was told by Dr Jan-Bart Gewald that I was the first African-born winner of the award. (I hope that I am not the last!) As far as I can tell, I have never been first among Africans to do anything, and this makes me deeply proud. I was treated with such compassion and hospitality by the students and staff of the African Studies Centre during my stay: thank you *all*. The few days I spent in the Netherlands were momentous, an unforgettable experience which I will surely treasure in my memory.

The Wits History Department has been my intellectual womb for the past decade, and my gratitude is extended to the wonderful teachers, mentors, colleagues, students and friends that good fortune has granted me during my time there. I am grateful to the National Research Foundation (NRF) for its financial support of this study, and especially to Professor Philip Bonner and Dr Noor Nieftagodien, as well as the rest of the staff and students of the NRF Chair in History and History Workshop's 'Local Histories, Present Realities' Programme, for their ongoing support and encouragement.

My thesis was examined by Dr Clive Glaser and Dr Jane Carruthers, two esteemed historians whose ongoing support has enriched my experience of the discipline. I am grateful to Jane for her kind words, in particular, to the late Dr Ivan May, President of the Convocation of Wits University, with whom I had the pleasure of meeting in person upon my return from the Netherlands, little over a month before he passed away.

Numerous archives and libraries were consulted over the course of my research. Thank you to the staff of the National Archives of South Africa, the Anglo American Library, the South African Jewish Board of Deputies Archive, and both the Pretoria and Cape Town branches of the National Library of South Africa. A number of the libraries of the University of the *Witwatersrand* were accessed, and gratitude is extended to the helpful staff of the Wartenweiler Library, William Cullen Library, the Wits Health Sciences Library (Medical School), the Geosciences and Mathematics Library and Jan Smuts House.

Particular thanks are extended to Zita Goldswain of the *Witbank News* for granting me access to the newspaper's collection of archival and photographic material. This has been lovingly preserved as a keepsake of the town's past. Some of these are reproduced here with permission. My deepest gratitude is extended to Colin Phillips for his time and energy in drawing up graphs. Thanks are especially extended to Micah Roshan Reddy and De Villiers Du Toit for their assistance.

My research took me on an adventure through Limpopo (in Penge and Mafefe), Mpumalanga (in Polokwane, Mokopane, Witbank, Kwa Guqa, Lake Chrissie, Carolina and Kwachibikulu), Gauteng (in Pretoria and Johannesburg) and the Western Cape (in Cape Town). The people I met along the way were wonderful, and particular thanks are extended to Professor Terence McCarthy, Dr Koos Pretorius, Christelle Pauw, Isaac Mampane, Malcolm Suttill, Mariette Liefferink, Le Clus Taute, Lance Greyling, Elphus Nkosi and Hannes Botha for sharing their knowledge and experience. I hope that my work may serve the struggle of a brave new South African environmental movement.

I am eternally indebted to my parents, Ada and Norman, my siblings, Moshe and Ruth, my grandmothers, Lily Singer and Rivka Lindenberg, as well as my extended family, for their unwavering devotion and support. I wrote this during a time of tremendous upheaval in my life, and I am grateful to those special friends and colleagues who gave me encouragement and companionship.

I wrote this with love, sweat and tears, in memory of all the lives that have been affected, and too often destroyed, by the South African mining industry.

Abbreviations

AMD	Acid mine drainage
APPA	Atmospheric Pollution Prevention Act (1965)
APPB	Atmospheric Pollution Prevention Bill
APOLCOM	Air Pollution Control Liaison Committee
CARE	Cleaner Air, Rivers and Environment Campaign
CSIR	Council for Scientific and Industrial Research
EPA	Environmental Protection Agency
ESCOM/ESKOM	Electricity Supply Commission
ICU	Industrial and Commercial Workers Union
ISCOR	Iron and Steel Corporation
MDR-TB	Multi-drug resistant tuberculosis
MLD	Mpumalanga Lakes District
MOH	Medical Officer of Health
NANS	United Nations for the Fight against Noise and Smog
NRDB	Natural Resources Development Board
NUM	National Union of Mineworkers
SANCO	South African National Civic Organisation
SANTA	South African National Tuberculosis Association
T&DB	Transvaal and Delagoa Bay Colliery
TCOA	Transvaal Coal Owners Association
TDS	total dissolved solids
VFTC	Victoria Falls and Transvaal Power Company
WHO	World Health Organisation

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Introduction

"I am known as the Coal City
No other land can rival my production
But I remain poor and destitute and my
People suffer the wound inflicted by the
Greedy."[1]

This work examines changing ideas about the environment in light of new knowledge arising from both scientific and environmental arenas. The 'state' of the Coal City described in the poem above has provided physical evidence of the severe impact of coal-based pollution in South Africa's carbon-rich Witbank coalfields. This book is based on a dissertation submitted to the Faculty of Humanities of the University of the Witwatersrand, Johannesburg, in South Africa, in February, 2010, in fulfilment of the requirements for the Degree of Master of Arts in History. The dissertation was supervised by Peter N. Delius and co-supervised by Muchaparara Musemwa.

The study explores the departure from positive perspectives of coal as a source of wealth and comfort, to more current anxieties based on knowledge of coal as a major polluter. This study covers the period between 1906 and 1978, when the increasing role of opencast coal production led to the exponential growth of the coal industry. It provides an historical analysis of changing ideas around coal and its environmental impact. Special reference to the Witbank coalfield between 1906 and 1978 provides a unique representation of how South African coal mining was perceived in the early twentieth century, particularly in revealing how these ideas were shaped by the appearance of different manifestations of coal-based pollution in the region.

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[1] Lucas Komana, 'Emalahleni', *Witbank News*, March 15, 2002

Each chapter provides a thematic representation of different aspects of coal-based pollution as they manifested over the course of the twentieth century. The first chapter highlights how early signs of environmental change were easily ignored by state and industry, owing to limited understanding of the broader impact of pollution, as well as the localized impact of early signs of pollution. The introduction of electricity by the early 1920s enabled the growth of the Witbank coal industry. The impact of this development is assessed in the second chapter, which explores how local industry was stimulated by the needs of the Second World War. This resulted in greater signs of pollution, and signaled a shift in the way pollution was understood in the region. National responses to intensified atmospheric pollution between the late 1940s and the mid-1960s resulted in the development of South Africa's first legislation related directly to the growing problem of pollution, the Atmospheric Pollution Prevention Act (APPA) of 1965. The third chapter provides insights into the way pollution was understood during this time by assessing the ideas that influenced the nature of the Act. The final chapter reviews responses to the APPA by the Witbank coal industry. It also explores the way in which water pollution was understood in light of the appearance of severe mine water pollution. The central concern of this study is to demonstrate an evolution of the ideas that shaped the way in which South African coal-based pollution has been conceived. The study thus reflects how and why these ideas have changed over time.

The moment that inspired the study in this direction took place in June 2007 at a public meeting which I attended held at the Lake Chrissie Lodge in Lake Chrissie, the historic village named after and founded on the shore of the largest fresh-water lake in southern Africa. This large pan also forms part of the eco-system of South Africa’s Mpumalanga Lakes District, threatened by the prospect of large-scale opencast coal mining throughout the Mpumalanga province. The tensions between different members of the local community underscored the political significance of issues around coal-based pollution, and sparked curiosity about how these conflicts emerged.[2]

Witnessing the way in which the local politics of a community were affected by the conflict of ideas around coal-based pollution inspired much of the research which took place over the course of this study. Preliminary interviews explored the local environmental politics and attempted to gauge perspectives on local attitudes towards coal mining and its environmental impacts.[3] This highlighted

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[2] Personal notes on discussion with Koos Pretorius, Lake Chrissie Lodge, Lake Chrissie, Mpumalanga, June, 2007

[3] See Interview with Christelle Pauw, Lake Chrissie, June 26, 2007; Interview with Mohammed Dindar, Lake Chrissie, June 26, 2007; Interview with Vusi Ngwenya, Kwachibikulu (Lake Chrissie), June 27, 2007; Interview with Nico Steinberg & Ane Steinberg, Lake Chrissie, June 28, 2007; Interview with Hannes Botha, Carolina, June 28, 2007.

the need for a unit of study that could reflect the historical evolution of ideas around coal-based pollution.

This book provides a critical study of changing conceptions of the environmental impact of South African coal mining, with special reference to the Witbank coalfield in Mpumalanga Province, in what was previously known as the Eastern Transvaal.[4] The choice of the Witbank region's heavily mined seams as a case study, dating back to the beginning of the twentieth century, was based on the extent to which mining activity has contributed to long-term environmental damage in the region. The period of study is thus framed by the long history of local coal mining activity in the region. This has also served in providing insight to the changing views of pollution over time, as they manifested in the region.

Responses to indications of severe coal-based pollution in the Witbank coalfields have contributed to growing global interest in the environmental hazards of coal mining. Of all fossil fuels, coal releases the most carbon dioxide emissions per unit of energy, posing a "further threat to global climate, already warming alarmingly". [5] Despite its significant contribution to climate change, the demand for coal continues to grow worldwide.[6] Ongoing coal production in the industrial 'Coal City' has resulted in the degradation of local natural resources, including air, water and soil. The changing history of coal-based pollution is thus crucial in the post-industrial age.

The release of carbons from fossil fuels has been recently acknowledged as the central cause of global warming, but this was not always the case. Over time, Witbank experienced different kinds of coal-based pollution. Much of it stemmed from the actual mining processes. Modes of production varied and relied on geophysical constraints such as depth of coal seam and weight of the overburden. Processing coal involves digging up layers of earth, blasting through rock ore, extracting waste and creating dumps. These processes disrupted the landscape and triggered off more delayed processes such as acid mine drainage and desiccation. Secondary implications of coal production have related to the combustion of coal. Myriad chemicals have been released into the atmosphere, specifically carbons, contributing to air pollution, and, more broadly, climate change. The study demonstrates how broader understanding of environmental change has evolved over time in line with ecological change and advances in scientific knowledge.

The impact of coal mining has been severe in the region, as a result of the neglect of the environmental cost of coal extraction and combustion by the coal

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4 *Minutes of Emalahleni Town Council Meeting*, received from the *Witbank News*. The Witbank district is known today as Emalahleni. It consists of the sprawling Witbank municipal zone, as well as smaller surrounding centres, including Ogies, Phola, Ga-Nala, Thubelihle and Rietspruit.

5 Appenzeller, Tim. 'The Coal Paradox', *National Geographic*, March, 2006.

6 Interview with Mohammed Dindar, Kwachibikulu, Mpumalanga Lakes District, June 26, 2007.

industry. One consequence of this neglect has been the prevalence of lung disease in the region, resulting in early calls for legislation around air pollution control. As Musemwa has pointed out, localized problems related to environmental degradation are often left out of the climate change debate, which constitutes the "macro-political and economic" side of the environmental debate; this paradigm has "tended to efface the micro problems through which the former have been poignantly manifested".[7] This work therefore charts the ways in which coal-based pollution was first understood locally, and marks changes in these conceptions as the growing visibility and physical impact of pollution was felt more over time.

Historically, conceptions of pollution were based on observations of the way coal-related activity affected nature. These understandings shifted with the emergence of related scientific data, demonstrating the relationship between coal and pollution of natural resources. The more scientists could explain coal and its properties, the clearer the process and impact of pollution became. This is reflected in the history of South African environmental law, generally subject to the constraints of scientific understanding of coal-based pollution.

The rise of an environmental consciousness of the impact of coal mining in the last three decades has, in part, led to a more critical consideration of the costs of coal to the environment by scientific and environmental bodies, local residents, state officials and the coal mining industry. The development of these perspectives over time has not been fully documented and explained. This study will address that omission.

Literature review

This study has drawn on existing literature which touches on ideas around coal-based pollution. This literature review demonstrates the paucity of material on the way in which South African coal-based pollution has been understood over time. Historical works on South African coal mining, while useful, are limited regarding pollution. Katherine Aiken has argued that historians have been "slow to analyse" the way in which the "heightened interest" toward the environment has affected the development of environmental policy.[8] The study highlights the value of environmental history as a way in which to speed up the analysis of

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[7] Musemwa, Muchaparara, 'Early struggles over water: From private to public water utility in the city of Bulawayo, Zimbabwe, 1894-1924', *Journal of Southern African Studies* 34(4), 2008, p. 881.

[8] Aiken, Katherine. G. '"Not long ago a smoking chimney was a sign of prosperity': Corporate and community response to pollution at the Bunker Hill Smelter in Kellogg, Idaho', *Environmental History Review* 18(2), 1994, p. 67.

these issues, as well as including local environments "in historical explanation".[9] According to Carruthers, environmental history also provides a way of "returning the discipline to political and social relevance" by asking new questions related to current concerns around climate change and sustainable energy.[10] This idea and many other perspectives were found in the literature on South African environmental history, and helped to formulate the conceptual framework used within this study. Many of these ideas were linked in *South Africa's Environmental History: Cases & Comparisons*, edited by Ruth Edgecombe.[11] The importance of Edgecombe's intellectual influence on this work is shaped by her intimate knowledge of the coal industry. Her work on the history of Hlobane Colliery in Natal provides a powerful case study of the pattern of economic development of the coal mining industry.[12] This is especially valuable when assessing the impact of coal in Witbank and its surrounds. She provides an important account of the workings of the early twentieth century coal industry, and her work serves as a good example of how to translate technical knowledge into historical narrative. Phia Steyn's assessment of environmental historiography inspired the conceptual formulation of this study.[13] Jacklyn Cock's critical assessment of the formation of a South African environmental movement and its implicit challenges was an important source of background knowledge for conducting field work.[14] Without reference to contemporary environmental literature, this study would have no bedrock. Having considered the contents of existing material, I seek to develop further the way in which society has understood environmental changes, particularly related to the mining industry.

Literature on the history of the South African mining industry was useful in establishing a context for further research on the coal mining industry. This study has thus drawn on a considerable body of literature on the history of the South African gold and diamond industries. Particularly in older histories of the South African mining industry, the emphasis has traditionally been on discovery, pioneering engineering and untold riches attained through gold and diamond mining.

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9 Carruthers, Jane. 'Environmental history in southern Africa: An overview', Dovers, S., Edgecombe, R. & B. Guest, eds, *South Africa's environmental history: Cases & comparisons*, David Philip Publishers, Cape Town, 2002, p. 5.

10 Ibid.

11 See Dovers, S., R. Edgecombe & B. Guest, eds, *South Africa's environmental history: Cases & comparisons*, David Philip Publishers, Cape Town, 2002.

12 Edgecombe, R. *The constancy of change: A history of Hlobane Colliery: 1898-1998*, The Vryheid (Natal) Railway, Coal and Iron Company, Ltd, Vryheid, 1998.

13 Steyn, P. 'The greening of our past? An assessment of South African environmental historiography', *New Contree* 46, November 1999.

14 Cock, Jacklyn. 'Connecting the red, brown and green: The environmental justice movement in South Africa', a case study for the UKZN project entitled: Globalisation, Marginalisation and New Social movements in post-Apartheid South Africa, Centre for Civil Society, School of Development Studies, University of KwaZulu-Natal.

The historiographical focus of most of these works is autobiographical, depicting the challenges faced by the Randlords in building up the industry. Kanfer's *Last Empire* provides a biographical history of Ernest Oppenheimer and the Anglo American Corporation.[15] Richard Mendelsohn's biography of Sammy Marks provides some context for the establishment of the coal mining industry in early twentieth century Transvaal, but focuses mainly on the personal and professional challenges faced by Marks.[16] Houghton and Dagut's published selection of archival excerpts on the South African economy provided useful, yet limited, reference to late nineteenth and early twentieth century coal figures.[17] This was useful in conceptualizing the scale of coal production, enabling a more accurate vision of the economic conditions of the coal industry in the early twentieth century. C.H. Feinstein provides the most valuable critical analysis of South African economic development trends, taking into account racially determined trends of economic growth.[18] John Lang's exhaustive study on the South African coal industry was valuable in establishing a basis of understanding for the study, particularly the role of coal in economic growth.

More recent literature on proletarianisation and the social impact of mining on coal workers is extensive, and it has helped make sense of the living and working conditions of early twentieth century migrant populations. Duncan's assessment of labour conditions between 1918 and 1948 highlights the attention drawn to labour conditions, but makes little reference to Witbank.[19] A critical assessment of the highly contested dynamic between mine owners and labourers is well addressed in Bozzoli's edited volume, *Town and Countryside in the Transvaal: Capitalist Penetration and Popular Responses*, even though the selected studies found in this work provided little direct reference to coal mining and pollution.[20] One exception to this is Peter Alexander's work on labour in Witbank which has provided valuable insight into the way the coal industry functioned in the first half of the twentieth century.[21] Alexander's study details the poor working and living conditions endured by African migrant workers in the Witbank coal in-

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15 Kanfer, S. *The last empire*, Coronet Books, Hodder & Stoughton, 1993.

16 Mendelsohn, R. & S. Marks: *'The uncrowned King of the Transvaal'*, David Philip, Cape Town, 1991.

17 Houghton, H. & J. Dagut, eds, *Source material on the South African economy: 1860-1970, Volume 3, 1920-1970*, Oxford University Press, Cape Town, 1973.

18 Feinstein, C.H., *An economic history of South Africa: Conquest, discrimination and development*, Cambridge University Press, Cambridge, 2005.

19 Duncan, D., *The mills of God: The state and African labour in South Africa: 1918-1948*, Witwatersrand University Press, Johannesburg, 1995.

20 Bozzoli, B., ed., *Town and countryside in the Transvaal: Capitalist penetration and popular response*, Ravan Press, Johannesburg, 1983.

21 Alexander, P., 'Culture and conflicts – Witbank colliery life: 1900-1950', Unpublished paper presented on Wednesday 14 May 2008 at the Centre for Sociological Research with the Department of Sociology and the Department of Anthropology and Development Studies.

dustry, but little attention is placed on either the appearance of coal-based pollution, or responses to it.

Some references to coal mining are to be found amidst detailed unrelated analyses which assist in establishing a general context of the coal mining industry. Elaine Katz's study of silicosis on the South African gold mines provides an interesting parallel in popular understandings of mining, pollution and disease.[22] Literature on asbestos mining and its social health implications has provided useful comparative perspectives for the critical study of coal-based pollution, both in revealing the extent to which mining companies engaged in irresponsible mining practices, as well as reflecting the social impact of irreversible environmental degradation. The work of Jock McCulloch highlighted the way in which mid-twentieth century British-based asbestos mining companies withheld extensive knowledge of the carcinogenic qualities of asbestos and related dangers of exposure to both their employees and the general public.[23] The impact of the mining industry in this instance raised questions about the extent to which Witbank experienced similar exploration and exploitation. It brought to the fore the question of industry liability, as well as the state's role in the assessment, monitoring and amelioration of coal-based pollution. Renfrew Christie's history of energy politics was very influential as a comprehensive intellectual study of energy in South Africa.[24] It demonstrated the relevant stakeholders in the history of South African energy production, particularly the coal industry, and also contextualized the bid for coal within the broader framework of Apartheid.

The historical analysis of coal mining and consequent pollution required an interdisciplinary approach, and close reference was made to the sciences of mining engineering, ecology, geology, and power production. This necessitated spending time on becoming familiar with these processes, and ample reference has been made to journal articles. Witcomb & Baxter's case study of abandoned coal land in South Africa provided crucial technical information related to the specific nature of coal-based pollution.[25] Perspective on the full impact of environmental changes induced by long-term coal mining activity was shaped by Limpitlaw, Aken, Lodewijks, and Viljoen's study on post-mining rehabilitation.[26] The value of the technical reports was multi-faceted, as it was not only the facts

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[22] Katz, E., *The white death: Silicosis on the Witwatersrand Gold Mines: 1886-1910*, Witwatersrand University Press, Johannesburg, 1994.

[23] McCulloch, J., *Asbestos blues: Labour, capital, physicians and the state in South Africa*, James Currey, Oxford, 2002.

[24] Christie, R., *Electricity, industry and class in South Africa*, State University of New York Press, Albany, 1984.

[25] Witcomb, A. & B. Baxter, 'Case study: Abandoned coal mine lands in South Africa', *Mining Environmental Management*, July 2000.

[26] Limpitlaw, D., M. Aken, H. Lodewijks & J. Viljoen, *Post-mining rehabilitation, land use and pollution at collieries in South Africa*, The South African Institute of Mining and Metallurgy, July, 2005.

and figures represented that facilitated the research, but also the way in which this knowledge was represented. It helped in understanding the actual impacts of coal mining, thus enabling the process of assessing historical changes in how pollution was conceived.

The coals of the Witbank district (Transvaal), published in 1931 by the Collieries Committee of the Transvaal Chamber of Mines, is a rare early published source specifically related to the Witbank coalfields.[27] It provided a solid understanding of the geology and chemistry of the Witbank coalfield. More recent studies supplemented representations of coal and pollution, but most useful was Terence McCarthy's paper on the 'Conservation of the Mpumalanga Lakes District', in which he predicted environmental changes which would likely be triggered by intensive mining activity.[28] Anthony Turton's assessment of water pollution, specifically the dire long-term implications of acid mine drainage, reinforced the need for this study, which hopes to contextualize the reality of mining and pollution in South Africa.[29]

There remains a dearth of historical material dealing with the environmental implications of coal. Barbara Freese's social history of coal examines the growth and impact of the coal industry within a global context, but there is little focus on South Africa.[30] One exception is James Clarke's *Our Fragile Land: South Africa's Environmental Crisis*, published in 1974, whose work is presented in an accessible, non-technical style.[31] While crucial in its critique of the problems related to pollution, Clarke's study does not provide a critical assessment of conceptions around coal-based pollution. The literature review has highlighted a significant body of material demonstrating the many problems around coal-based pollution, but none address the key issues dealt with here. This study forms the first attempt to assess ideas revolving around the broader impact of coal-based pollution, and how these changed over time.

Methodology

Reference to published material was an important preliminary part of this process, as described in the literature review above. It helped establish the strengths, gaps and silences in the field of environmental history, and specifically on the subject of this study. Close reference to sources of background and technical

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[27] Graham, A.C. & P.N. Lategan, *The Coals of the Witbank District (Transvaal*), The Transvaal Chamber of Mines, Collieries Committee, 1931.

[28] McCarthy, T, B. Cairncross, J. Huizenga & A. Batchelor, '*Conservation of the Mpumalanga Lakes District', 2007*, Copy received from author.

[29] See Turton, A., 'SA water and mining policy: A study of strategies for transition management', April 20, 2009, received draft copy from author.

[30] Freese, B., *Coal: A human history*, Arrow Books, Random House, 2003.

[31] Clarke, J., *Our fragile land: South Africa's environmental crisis*, Macmillan, Johannesburg, 1974.

information opened up a range of debates around environmental concerns, paving the way for a clearer research focus. Additional research conducted for an undergraduate project on the environmental impact of asbestos mining, as well as participation in a research product conducted by the Centre for Sustainability in Mining and Industry for Asbestos Relief Trust to assess the socio-economic implications of long-term exposure to asbestos dust provided valuable comparative insight into the relationship between mining practices and pollution.[32] The range of sources included here demonstrates an attempt to apply critical awareness of changing ideas around coal-based pollution. The research process was undertaken with certain assumptions about the contents and availability of relevant sources. Numerous challenges were experienced, including the inability to access certain archival records, particularly the Chamber of Mines and Witbank's town records.

A major source for this study was the *Witbank News*. Exhaustive reference was made to all weekly publications between 1923 and 1965, selected editions between 1980 and 1981, as well as weekly editions between 2000 and 2008. This source is imbued with a comprehensive knowledge of the town – its culture, politics, economy – and specifically its coal industry. The *Witbank News* also demonstrated an evolving culture of understanding the environmental implications of industrial activity stimulated before and during the Second World War to produce more coal and manufacture steel. Particularly interesting was the role of the media in the construction of knowledge related to pollution. Direct references to coal-based pollution did not appear until the 1940s and 1950s, when air pollution became a major problem for the town. The level of bias implicit in the perspective of the *Witbank News* was taken into account during the analysis of this source, highlighting the source as only partial representation of the local views, with racially determined exclusion of the experiences of thousands of residents in Kwa Guqa and other townships.

A number of visits were made to the National Archives of South Africa (NASA) in Pretoria, where archival evidence of coal trade stretched back to the mid-nineteenth century. Detailed minutes, inspectors' reports, parliamentary debates, correspondence, legal documentation, amongst other primary sources provided important information on the establishment of the Witbank Colliery, and how it affected the town's growth. The most useful and explicit set of archival material included extensive documentation around the passing of the Atmospheric Pollution Prevention Act (APPA) of 1965, which is dealt with closely in

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[32] See Singer, M., 'A social history of rural neglect: Mafefe in the 20th Century', Honours Dissertation, Department of History, University of the Witwatersrand, 2005; *The future of Penge: Prospects for people and the environment, Project Report and Guidelines*, Final Report, Centre for Sustainability in Mining and Industry, University of the Witwatersrand, Johannesburg, July 2008.

the latter half of the book. This spoke directly to the task of evaluating changing conceptions of coal-based pollution. These archives were valuable, particularly after a frustrating attempt to access Witbank's local municipal records, which proved not to predate the 1990s.

This study relies strongly on the findings of archival research, but at its heart are the oral sources produced during the course of field visits to Witbank in June and September 2008. The interview process provided insight into contemporary conceptions of coal-based pollution. Respondents were selected because of their expertise and experience of coal-based pollution. The interviews provided relevant insight for the period after the promulgation of the Atmospheric Pollution Prevention Act (APPA) of 1965, making it necessary to rely on archival findings. Interviews were held in conjunction with a number of site visits to active and abandoned workings, dumps, underground fires and communities throughout the Witbank coalfield, as well as other affected coalfields throughout Mpumalanga, including the Mpumalanga Lakes District. This has also included several site visits to asbestos, platinum and coal mining districts throughout Mpumalanga and Limpopo, enabling a more accurate context of pollution and its role in shaping the history of Witbank and South Africa. The subject of the study was the local environment of the Witbank coalfield. The trips were made to places of intensive coal-based pollution, including abandoned mines, mine dumps and sites of mine water pollution. These field visits were invaluable, enabling a more accurate vision of pollution and its role in shaping the history of Witbank and South Africa.

Chapter outline

This study depicts the shaping of ideas around coal-based pollution, relying heavily on the interplay of theme and chronology. Each chapter focuses on how different manifestations of pollution were received by the South African state, the industry and civil sector. The chapters are linked to the central question of the study by their exploration of specific environmental impacts that affected the Witbank district over time. Witbank's pollution did not relate to any specific part of the process of coal mining, and this needed to be reflected both in the structure of the argument and the content of the narrative. The nexus of chronology and thematic structure has reflected the evolving nature of pollution itself, considerably influenced by the way in which coal-based pollution was understood.

The first chapter explores the initial period of coal mining in Witbank. It focuses on early understandings around coal-based pollution by tracing the history of the local industry, town and surrounding areas. The introductory chapter depicts the limitations of early conceptions of coal mining, and demonstrates how physical evidence of environmental changes, specifically as a result of coal

mining, was ignored. Reference is made to evidence of early twentieth century legislation related to the prevention and control of pollution. By the 1930s, demand for Witbank coal grew, with infrastructural development and capital investment making it possible for the local industry to expand dramatically. This also had the effect of setting in motion long-term processes of environmental degradation.

The second chapter assesses understanding of coal-based pollution in light of processes of industrial transformation set in motion by the Second World War. The period between 1930 and 1947 is conceived as an ecological-economic turning point for Witbank coal. The chapter thus depicts the process of change leading to the significant changes in perceptions realized during this time. Post-war reconstruction involved a committee of inquiry into the nature of pollution, yielding findings which profoundly changed the way in which the environmental repercussions of the war were seen. This was significant in the politicization of issues related to pollution. Reference is made to State findings about the environmental impact of industry and mining, demonstrating how few measures were taken to monitor and prevent pollution. This was not a priority, particularly during the war, when pressure was placed upon the South African state and industry to increase coal production for the war effort.

The process leading to the promulgation of South Africa's first major environmental law, the APPA, is addressed in the third chapter. This involved significant research and analysis of coal-based pollution. A scheduled list of industrial pollutants was compiled for the APPA, with coal listed as a chief polluter. This meant that the coal industry was now subject to inspection and monitoring. The Act also expected the coal industry to introduce internal pollution monitoring devices. This dramatically changed the way in which the coal industry functioned. The chapter also provides an overview of responses to air pollution in Witbank, from early records of the appearance of air pollution, to community mobilization against the smoke emissions of local industries such as the Highveld Steel and Vanadium Company. The APPA was significant in setting a new legal precedent around coal-based pollution, forcing State and industry to pay more attention to pollution control measures.

The implications of South Africa's first major environmental legislation are addressed in this final chapter. The fourth chapter begins with the implementation of the APPA, demonstrating a considerable shift in the way pollution was understood and addressed by the South African state and coal industry. It provides an assessment of the relative efficiency of measures taken to implement the APPA, reflecting the increased awareness of the implications of coal-based pollution. It describes the period between the introduction of the APPA and the exponential growth of industry with the introduction of large-scale modes of

opencast production by the late 1970s. As evidence of pollution was observed over time, more attention was drawn to the relative uncertainty of its full impact, but this did little to change the tide of unforeseen growth that transformed Witbank and its coal industry by the late 1970s. Responses of government, industry and civil society stakeholders to new protective legislation such as the APPA and the amended Water Act of 1966 reflected new conceptions of pollution and highlighted the need for new ways of monitoring pollution.

2

‘Undermining’ the land: A history of coal mining and environmental changes in the Witbank Coalfield, 1838-1930

Introduction

> … it’s an underground mine, and (at) *any time* they are afraid that it can sink.[1] (My italics)

Understanding the gravity of coal-based pollution involves exploring the environmental legacy of Witbank’s coal-based economy. This chapter explores the early conceptions around coal-based pollution by tracing the history of the local industry, town and surrounding areas. Coal-related pollution is widespread in this region, but the full intensity of ecological degradation in areas where mining has taken place in the Witbank coalfield has taken almost a century to be fully felt. This has resulted in long-term ecological damage throughout the district.

The ability of the environment to withstand long-term pollution has delayed reactions of the environment to changes set in motion by intensive coal mining and power production activity. Without visible evidence of pollution, the capacity of intensive mining activity to pollute was historically not known. Conceptions of coal and pollution were thus based on contemporary notions of industrial growth and urban development. This involved a tacit acceptance of the changing face of the local environment and its influence over the spatial planning of the new coal town.

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[1] Interview with Isaac Mampane, Witbank, June 2, 2008.

The Witbank coalfield: A geological account

> … if coal were not so plentiful one could imagine it lovingly displayed in museums.[2]

Within the Witbank coalfields there are five known coal seams, horizontally formed, and labelled No. 1 to No. 5 from the deepest to the shallowest. Other than the No. 3 seam, which is too thin to be of any commercial value, all seams have been worked. The main seam is No. 2, whose thickness rarely exceeds 120 metres. While the coal is not always of a high quality, it has carried "consistent high values over large areas".[3] Although partially workable, the other three seams have either been denuded or present greater difficulties in mining. Thousands of boreholes have been sunk over the years to prospect the underlying seams.[4]

The coalfields are contained beneath the expansive grasslands and ancient rocky outcrops of South Africa's Mpumalanga province, in what was previously known as the Eastern Transvaal. These are arguably the most important coalfields in South Africa, and have provided billions of tons of coal for energy production over the past century. The relatively unfaulted seams extend over a distance of 180 kilometres from Brakpan in the west to Belfast in the east, with a north-south width of approximately 40 kilometres.[5] They are contained within a much larger series of sandstone, shale and grit layers known as the Karoo System, which runs beneath the Western Cape, the Free State, northern Kwazulu-Natal and Mpumalanga.[6] A 1931 geological survey argued that in the Witbank coalfields "alone (were) found the coal measures … of any economic importance to South Africa".[7] The success of these coalfields was also based on their proximity to the Witwatersrand, the locus of gold mining in the Union of South Africa during the late nineteenth and early twentieth centuries. The coal from these fields was bituminous, easily combustible, and worked well for energy production to support sustained economic activity in the region.

The way coal was formed had become common knowledge by the 1930s, but during the late nineteenth century, the cause of high carbon content in coal was largely unexplored. The capacity for coal to burn, and even to sustain com-

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2 Freese, B., *Coal: A human history*, p. 3.

3 Graham, A.C. & P.N. Lategan. *The coals of the Witbank District (Transvaal)*, The Transvaal Chamber of Mines, Collieries Committee, 1931, p. 11.

4 Ibid.

5 Smith, D.A.M. & R.L.G. Whittaker, 'The Springs-Witbank Coalfields', in: C.R. Anhaeusser & S. Maske, eds, *Mineral deposits of South Africa*, p. 1969. Geological Society of South Africa, Johannesburg, 1986.

6 Graham, A.C., p. 1.

7 'Coal and other fuels', in: P.A. Wagner & L. Reinecke, eds, *Mineral deposits of the Union of South Africa*, p. 233. Third (Triennial) Empire Mining and Metallurgical Congress, 1931.

bustion, reflected the unique nature of its composition. Understanding of coal was based more on observation than scientific knowledge.

Witbank coal became the subject of early scientific inquiry when large-scale gold mining in Johannesburg stimulated interest in the "microscopic examination" of particular coal samples.[8] Coal came to be understood as a volatile organic substance, formed from the fossilized vegetation of prehistoric forests. The high carbon content of coal was the result of photosynthesis by ancient vegetation, stored and concentrated over millions of years. The rising impetus for coal research was driven, for the most part, by the energy requirements of the gold industry.

Settlement and mining in Witbank, 1838-1906

> The areas now being mined must have been inhabited by wild animals … reports have it that, in the very early days, elephants and lions roamed the countryside.[9]

The modern discovery of coal in the Witbank district was precipitated by the relatively shallow nature of seams. Numerous coal outcroppings appeared along hillsides and in the beds of streams.[10] Written historical accounts of South African coal mining date back to as early as 1838. There is evidence, discovered through early twentieth century surveys, recording signs of pre-historic extraction. Slag heaps discovered alongside outcroppings suggested that coal was used by indigenous hunter gatherers or Late Iron Age groups to heat furnaces for smelting iron ore into workable tools and weapons. Extraction was limited to seams of black coal running to the surface of rocky outcrops. Before the establishment of the local coal industry, the most popular land activity in the rural Witbank district was agriculture, including maize and corn.

The first recorded coal sale in the Transvaal dates back to the Natal colony in 1842. This coal was mined and transported by wagon to markets in Pietermaritzburg. By the 1850s, prospectors had gravitated to the Highveld, following reports of "considerable quantities" of coal in the Middelburg district.[11] By 1868, Transvaal coal was described by the explorer, Thomas Baines, as looking "tolerably well – black, with a moderate gloss, and clean fracture".[12]

On one of his treks from the Transvaal to Natal in 1872, Baines witnessed shallow digging on the farm of Daniel Kruyger, situated along the banks of the

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8 'Witbank Coalfields', *Witbank News*, August 18, 1933.

9 *Witbank News*, October 16, 1981.

10 'The stored wealth of the Transvaal: History & progress of mining – Mr James McPhee's Address to the Metallurgical Congress', *Witbank News*, May 8, 1930, p. 4.

11 Lecture, Mr. E. Soar, *Witbank News*, 1930, p. 6.

12 Civil engineer Thomas Baines is remembered as the "artist who in his spare time became the father of South African geology". See 'Electrical Engineers Visit Witbank', *Witbank News*, August 16, 1935, p. 5.

Steenkoolspruit. Despite ready access to water, energy resources were scarce. Baines reported that "the family was using coal as its only fuel".[13] This fossil fuel was cheap, readily available – and a useful alternative to dried dung or firewood. He empathized with Kruyger, referring to the "bleak heights" of the area as being "so absolutely destitute of wood" that Baines had servants collect "cakes of partially dried cattle dung" that they found along the road to use for fires to cook their meals and "keep them warm at night".[14] Another traveller compared the local coal's quality to that "known in Lancashire as the 'Arley Main'".[15] While comparisons to the British coal seams were made, there is little to indicate that the expansion of trade markets was seen as a possibility in the Transvaal.

Local trade, where it existed, was small-scale and subsistence-oriented. First-hand accounts reported that wagons were backed into coal seams nine metres thick. The wagons were loaded with high grade coal with "the same ease that a wagon might be filled with rock from an ordinary mountain".[16] This coal would be transported and sold to the dispersed rural community for approximately fifteen shillings per ton.

The first few mines in the Middelburg District included the Crown Douglas and Maggies Mine.[17] The Brugspruit Mine was named after one of the tributaries of the Olifants River system, a particularly sensitive water system which encompassed the area in a catchment of heavy industrial and mining use.[18] Early small-scale coal mining targeted adits, or shallow horizontal shafts, where blasting and coal extraction was most simple. Once these seams were exploited it became more difficult to mine, as the majority of the coal was located beneath a thick layer of solid rock and earth, and required vertical shafts which went underground, through layers of rock. Shafts such as these had been used from as early as 1908, with relatively shallow coal faces being mined from underground.

The most popular method of underground mining in the Witbank coalfields was known commonly as 'pillar and bord' mining.[19] According to a 1918 *Glossary of Certain Words Used in Collieries*, this was the "usual way of working a South African colliery, in which two series of parallel excavations were made at right angles to each other, and by which approximately three quarters of the coal (was) extracted and one quarter left standing in rectangular pillars to support the

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13 Ibid.

14 'Electrical engineers visit Witbank', *Witbank News*, August 16, 1935, p. 5.

15 Duncan Campbell Francis Moodie, quoted in article. Ibid.

16 Ibid.

17 Lecture, Mr. E. Soar, p. 6.

18 Asmal, Kader, 'Speech by the Minister of Water Affairs and Forestry, Member of Parliament at the official opening of the Brugspruit Water Pollution Control Works as well as the official launch of Water Week 1997', Witbank, March 17, 1997.

19 This method was also known as 'pillar and stall'.

roof".[20] Following initial extraction, workings were usually sealed off and abandoned.

The popularization of the pillar and bord method of underground mining was an economic windfall for the region. It increased local coal production enough to make it able to compete with other industries in the Cape and Natal. Still, efforts to expand coal markets were held back by numerous obstacles. The first involved finding high quality coal that would suit markets. Before contracts could be negotiated, coal properties had to be tested. Methods used to test the coal were rudimentary and generally relied on assessments based on visual results – reflecting limited scientific knowledge and understanding of coal and its properties. This was evident in a number of tests done in 1902, where several Transvaal coal "specimens" were tested for the naval and railway markets.[21] An engineer officer of the British naval ship 'H.M.S. Thrush' compared two samples by burning them simultaneously. Placing the samples on the front of a fire, he observed that they would ignite and then crumble rapidly, "giving a fierce heat for a short period".[22] After receiving two firings in the front the coal would then be spread throughout the furnace. An iron pricker would be used to prod the coal, spreading ash. Hard, burnt pieces, known as "clinker", were "easily broken" by the fire iron, so that they collected with the ash through the bars.[23] High quantities of ash and clinker were signs of poor quality. Another measure of quality was calorific content – established through units of water turned into steam by a single unit of coal.[24] Calorific content requirements depended on the specific needs of consumers, resulting in considerable insecurity for prospective Transvaal colliers.[25]

A second obstacle in the development of the Witbank coal industry was the lack of adequate transport infrastructure. This began to change in 1895 with the construction of a railway from Pretoria to the port of Lourenço Marques along Delagoa Bay in Portuguese East Africa.[26] The establishment of the Witbank station sped up industrial development. As the cost of transport decreased, Wit-

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[20] National Archives of South Africa (hereinafter referred to as NASA), *Government Native Labour Bureau, 1904-1950* (GNLB) 304/427/18, 'Glossary of Certain Words Used in Collieries and Mentioned in this Report', December 18, 1918.

[21] NASA, Governor of the Transvaal (GOV) 588/PS/290/01 Ibid. Report on Two Specimens of Transvaal Coal, Trials of Transvaal Coal for Use on British Ships, by R. Hingston, Engineer Officer of H.M.S. Thrush, August 9, 1902.

[22] Ibid.

[23] Ibid.

[24] Calories are commonly used to derive the energy content of carbon, such that when combustion takes place, the energy that is released may be measured in units. A 1933 study defined calorific value as the measurement "in units that refer to the number of pounds of water that can be transformed into steam by a pound of the special coal in question" See *Witbank News*, August 18, 1933, p. 3.

[25] Naval and railway markets demanded high quality coal, but use for poorer quality coal, or 'duff' coal, would arise over time.

[26] *Jewish Life in the South African Country Communities, Vol. 1*, SA friends of Beth Hatefutsoth, Johannesburg, 2002, p. 102.

bank coal was absorbed into the bunker trade. Transvaal coal was now more easily marketable to international trade networks. Early commercial trade of coal between the Transvaal-based coal companies relied on varied export markets and public tenders. Standard practices indicated specifications for coal composition, including size, presence of rock, shale or foreign matter.[27] The chemical properties of coal were an important consideration for consumers, particularly sulphur content, which could not be removed from the coal through existing methods.[28] The organic sulphur content, infused "fairly uniformly"[29] through chemical bond with hydrocarbons in the coal, was often too high to meet export standards. With time, and rapid industrial advances, larger chunks of coal referred to as 'nuts' or 'peas' were sold. Profits were still curtailed by the rejection of enormous amounts at the pithead. Quality of coal was only determined once it was brought to the surface, resulting in the dumping of large quantities of rejected coal. Colliery dumps of this time "rivalled those of the gold mines", permanently altering the landscape of the rapidly transforming district.[30]

The South African war temporarily halted the growth of the new coal industry. Post-war figures by 1902 were a mere quarter of 1898 figures of approximately two million tons, but the industry recovered quickly. Early twentieth century fortune seekers flocked into the district. When it became clear that the elusive gold seams simply did not exist, many prospectors turned to coal. This seemed a secure investment; the Highveld plains provided ample and affordable coal-bearing ground. Thick, shallow and unfaulted seams, coupled with cheap labour, meant that coal could be cheaply mined.[31]

By the turn of the century, production of coal had slightly increased. The urban settlement began to grow with "about 60 or 70 people (who) had built their homes – very haphazardly – around the original hostelry".[32] The shanty town came to be known as Witbank – 'wit' referring to the characteristic white sandstone outcroppings of the district.[33] The township of Witbank was established in 1903 by Samuel Stanford, who had originally arrived in the Middelburg district as a trader in the 1880s. He spent time setting up a trading store near the farm, Zeraatsfontein, and surveying it for coal. The farm owner, Jacob Taljaard, let

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[27] 11.19 Kilojoules per kilogram (kJ/kg) was the average calorific value of bituminous coal in Witbank, but 12.5 Kilojoules per kilogram was the minimum accepted value for railway or naval use, posing early challenges to the marketing of Witbank coal.

[28] NASA, *Colonial treasurer (1900 - 1910)* (CT) 150/T33/441 'Miscellaneous: Supply of Coal to Mauritius', *Mauritius Government Gazette, No 1*, January 4, 1909.

[29] Camm, A., 'Sulphur in coal and its removal', *Mining Engineer* 151(361), October 1991, Institute of Mining Engineers, p. 118.

[30] 'Miscellaneous', *Mauritius Government Gazette*, No 1.

[31] Mendelsohn, R., *Sammy Marks*, p. 119.

[32] Ibid.

[33] 'Farming – In Witbank', *Witbank News*, November 20, 1931.

Stanford survey the farm property, where he found a thick seam of coal. The existence of coal in the district was "anything but a secret" but Stanford was the first to "enlarge the scale of mining from the mere picking up of stray pieces to systematic exploitation".[34]

Through investment from the Neumann Group, Stanford founded the Witbank Colliery. Soon after, the town was laid out in 1903, within relatively close proximity of the numerous workings. While the Witbank Colliery exerted an inordinate influence over the new settlement, colliery management showed little consideration for the adverse effects of the underground mining within the town boundaries. In July 1904, Mr. Tamplin-Lewis, acting manager of the colliery, made an application to the Office of the Commissioner of Mines in Johannesburg to "obtain permission to carry on ordinary Mining operations under the proposed Township of Witbank".[35] Even with little official regulation over mining practices during this time, this application was rejected. The Government Mining Engineer argued that

> in view of the shallow depth at which mining is carried on at Witbank it is considered … that subsidences of the surface (would) sooner or later take place which would endanger the safety of the persons residing in a township built over such workings.[36]

H.W. Smith, Secretary to the Mines Department, argued that under Article 2, Section 2, of the Mines and Works Regulations, mining "beneath the township in question should be prohibited".[37] Tamplin-Lewis's application was rejected on the basis that mining under a built environment – namely, the town of Witbank – could compromise the structural integrity of roads and buildings in the town, which would then become prone to subsidence. This would endanger residents of the town. This legal exchange reflects caution about the inherent dangers of underground mining. The environmental risk to the town's future was recognized, but only insofar as it threatened potential future capital investment.

Mining remained a staple economic activity in the region – eclipsing alternative land uses – especially agriculture. This is illustrated in the case between the Witbank Colliery and Daniel Jacobus Malan, a local Witbank farmer. In November, 1904, Malan appeared at the Office of the Registrar of the Supreme Court of the Transvaal. The plaintiff, Witbank Colliery, had concerns over the terms of their contract with Malan, who had ceded the mineral rights to his farm

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34 'Electrical engineers visit Witbank', *Witbank News*, August 16, 1935, p. 5.

35 NASA, *Secretary to the Law Department, 1900-1925* (LD) 380/AG 1323/03, Letter from H.W. Smith, Secretary to the Mines Department, to Office of the Commissioner of Mines, Johannesburg, July 9, 1904.

36 Ibid.

37 Ibid.

'Blesboklaagte' in 1898, "without restriction and in perpetuity",[38] while coal operations were still taking place on the adjoining farm. In the interim, Malan had constructed several buildings upon his land, violating the terms of his contract. As a result, the Mining Department, "acting under their duly promulgated Mining Regulations", refused to allow the Witbank Colliery to continue mining operations under the buildings which Malan had constructed.[39] The plaintiff thus argued that the farmer had interfered with their "Mining Rights". This particularly related to a clause granting the Witbank Colliery

> the right to sufficient ground for the sinking of shafts and wells, the making of excavation and other facilities … together with a piece of ground sufficient for a siding on the railway … 'minerals and mineral rights' (would) include and comprehend the right to mine, dig and win gold, silver, diamonds, coal and other minerals and metals of what nature so ever.[40]

Was Malan even aware of the permanent changes to his agricultural land? Without his testimony, this is impossible to prove. The nature of his contract with the Witbank Colliery revealed early industry knowledge of the immediate environmental impacts of coal mining. It serves as historic evidence of the accepted fact that building construction could affect, or restrict, mining operations. It also revealed some indication of preferential treatment of mining over agriculture as a national economic activity.

Finally, Malan's case reflects the environmental challenges encountered by companies in mining the Witbank coalfields. The industry had begun to cultivate economic growth for the local district far more effectively than local agricultural markets. The distinction between town growth and industry growth was thus often blurred; this had the result of compromising legal decision making processes around continued mining in a rapidly developing regional centre.

Environment and labour: Twin costs of coal mining in Witbank, 1906-1920

With intensified industrial transformation throughout the Transvaal, the 'coal city' of Witbank rapidly emerged. An assessment of the town's development provides remarkable insight into the way energy was produced and consumed in the first two decades of the twentieth century. In 1907 the Transvaal Coal Owners' Association (TCOA) further formalized the emerging coal industry. In the same year, an economic study conducted on the effect of power supply

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[38] NASA, Registrar of the Supreme Court of the South African Republic and of the Transvaal Colony, 1877-1910(ZTPD) 5/590/150/1905 Illiquid Case – Declaration – Witbank Colliery Ltd vs. Daniel Jacobus Malan', 1905.

[39] NASA, ZTPD/5/590/150/1905 Summons from Registrar of Supreme Court to Sheriff of the Transvaal to 'command' D.J. Malan to appear at the Office of the Registrar of the Supreme Court of the Transvaal.

[40] Ibid.

schemes in the Transvaal revealed far-reaching obstacles in the process of energy production, particularly how difficult it was for the coal industry to make ends meet. The study showed that the railways benefited more from transporting the heavy cargo than the colliery owners of the pits benefited from the sale of coal, especially "when one (took) into account the sale price of the product at the pit head, as compared with the heavy rate per ton … for its conveyance to the market".[41] The irregular supply and availability of railway trucks used to transport coal to markets also held back production, frustrating Witbank's colliery managers.

According to P. Dickson, manager of the Coronation Colliery in 1911, halting the steady output of coal had ripple effects felt throughout the industry. According to his estimate, being "idle" for 38 hours during July, 1911 had

> represented a loss of about 3,500 tons … and 30 hours during August which gave … a drop of over 3,000 tons … these shortages had to be made up by overtime. Assuming that the other collieries in this district lost to the same amount in proportion to their allotment, this would mean, without overtime, a loss of about 35,000 tons per month, approximately. The result would mean the closing of several of the gold mines for a few days … if the administration could supply trucks regularly as requisitioned for, it would be a great relief to the various colliery managers.[42]

In many cases, the burden of intermittent stoppages of coal loading fell upon the labourers, whose long hours were often extended into overtime in order to minimize the loss of productivity caused by lack of available transportation. The medical officer of the Coronation Colliery had argued that the high number of labourers being admitted for medical attention was directly related to the "amount of overtime worked",[43] but that it was "difficult to avoid this"[44] because of the need for continued output of coal to meet contractual agreements with consumers when trucks were available.[45]

Colliery owners were obliged to maintain strong relations with the South African Railways. In a 1907 letter to the prime minister of the Transvaal, the secretary of one company recognized the

> ... importance of the Railways as consumers at any rate assisting and encouraging within all reasonable limits the Coal Mines and Coal Industries of the two Colonies concerned.[46]

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41 'Mr. Dalrymple on power supply schemes and their effect on Transvaal Collieries', SAE, April 1907, p. 60. Quoted in Christie, Renfrew, Electricity, Industry and Class in South Africa, p. 40.

42 NASA, GNLB/25/2288/11 Letter from P. Dickson, Manager, Coronation Collieries, Limited, to Inspector, Department of Native Affairs, Witbank, October 5, 1911.

43 Ibid.

44 Ibid.

45 Ibid.

46 NASA, CT/146/T33/212 Correspondence between Secretary, Vereeniging Estates, Ltd, to the Prime Minister of the Transvaal, Pretoria, July 25, 1907.

Each colliery had to enter into a 'Private Sidings Agreement' in order to be able to construct railway sidings at the station.[47] Without this, they would be cut off from the loading stations where bunker coal was loaded to be transported to the coast. In addition, there was consensus amongst local colliery owners that the "shortsighted policy of imposing railway rates (on the coal industry) … (had) successfully stifled any hope of … building up or even maintaining the bunker trade". [48]

Despite restrictions, coal output in the Transvaal grew exponentially during this period. 2,345,427 tons of coal were sold in 1910. The Power Act was promulgated in 1910, and under Section 27 the prime minister was given authority to grant licenses for the supply of local municipal power. Market expansion thus rested largely on the electrification of the town of Witbank itself.

By 1918, the Witbank Colliery was granted permission by the Governor-General-in-Council to supply "electric current for lighting purposes" to the compound of Witwatersrand Native Labour Association situated on the farm Blesboklaagte, previously owned by Daniel Jacobus Malan.[49] By 1920, permission had been granted by the Minister of Mines under Section 27 for the Witbank Colliery to supply electric current to the municipality of Witbank "for lighting and other purposes".[50] By 1921 the annual output of the Witbank coalfield had increased to 6,947,362 tons.[51].

Prior to the establishment of the Electricity Supply Commission (Escom) in 1922, the Witbank Colliery provided power generation through its 'Main Generating Station'.[52] The Witbank Power Station was built by Escom in 1926, but was staffed and operated by the Victoria Falls and Transvaal Power Company.[53] At the time of its construction, the Witbank Power Station was the largest in the Southern Hemisphere, stripped of its title only with the later construction of the Klip Power Station in Vereeniging. It represented a revolution not only in the way coal was marketed, but fundamentally in the methods used to produce energy. The Witbank scheme would serve as an example to other towns of how

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47 *Coals of the Witbank District*, p. 25.

48 'Coal – High S.A.R. Charges' – South African Coal Estates (Witbank) Ltd, Annual General Report, December 14, 1928, p. 7.

49 NASA, Decisions of the Executive Council, 1910-1985 (URU) 367/1676 'Grant of permission', Prime Minister's Office, Pretoria, 1918.

50 NASA, URU/367/1676 Memorandum, 'Grant of permission', Prime Minister's Office, Pretoria, March 30, 1920.

51 'Progressive Coal Totals', *Witbank News*, September 25, 1925.

52 Ibid.

53 Ibid. Most of the electrical units were bought by the VFTPC to be resold, at a profit, to the gold mines. With costs being subsidized through government funding, capital accumulation and profiteering by the VFTPC was exorbitant.

Photo 2.1 The regional offices of the Electricity Supply Commission in Witbank (*Witbank News* Collection, undated, c. 1933)

light and power should be supplied.[54] A newly electrified Witbank would be marketed as a model town in an attempt to draw the attention of industrialists, representing "a landmark in the history of electricity in this country".[55]

Electricity was an amenity not extended to the hostels that housed the local migrant labour force. Those residing in the local hostels worked for some of the largest collieries in the district, including the Transvaal & Delagoa Bay, Cassel Coal Company and Witbank Colliery.

Living conditions were generally poor. The cramped conditions in compounds were made worse by poor sanitation and diet; the proximity of compounds to mining activity further exacerbated public health conditions. Underground conditions were restricted by the environmental constraints of the labour intensive pillar and bord method. Workers were thus exposed to a number of impacts of coal-based pollution in both occupational and living environments, including smoke, dust and chemical fumes.

Consisting mostly of migrant workers from rural South African districts, as well as seasonal workers from across the national borders, the African workforce existed in a "state of drudging toil, and wearing poverty".[56] The poor living and working conditions, exposure to coal-based pollution and general lack of rights and long hours was considered by the secretary of the regional Industrial and

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54 'The Electricity Question', *Witbank News*, August 27, 1926.

55 Editorial, *Witbank News*, July 1, 1927.

56 Published letter from Thomas Mbeki, Secretary of Industrial and Commercial Workers' Union (ICU), Middelburg branch, to Editor, *Witbank News*, May 7, 1926.

Commercial Union to be a "horrible state of affairs … contrary to justice".[57] The message of this 'dissident' voice was largely silenced by the pressure placed on managers to push workers to produce more and more coal in line with growing markets.

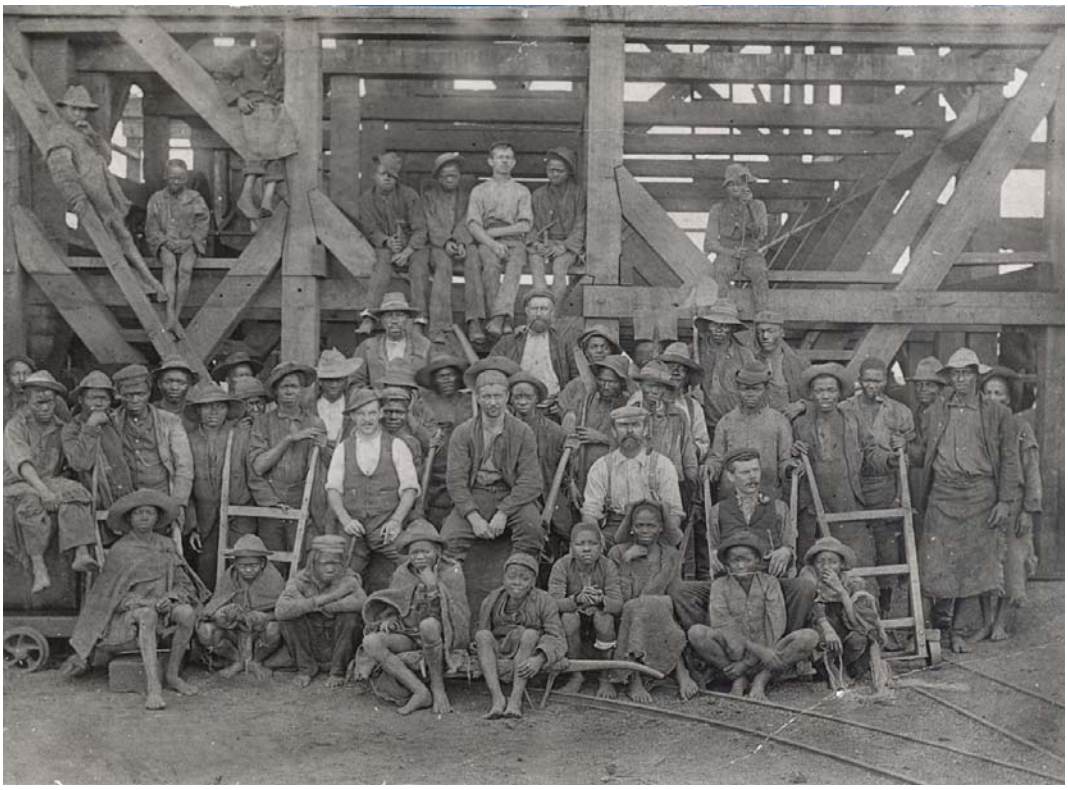

Photo 2.2 Gang of coalminers, c. 1930s.
This undated, unlabelled photograph, found in the collection of the *Witbank News*, depicts a gang of coal miners in the early years of Witbank's coal mining industry. The notable inclusion of children amongst the visibly impoverished group highlights the role of child labour on the coal mines.
(*Witbank News* Collection, c. 1930s)

The "unhealthy state of the coal mines" did not affect only African workers. Despite the fact that white mine workers, mostly British or European skilled miners deployed by companies to the region, earned up to nine times as much as the average African worker, this placed them at no lesser risk to occupational exposure. If miners complained, they would generally "get the sack".[58]

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[57] Ibid.

[58] NASA, GOV/1027/PS76/18/06 Correspondence, Anonymous, Cornelia Colliery, Viljoensdrift, Orange River Colony, to Secretary of State for the Colonies, May 31, 1906.

Regulations around working hours were outlined in the Mines and Works Act of 1911, but this did little to improve overall conditions. The causal relationship between coal-based pollution and poor general health amongst coal workers was also poorly defined; Herbert Payne, a local Inspector for Native Affairs in Witbank complained to the Native Affairs Department in 1912 that workers were "overdriven", given little time to "wash themselves and to sleep".[59] Most collieries in the district still maintained twelve hour shifts. Besides, the implementation of the regulations defined by the Mines and Works Act of 1911 was obstructed by the need to fulfil orders. Another factor was the high demand for workers, and their ability to move from one colliery to another. Short-term contracts made it more difficult to assess long-term health implications of intensive exposure to coal-based pollution, including the ingestion of coal dust, the effects of chemical exposure, as well as higher prevalence of tuberculosis and silicosis. By 1912, tuberculosis had become a major health problem in the region, and a Tuberculosis Commission was appointed to examine conditions.[60] Colliery owners generally avoided taking care of the sick, and workers affected by tuberculosis were generally "repatriated".[61] Living conditions in the compounds did not improve.

A visit by the regional Medical Officer in November, 1916, revealed that the residences attached to the Witbank Colliery were in many ways "defective and contrary to the Regulations". One response to the poor conditions in compounds, as well as the growing pollution problem, was the emergence of an off-mine African community in locations on the verges of the urban settlement.

The theory and practice of environmental legislation

Early twentieth century legislation recognized coal mining and combustion as a chief pollutant. In fact, the problem was not restricted to a lack of legislation; it also extended to the lack of enforcement of existing regulations. Legislation that complicated or obstructed the advancement of profit within the coal industry was conveniently sidelined.

This section interrogates some of this legislation, particularly in relation to the production of pollution, with the aim of establishing legal conceptions of coal-based pollution during the early decades of the twentieth century.

The most immediately felt form of pollution related to coal mining involved the displacement of the earth – however, this was not understood in terms of

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[59] NASA, GNLB/25/2288/11 Correspondence between Inspector of Native Affairs and the Director of Native Affairs, May 21, 1912.

[60] 'Notes on basis of approach to appeal', South African National Tuberculosis Association (SANTA), National Appeal, 1962-1963, Johannesburg, p. 1.

[61] NASA, GNLB/304/427/18 Report of Committee Appointed to Enquire into Colliery Conditions, 1919.

pollution, but rather in terms of financial convenience. The risk of pillar collapse, with concomitant outbreak of uncontrollable underground fires, was a constant threat to colliery owners. In 1906 the Witbank Colliery's Secretary, H.G.L. Panchaud had written to the Acting Government Mining Engineer in Johannesburg because of a controversy between them and their neighbouring colliery. The Landau Colliery had requested the reduction of pillars bordering the two separate workings.

Panchaud was opposed to this – he even described it as posing a significant threat for the Witbank Colliery. This referred to the risk of pillar collapse as a result of weakened integrity of the pillars. He also recognized that

> in a coal mine there (was) always more or less danger of an outbreak of fire and that in case of such an outbreak a 30` pillar would probably not be sufficiently thick to prevent the spread of the fire from one colliery to another, whereas the 100` pillar might keep such a fire from spreading.[62]

Industry officials recognized the risk of underground fires breaking out, but there was little knowledge of how to control them, and the conception that a 30` pillar was not 'sufficiently thick,' as opposed to a 100` pillar, was intuitive rather than scientific. Another "objection" involved waste water "percolating through … from a neighbouring mine in which mining and pumping operations" had been suspended.[63] With no joint application between the competing collieries, the discretion fell upon the Government Mining Engineer, who referred to the Crown Law under Regulation 17.

Panchaud, speaking on behalf of the colliery's Board of Directors, had argued that if the Cassel Coal Company was granted permission to reduce the boundary pillars on their side, their own potential output capacity would be reduced as they "would consider it their duty to leave on this Company's side of the boundary, a pillar of 85 feet, which would mean sacrificing by this Company of 35` of coal through out the length of their boundary".[64] While the Witbank Colliery reflected some concern over determining the precise boundary pillars, these concerns were based primarily on economic expedience. The collapse of an underground mine ceiling as a result of compromised pillars would have amounted to an enormous loss for the company. Water 'percolating' into the mine was not understood in terms of the potential build-up of acid mine drainage, but rather as an added cost in the production of coal for a market with extremely narrow profit margins.

Early twentieth century archival records reflect some indication of government attempts to control sources of pollution. A brief examination of some of the earliest South African legislation has yielded evidence of consciousness of envir-

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62 NASA, GM/5480/06 Correspondence between H.G.L. Panchaud, Secretary, Witbank Colliery, Ltd and the Acting Government Mining Engineer, Johannesburg, November 27, 1906.

63 Ibid.

64 Ibid.

onmental constraints by policy makers, as well as an acknowledgement of the role of the mining industry as a source of pollution, particularly with regard to water resources. Regulation 22 of the Gold Law Act (No 35) of 1908 stipulated that

> no holder of a water right or mining title shall allow the refuse from battery or mining plant to flow or fall into, pollute or make turbid the water of any stream, river or water course.[65]

While this legislation may have taken into account the potential of mining to pollute, revealing a very specific knowledge and conception of the environmental impact of industry, including coal mining, it did not specify *how* this could be prevented. Regulation 7 (Part 1 and 2) of the Mines and Works Regulations Act (No 12) of 1911 attempted to deal with the fact that pollution of water sources *was* happening, in an attempt to control the extent of the problem. Under no circumstances was it acceptable for polluted water to "escape without having been previously rendered innocuous".[66] The Act went on to define measures which should be taken to prevent consumption of polluted water, including fencing off contaminated sites to prevent "inadvertent access", as well as posting notice boards "in suitable places to warn persons from making use of such water".[67]

There are clear indications in the early legislation that it was understood that coal mining contributed to the pollution of water and land sources, adversely affecting surface land activities such as irrigation. A stipulation in the Irrigation and Conservation of Waters Act No. 8 of 1912 also clearly reflected the extent to which the state prioritized mining. Section 137 of this act appeased mining industry officials by asserting that "nothing contained in this Act shall be construed as derogating from any powers or jurisdiction conferred upon the Minister of Mines or any Mining Commissioner by any law relating to mining for precious or base metals".[68] The jurisdiction of the Witbank coal industry was thus protected by the state, often compromising alternate sources of land-based economic output such as irrigation for agriculture.

In 1921 this Act was amended, citing coal mining and washing as a significant contributor towards the creation of waste water contaminating rivers and streams. As industrialization in the Transvaal progressed, there was a growing recognition of "the large number of industrial processes in which problems of treatment and disposal of polluting waste waters have to be considered, if river and stream pollution is to be avoided".[69] The legal conception of industry-based pollution

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65 NASA, Department of Health, 1900-1973 (GES) 2069/107/33 'Report of the Departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies, 1943-1948.

66 Ibid.

67 Ibid.

68 Ibid.

69 Ibid. See Section 137, Irrigation (Amendment) Act (No 8) of 1921.

thus reflects considerable appreciation of environmental risks of mining, but did little to disseminate standardized practices for local authorities to utilize in the prevention or remedy of these inevitable impacts. This can also be seen in government's response to growing complaints of water pollution in Section III of the Public Health Act (No 36) of 1919, where the responsibility of water resource management was placed upon local authorities

> for preventing the pollution so as not to endanger health of any supply of water which the public within its district, has a right to use and does use for drinking purposes (whether such supply is derived from sources within or beyond its district) … and for purifying any such supply which has become so polluted, and to take measures (including, if necessary, proceedings at law) against any person so polluting any such supply or polluting any stream so as to be a nuisance to health.[70]

Witbank had been declared a local municipality in 1914, through significant financial support from the Witbank Colliery. For the first decade of its existence, the Witbank Colliery had, in effect, served as the local authority for the town. Hence, a very deeply entrenched conflict of interest may be cited as a hindrance for the effective implementation of the Public Health Act in Witbank. This was also constrained by a limited comprehension of the extent to which coal mining actually polluted local natural resources.

Changing conceptions of the 'Coal City', 1921-1933

Following the electrification of the town, and particularly after the establishment of the Electricity Supply Commission (Escom) in 1923, with offices in Witbank, the Witbank municipality began a campaign to attract further industry to the emerging industrial centre.[71] With an average annual output of six million tons, the basis of this campaign was that Witbank was the 'model' town for Escom.[72] This resulted in the up-scaling of mining and levels of output throughout this decade. Local residents felt that the government had a duty to support continued expansion through the "extension of the lives of existing mines by a reduction in working costs, and the opening up of new mines".[73] In 1927, Witbank became the "most efficiently and adequately lit town in the Union"[74] when the Mayor's wife was called upon to switch on Escom's 'Electric Lighting System'.[75]

With the rapid expansion of the gold industry, coupled with the steady growth of secondary industry throughout the Transvaal, the demand for electricity had become a matter of national priority. The Electricity Act of 1922 resulted in the

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70 Ibid.

71 The popular acronym for the Electricity Supply Commission was used until 1987 when it became known as Escom. To ensure historical accuracy the anglicized version is used.

72 'Advert – Witbank Municipality', *Witbank News*, May 14, 1926, p. 8.

73 'State aid for mines', *Witbank News*, June 5, 1925, p. 4.

74 'Model town – lighting', *Witbank News*, August 5, 1927, p. 4.

75 'Official opening of electric lighting system', *Witbank News*, August 5, 1927, p. 5.

formation of the Electricity Supply Commission under Dr. van der Bijl in March the following year.[76] Escom was the outcome of recognition by government officials that electricity was both "a public utility and an instrument of industry".[77] It was not a private company, and in its creation "it was not intended to create an electricity supply monopoly".[78] As a public works utility, Escom would function at cost.[79] Throughout the 1920s and 1930s Escom worked according to these principles. This provided a sense of security to Witbank authorities, presumably preventing any conflict of interest between various community stakeholders.[80] Escom provided new incentive for economic growth, and the local industry was supported by the community, such that its establishment in the district was almost certain. When Escom was taxed £600 for machinery in 1927, local debate ensued about why this company was being treated differently to the coal companies, who were not taxed, but were "engaged in what (was) practically equivalent to the operations of the Electricity Supply Co., that is, the wresting of potential power from Nature".[81] This impression of the coal industry and Escom reflects a common battle between industry and the natural environment to harness its energy potential for economic growth. Whether or not environmental impacts were understood, or felt, by residents, was secondary to the perceived role of the coal industry, which defined Witbank's very existence.

The Fuel Research Act of 1925 demonstrated increased control over natural resources by the state by the mid-1920s. This Act made it mandatory for prospectors and miners to submit information to the relevant state departments; it thus became easier to trace the growth of the industry from this point, revealing key indicators of local conceptions around coal use and resultant pollution.[82]

The power company claimed that all poisonous gases, "such as the deadly carbon monoxide", were destroyed through the super-heated and rapid burning of the fuel.[83] This total combustion prevented the atmosphere from becoming "unhealthy".[84] Remaining ash and clinker from the furnaces were transported to dumps, while the massive amount of water used to produce steam was condensed

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[76] Much of the early literature refers to the Electricity Supply Commission with an English acronym – Escom – this changed when the term 'Eskom' passed into law in 1987.

[77] Merz, C.H., 'Electric power supply', (1920) *Witbank News*, January 20, 1933.

[78] Ibid.

[79] 'Cheap electric power: Work of the Electricity Supply Commission', *Witbank News*, August 3, 1928, p. 5. While these principles guided Escom at this point, market forces precipitated political pressure over time. This led to amendments, particularly regarding foreign investment and state support of local industry and agriculture. The first amendment was made in 1947.

[80] 'The electricity question', *Witbank News*, August 27, 1926, p. 4.

[81] 'Attracting industry', *Witbank News*, September 23, 1927, p. 4.

[82] 'The Springs-Witbank Coalfield', in: C.R. Anhaeusser & S. Maske, eds, *Mineral Deposits of Southern Africa, 1969-1984*, p. 1971, 1986.

[83] Light and the municipality', *Witbank News*, November 6, 1925.

[84] Ibid.

and cooled in a pond daily. These processes were cheap and convenient, and provided a *supposedly* safe way of burning coal without poisoning the atmosphere.

While manual recording and later mechanical recording devices measured carbon dioxide levels of coal combustion, these were not seen in terms of long-term atmospheric pollution. Claims about improved burning processes, resulting in the safe consumption of carbon monoxide, cannot be proven through such tests, neither are they likely. A lack of environmental impact assessments from this time reflects how pollution was generally measured at face value in the establishment of energy processes related to economic growth. Did a smokeless power station really equal safe carbon emission? Claims regarding public health not only reveal that industry officials acknowledged the potential public health (and, indirectly, environmental) implications of coal mining, but also marketed supposedly 'cleaner' processes as a means by which to placate general opinion.

By the mid-1930s, geology, along with chemistry, had become crucial for industrial development. A geological study of the Witbank Coalfield was published, entitled *Coals of the Witbank District*. The work was welcomed by the coal industry. The foreword was written by John Roy, then-Chairman of the Collieries Committee of the Transvaal Chamber of Mines.[85] He boasted that "the collieries working in this area alone (were) capable of producing all the coal required to fulfil the entire demands of the coal trade".[86] Thirteen active collieries were recorded, including the Witbank Southern Area, Witbank Central Area, Transvaal & Delagoa Bay, Landau, Anglo-French Navigation, Schoongezicht, Middelburg Steam, Douglas (Witbank), Coronation (Kromdraai), Clydesdale, Tweefontein & Waterpan, Minnaar and Kendal. The *Witbank News* published extracts, and readers were urged to refer to the book itself for "proofs of these interesting and surprising statements".[87]

Conclusion

By the 1930s, the Witbank coal industry had grown into a significant producer of coal, as well as a range of other mineral and chemical products. The coal market developed in spite of numerous obstacles, including the absence of railways, truck shortages, competition and poor coal quality. The economic activity stimulated by the successful marketing of coal stimulated rapid urban expansion, as coal stimulated further growth. The environment of the Witbank coalfield was severely compromised in the growth of coal market. What legislation did exist was barely implemented, and generally placed the onus on the industry, as well

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85 'Foreword', Roy, John, *Coals of the Witbank District*, p. iii.
86 Graham, *Coals of the Witbank District*, p. 3.
87 'The Coals of the Witbank District', *Witbank News*, January 22, 1932, p. 2.

as the local municipal authorities, to deal with issues of pollution from industrial waste – with few enforcement measures implemented. After all, the local coal industry carried enormous political and economic leverage. Local conceptions towards coal mining, and its environmental implications, were strongly influenced by these power structures. The jurisdiction of the Witbank coal industry was thus protected by the State, often compromising alternate sources of land-based economic output. The following chapter deals with the impact of the Second World War as a stimulus for industrial growth and expansion of coal mining production, as well as the impact that this had on coal-based pollution in the Witbank district.

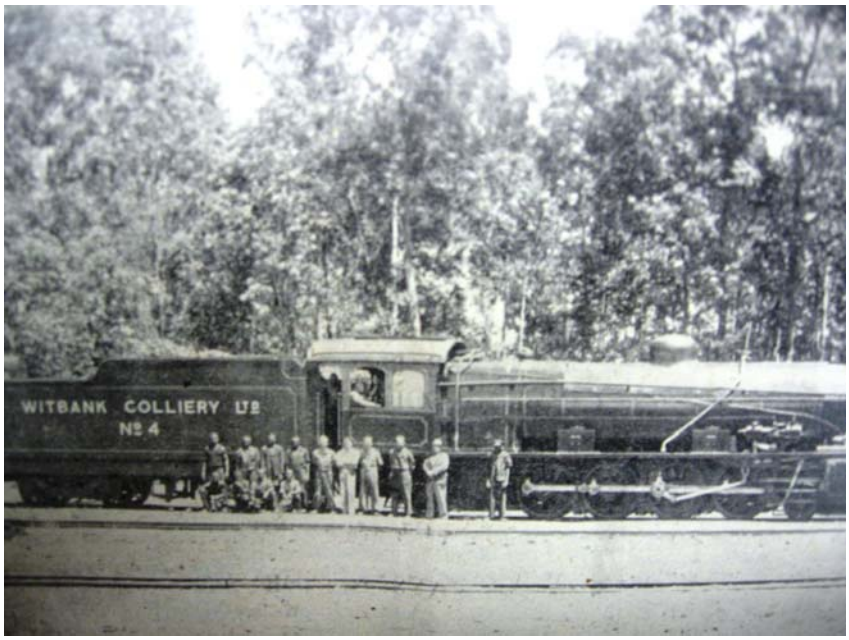

Photo 2.3 Coal transport, undated.
As the scale of production grew in Witbank, the transport of coal to markets became increasingly important, and challenging. This image depicts a locomotor of the Witbank Colliery Ltd, where coal would be loaded.
(*Witbank News* collection, undated)

3

The effect of war: Witbank's changing environment in a growing energy market, 1930-1947

Introduction

By 1930, the Witbank coal industry was a major producer of bituminous coal in South Africa. Over the decade, the State began to prioritize industrial expansion, especially immediately before and during the war years. It focused on building up its twin parastatals, the Electricity Supply Commission (Escom), and the Iron and Steel Corporation (Iscor). Coal thus experienced an increase in demand, with significant development in mine engineering technology to yield greater quantities. This chapter will assess conceptions of coal-based pollution in light of this industrial transformation, particularly within the context of the Second World War. The rapid expansion of industry stimulated more intensive forms of coal extraction, placing increasing pressure on available natural resources in the Witbank district. This chapter explores how ideas around coal-based pollution changed as a result of trends directly related to the war, especially the use of unorthodox methods of underground mining to complement coal production for the war effort. The contribution of the industry to the war industry was celebrated during this time, and little emphasis was placed on the potential environmental cost of intensified levels of production. Pollution was viewed as an unavoidable consequence of industrial development and economic growth. Worsening environmental conditions in Witbank by the end of the war rapidly changed perceptions of the gravity of coal-based pollution.

Towards a 'different' kind of beauty

The continued industrial transformation of the Witbank coalfield, coupled with the marketing of the town for other kinds of industry, resulted in largely positive perspectives of coal. During the 1930s, with the steady expansion of the coal market Witbank gained international recognition as providing the "principal coal beds" in South Africa.[1] Many investors now explored opportunities in the region with renewed interest. This included a delegation of the Third Empire Mining and Metallurgical Congress, which toured the region in April, 1930. The group was welcomed by John Roy, Governor-General of the Transvaal Coal Owners Association (TCOA). Roy assured the visitors and their wives that while the district was "possibly not (as) attractive as places previously visited", it was crucial for the "development of all other industries and the requirements of man-kind".[2] Roy made reference to the loveliness of the sunlit Transvaal highveld, with its variety of flora and fauna, riverbeds teaming with wildlife, and tall grasses swaying under an expansive blue sky. Witbank was clearly an unusual stopping point for the pleasure-seeking traveller – but the town had appropriated its industrial accoutrement as a new form of attraction. Witbank was appealing because of, and not in spite of, early appearances of coal-based pollution.

Coal was seen as essential for sustained industrial transformation in the Witbank district. This amounted to an aesthetic re-configuration of the natural environment. Coal-based pollution was sublimated by the idealization of local environmental changes, including the increasingly common appearance of a smoky horizon, dotted with smoke stacks and black mountains of coal waste. In this sense, Witbank retained its status as an ideal location for industrial development, despite having "very little claim to beautiful scenery".[3] The town took on the qualities of "a different kind of beauty … in its dark clouds of smoke which (could) be seen in every direction."[4] Conceiving the haze in such a way was seen to be a symbol of progress – rather than the steady build-up of atmospheric pollution. Signs of coal-based pollution were culturally linked to progress and development for the region. Witbank Colliery was even featured in a picture postcard advertising the town. The 'Approach to Witbank Colliery' featured power lines, smoke stacks and dark smoke emissions alongside neatly planted wattle trees in the picture framing the pathway leading to the colliery. Pollution was central to this aesthetic construct, with dark, billowing fumes

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1 Quoted by Governor General and representative of the Transvaal Coal Owners' Association, John Roy, to a delegation of the Third (Triennial) Empire Mining & Metallurgical Congress, 'Empire Mining Visitors – Inspect Witbank Mines & Industries' *Witbank News*, April 25, 1930, p. 4.

2 Ibid.

3 'Witbank: the Industrial Centre', *Witbank News*, June 17, 1932, p. 8.

4 Ibid.

demonstrative of the wealth of the city. Not only was pollution acknowledged as a distinguishing feature of the region, it was a way to market the town. This resulted in the idiosyncratic ideological construction of the natural landscape in line with the rapid industrial changes of the region.

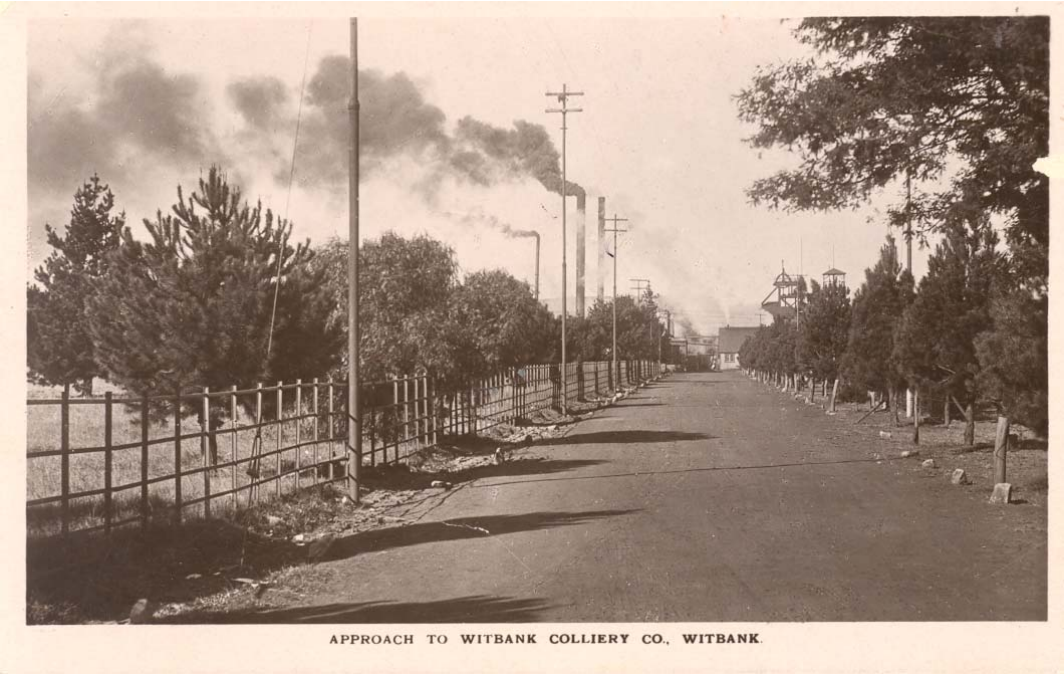

Photo 3.1 Postcard depicting 'Approach to Witbank Colliery Co. Witbank' (*Witbank News* collection, undated)

Not everyone accepted the overwhelmingly positive perception of coal mining. Some dissent could be seen in the pages of the *Witbank News*. For many, the place stood out not because of the "beneficial employment afforded, nor … because of the trade advantages", but rather because of the "smoke nuisance".[5] The unprecedented growth of the coal industry, coupled with the lack of state regulation over industrial emissions, during these decades meant that opposition to coal-based pollution would go unheard for decades to come. The appearance of severe localized evidence of coal-based pollution had a direct impact of the daily lives of local residents, but even "the silent curses of housewives, residents and visitors … must … have nearly blasted the smoke stack".[6]

[5] 'Witbank Colliery', *Witbank News*, January 21, 1927.
[6] Ibid.

A ‘superhuman’ battle against spontaneous combustion

One of Witbank’s biggest headaches …[7]

Witbank’s underground coal mines would regularly burst into flame. The appearance of fires was a significant challenge for colliery management. Once underground fires broke out, they were largely inextinguishable. The typical coal face in an early twentieth century underground mine was crudely exposed, with no preventive measures to ensure safety. Fine coal particles were strewn around the mine, and few measures were taken to ventilate the working area or wet the coal. This had the effect of exposing a large surface area of coal to oxidation. The layer of soil above the mine tended to dry out and subside, allowing “continuous free entry of air into the workings”.[8] The high pyrite content of the coal made the coal more susceptible to combustion and constant self-generation.[9] Flames could be doused, but the subterranean coals would continue to smoulder. Fires also had the effect of compromising the stability of the surface above the mine, with widespread subsidence. The fragmented surface, with “crown holes” and “deep tension cracks” thus allowed oxygen in, facilitating combustion.[10] Once burning, coal could no longer be used. Land affected by underground fires was usually abandoned, resulting in significant financial losses for the coal company.[11]

In July 1926 a fire erupted in the main shaft of the Witbank Colliery. Representing millions of pounds of losses for a company which largely controlled the town, a blaze in the colliery was breaking news. The fire was reported and debated in both the media and company meetings. It was described as representing “a terrific battle … waged with the forces of nature on one hand, and really superhuman efforts by the mine staff and employees on the other”.[12] That the experience of dousing the flames was analogous to a ‘battle’ reveals an understanding of the natural environment held to the coal mining industry. ‘Nature’ was seen as a realm to be dominated, controlled – and even defeated. Within this paradigm, man was elevated to a ‘superhuman’ realm, suddenly able to wage a ‘battle’ against the ‘forces of nature’ which held him back from his objectives. No mention was made of the cause of the fire – and later reference to the underground fires would argue that although “nobody (was) quite sure as to how

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7 ‘Paxton road safe from flames’, *Witbank News*, October 2, 1981, p. 64.
8 Bullock, S.E.T & F.G. Bell ‘Some problems associated with past mining at a mine in the Witbank coalfield, South Africa’, *Environmental Geology*, 33, 1, December, 1997, p. 68.
9 Ibid. p. 65.
10 Ibid. p. 68.
11 Ibid.
12 ‘Fire at Colliery’, *Witbank News*, July 9, 1926, p. 5.

the fires originally began, it (was) thought that they (were) a result of the old coal seams catching alight by spontaneous combustion".[13]

Six months later, the underground fire still smouldered. The battle to extinguish it was abandoned. Mining operations had to continue, and shareholders now focused on ways to contain the fire. The coal face was isolated "by means of sand and water lowered through boreholes sunk from the surface around the affected area".[14] The company gained some recompense through an insurance settlement of £30,000. Within a year, operations around the sealed off section continued to extract coal not affected by combustion. New shafts were sunk on the Central section of the Witbank coal property.[15] This reflected the importance of continued and regular output of quality coal.

This experience proved that while the dangers of coal mining did exist, they were controllable – and, besides, the need for continued mining outweighed its risks. This example of what could go wrong in a coal mine was soon forgotten. By the early 1930s, electric coal cutters and centrifugal pumps had increased the potential output of the workable coal seams. Owing to the relative dryness of the mines, these pumps were often "excessively corroded" by acidic mine water which would then be released into surrounding river and ground water catchments.[16] The colliery assured the public that even though instances of gas had been found in the Central area, ventilation was "(e)specially efficient".[17] Measures such as safety lamps were "obligatory", but there was an assurance that "no explosions (had) ever taken place in the history of the district".[18] The Witbank Colliery declared that Witbank coal was "specially noted for its freedom from any tendency towards spontaneous combustion".[19] Such claims could be made, in spite of the July 1926 fire, as the cause of the fire had never been established. Still, there was no certainty that such incidents would not recur. In spite of the visible risks of coal mining, the industry continued to develop and expand into the 1930s.

Marketing energy

The influence of the Witbank Colliery had long been the basis for Witbank's economic growth and expansion. This was consolidated throughout the 1920s, as the company began to expand its scope in the production of electricity. In 1920,

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13 'Paxton road safe from flames', *Witbank News*, October 9, 1981, p. 3.
14 'Witbank Colliery, Ltd. AGM: Witbank Colliery's Prosperous Outlook', *Witbank News*, January 14, 1927.
15 'Witbank Colliery, Ltd. AGM: Bad setback last year', *Witbank News*, January 28, 1928.
16 Ibid.
17 'Witbank Coalfields', *Witbank News*, August 18, 1933, p. 3.
18 Ibid.
19 Ibid.

under Section 27 of the Power Act of 1910 of the Transvaal, the company was granted permission to "supply electric power to the Town Council and Municipality of Witbank".[20] Signed by the Minister of Mines and Industries, this permission was granted for ten years, with rates not exceeding 3 pence per unit. The electric power would be supplied on a "3-phase alternating system of 50 cycles per second … and the point of delivery … in the Company's Main Generating Station at its Colliery".[21] The company had also arranged to sell most of its generated power to the Victoria Falls and Transvaal Power Company (VFTPC).[22] Coal was readily available in Witbank, but a central concern of the VFTPC was the availability of water for the station. In January, 1924, the VFTPC appealed to the Water Court in Pretoria for permission to impound water from the Olifants River for the Witbank Station.[23] The present license of the VFTPC did not allow them to supply power outside of the Rand, but they sold most of their power to Escom, who, in turn, supplied power to the South African Railways. A representative of the VFTPC argued to the Water Court that as Escom expanded, "their demand for water (would) increase".[24]

By 1927, Escom's national grid was complete. This was referred to as its first 'Electric Lighting System'.[25] Soon, more power stations were constructed near known reserves of coal, allowing for reduced capital expenditure. Their proximity to coal and water helped reduce the costs involved in coal production. These included the Klip, Wilge and Vierfontein power stations, all providing coal-fired power to the national electricity grid serviced by Escom.

A rapidly expanding energy market required cheap and abundant supplies of coal. Transvaal power stations of the 1920s were designed accordingly. Where coal quality was poor, carbon concentration was reduced, and the existence of impurities was greater. Stacks were constructed with the capacity to burn at higher or lower temperatures, enabling the consumption of low quality coal. The Witbank Colliery saw this as the "commencement of an assured market for … duff coal".[26] The creation of such a market for duff coal was met with mixed responses from the coal industry. Despite the certainty of markets, the selling price for duff coal remained extremely low, and could "scarcely be reckoned a

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[20] NASA, URU/444/1015 Memorandum, 'Grant of permission to Witbank Colliery to supply electric current to the municipality of Witbank', April 22, 1920.

[21] Ibid.

[22] Christie, Renfrew, *Electricity, industry and class in South Africa*, p. 56.

[23] NASA, Secretary of the Department of Mines and Industries, 1902-1950 (MNW) 711/MM/1172/24 'Application for the Victoria Falls and Transvaal Power Company', Water Court, Pretoria, January 7, 1920.

[24] Ibid.

[25] 'Official opening of electric lighting system', *Witbank News*, August 5, 1927, p. 5.

[26] 'Witbank Colliery Ltd. Annual Meeting, January 8, 1926', *Witbank News*, January 22, 1926, p. 2.

profitable part of the work of any colliery".[27] This was countered with the argument that the benefits of the power stations would result in further investment in the Witbank area, leading to greater consumer markets for coal. The Power Companies Commission had argued that the use of duff coal would conserve coal resources, preventing the build-up of coal waste sites.[28] In fact, the coal dumps continued to grow. At least one of these was situated in the central business district of Witbank.[29]

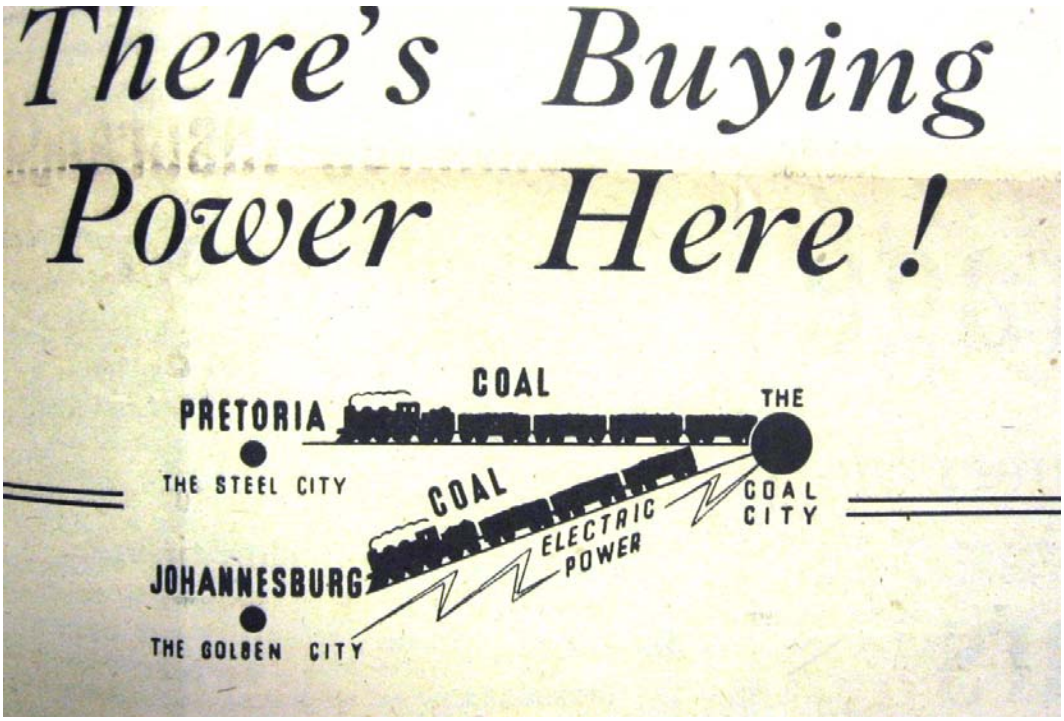

Photo 3.2 Advertisement for Witbank (*Witbank News*, December 12, 1930)

Duff coal may have aided the economic 'conservation' of coal resources, but its consumption exacerbated environmental conditions. Burning low quality coal released significantly more fly ash into the atmosphere than higher quality stock. Fly ash, previously referred to as clinker, was the ashen residue of coal combustion. The chemical composition of fly ash was complex, and often retained the sulphur, magnesium and mercury, amongst other minerals, found in the fossil

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27 'Coal and the immediate danger', *Witbank News*, October 30, 1931.

28 Christie, Renfrew. *Electricity, industry and class*, p. 41.

29 The coal dump in the centre of the town was eventually 'packed' underground, supposedly making the ground solid enough to endure the weight of building on the surface. See Interview with Malcolm Suttill, *De Heuwel*, Witbank, June 3, 2008.

fuel. Coal combustion at higher temperatures in the numerous power stations further reduced the emission of sulphur into the atmosphere. This gave some credence to the public conception that household silverware would not "tarnish so easily" in the era of domestic electrical power "for there (was) much less sulphur in the air".[30] South African coal was typically low in sulphur content. Still, at least half of the sulphur remained in the pervasive fly ash. This was spread by wind and rain throughout the district, gradually polluting land resources of the district, and shifting perceptions of coal-based pollution.[31]

Responsibility for tackling concerns around pollution was retained by the Department of Mines and Industries. This was emphasized in a 1931 letter by then-Minister of External Affairs J.B.M. Hertzog, advising the British Water Pollution Research Organization to contact the Secretary of the Department of Mines and Industries "for any information it may desire on the subject of the pollution of rivers in the Union of South Africa".[32] The Department of Mines and Industries acknowledged the existence of pollution as a consequence of coal mining and combustion, but little was done to ameliorate conditions. Monitoring and preventing industrial pollution was not a priority, particularly in light of the value of electricity in speeding up industrialization. Witbank had been elevated from the "poverty of a sparsely populated veld to the wealth of a populous and progressive town".[33] The environmental costs of this were thus seen as unavoidable.

Before electricity, energy creation for domestic cooking and heating had involved the onerous use and maintenance of coal. One housewife quoted in an Escom publication argued that even those who missed the romantic "crackle and traditional appeal" of a coal fire were "willing to concede the immense usefulness of the electric heater".[34] On the surface, coal-fired electrical energy appeared to be entirely safe, clean and economical. This type of manoeuvring typified Escom's marketing strategy. The power company aimed at *creating* further need for electricity, and encouraged the higher purchase of numerous household electric appliances. It emphasized the new convenience, and even luxury, attained by those on the power grid. This early marketing strategy entrenched the association between electricity and modernity. A 1933 engineering publication described electricity as providing salvation from the "dirt, depression

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30 'Light and the municipality', *Witbank News*, November 6, 1925.

31 Clarke, James. *Our fragile land: South Africa's environmental crisis*, Macmillan, South Africa, 1974, p. 38.

32 NASA, Prime Minister, Transvaal, 1907-1910 (PM) 1/2/316/PM/88/19/1 Letter from J.B.M. Hertzog, Minister of External Affairs, to the Water Pollution Research Organization, Department of Scientific Industrial Research in the UK, re: Prevention of River Pollution, 1931.

33 'Witbank, the city of coal-emerging from the Dorp stage', *Witbank News*, October 29, 1937.

34 'Electric fires: Heat when and where you want it', *Witbank News*, July 2, 1937, p. 2.

and disease" and "oppression of the smoke pall".[35] These would be eradicated and replaced with "cleanliness, brightness and health … as the work done by the steam engine and the coal fire (was) taken over by electric motors and electric radiators and cookers".[36] Escom played on a moral panic that emphasized access to energy as the only way of preventing an atavistic throw-back to pre-industrial conditions where housewives would be reliant on dirty, onerous coal fires to get their work done. Without power, the progress of industry and urban development would be lost, but the potential costs of this were not discussed.

Escom's domestic consumer market was thus stimulated through altering the general perception of an acceptable standard of living. In part, pressure to conform to this new lifestyle resulted in the production of an energy market.[37] While the grid already existed, the marketing of coal-fired power was geared towards the production of a new domestic consumer, firmly establishing Escom's political and economic importance.

Coal: 1,000 uses for man

> (The) power stations are here … the mines are here … we have coal. You look at industry – there is steel – it is here.[38]

The emergence of a local steel industry was a major turning point for coal expansion. This was illustrated in early 1927, when the Iron and Steel Industry Bill was read in parliament twice, reflecting the political significance of industrial growth at the time. Addressing parliament, the Minister of Defense, Colonel F.H. Creswell, argued that "the whole material" of modern civilization had emerged "from the discovery … that the heat energy locked up in coal could, by the intervention of suitable machines made of iron, be converted to a 1,000 uses for man".[39] Industrial growth and moral enlightenment were enmeshed within this understanding of coal-fired power. The Iron and Steel Industry Bill passed quickly through parliament. The Iron and Steel Corporation (Iscor) was established in 1928, chaired by Dr Hendrick van der Bijl. The parastatal would stimulate the local production of steel to ease over-reliance on imported steel.

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35 'The manifold uses of electricity', The SA Electricity Review & Engineer, reprinted in the Witbank News, September 22, 1933, p. 6.

36 Ibid.

37 According to Michel de Certeau, consumer production formed a covert form of marketing in that it did "not manifest itself through its own products, but rather through its ways of using the products imposed by a dominant economic order." De Certeau, M., *The practice of everyday life*, University of California Press, Berkeley, 1984, p. xiii.

38 Interview with Kaizer Mabena, representative of the Emalahleni South African National Civic Organisation (SANCO), SANCO Offices, Thushanang, June 4, 2008.

39 Houghton, H. & J. Dagut, eds, *Source material on the South African economy: 1860-1970, Volume 3, 1920-1970*, Oxford University Press, Cape Town, 1973, p. 92.

In 1928 the Minister of Justice, Tielman Roos, argued that the great abundance of easily obtainable, high-quality coal could "never mean a great export trade by itself".[40] This resonated within the Witbank coal industry, particularly with the discovery of abundant coal measures suitable for use in the process of steel production. Coking coal was generally of a higher quality than most bituminous coal. This made it possible for it to undergo a distillation process to remove its volatile components. The solid-fuel product could then be used, with iron, in the production of steel. Suitable coking coal was found in the Navigation Colliery of the SA Coal Estates (Witbank).[41] Iscor negotiated a contract for a provisional 25,000 raw tons of good coking coal per month to be delivered to the Pretoria steel works.[42] This resulted in broader recognition of Witbank as a site for industrial development, and by 1934, the first South African steel was tapped.[43] A 1936 marketing brochure of Witbank, introduced by Dr van der Bijl, highlighted the town as ideal for "the industrialist seeking a location for his activities".[44] Escom had been successful in its efforts to crystallize the domestic market for electricity. Energy requirements had steadily grown over the decade, and by 1939, general electricity consumption had increased over 17 per cent from the previous year.[45]

The modernity heralded by domestic electrification did not extend to the separated African locations which, by the end of the war, had thousands of residents. Thushanang was incorporated into a greater area known as Kwa-Guqa; other areas included Vosman and Hlahlanikahle. These areas had been constructed specifically to fall outside of Witbank's municipal boundary.[46]

Industrial growth and ecological effects during the Second World War

The rapidity of South Africa's war-era economic growth was unprecedented, with concomitant implications for Witbank's environment. Sudden demand from a range of both domestic and foreign buyers required quick increases of output.

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40 'National petrol,' *Witbank News*, April 13, 1928, p. 4.

41 NASA, Secretary of Justice (1899-1966) (JUS) 296/3/1122/20 Correspondence between Van Hulsteyn, Feltham and ford, attorneys, Notaries and conveyances, and the Minister of Justice in Pretoria, re: 'Flotation of a New Company,' November 24, 1920 Under the auspices of the South African Townships, Mining and finance corporation Ltd, the company had been floated in 1920 to take over the assets liabilities of the pre-existing Transvaal Navigation Coal Estates and Cassel Coal Company Ltd.

42 'Big Coal contract – 25,000 tons a month', *Witbank News*, August 5, 1932, p. 4.

43 Advertisement, 'Quality steel from ISCOR, Alan Grey Report on the Republic, 1968, p. 29.

44 Dr van Der Bijl, 'Introduction, Witbank – Power, water, light, coal', quoted in 'Rich in Industrial Potentialities', in *Witbank News*, May 7, 1937.

45 'Electricity supply – Annual Report, 1939', *Witbank News*, July 14, 1939, p. 5.

46 'Abandoned mine lands in South Africa: Case Study', *Mining Environmental Management*, July, 2000, p. 9.

Industrial expansion grew exponentially, owing largely to foreign geo-political uncertainties which stimulated foreign demand for local coal. Geological surveys done in the Witbank coalfields placed the extractive potential of the entire district at "roughly" 4½ trillion tons. The global total output estimate at this point was just under 1½ trillion tons.[47] Foreign investors looked towards Witbank more closely than ever before for cheap raw and coking coal. The extractive capacity of most coal mines was thus stretched to the limit. Railways were equally hard-pushed to transport the bulky commodity. Witbank's numerous collieries were overwhelmed with orders, and mine expansion was necessary to meet demands.

Politician and industrialist Dr Hendrik van der Bijl became the Director-General of War Supplies in 1938. He headed the construction of forty new factories, and the conversion of over six hundred factories to support the war effort. This included Iscor, which had expanded its ingot steel capacity, effectively becoming a war factory.[48] Industrial activity was sped up to meet the needs of the war-oriented state. This placed heavy demands upon the coal industry, whose profit margins were narrow. Instead of raising capital for new mining companies, Dr van der Bijl suggested that "the balance of the requirements" of coal orders could be provided by the existing collieries. This would involve extracting the "millions of tons of coal … left either on the floor or roof of their miles of workings".[49] The coal had been left behind in adherence to the safety requirements of environmental engineering design to ensure the structural integrity of the ceiling, as well as for its relatively low calorific value. At a time when industry needed it most, the "low cost would more than compensate for its admitted low grade".[50] With war time inflation, and narrow profit margins, it was more economically viable to return to abandoned mining sites to extract the remaining coal from pillars left to hold up the ground. This secondary extraction violated fundamental principles of environmental engineering employed in the initial design of the underground mines.[51]

Also known as 'pillar robbing', this method "had a marked effect on the environment".[52] Pillar and bord mines had been designed according to a "chequerboard" system of pillars, generally six square metres thick.[53] In light of the demands of a voracious economy, these spherical pillars were "whittled down to

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47 'Coal, the material source of energy', *Witbank News*, October 9, 1931.
48 Ibid.
49 'Oil from coal', *Witbank News*, January 28, 1938, p. 3.
50 Ibid.
51 For more on secondary extraction, see L.S. Jeffrey, '*Geotechnical factors associated with previously mined areas of coal and their impact on subsequent extraction*,' Masters thesis, Faculty of Engineering, University of the Witwatersrand, 2002.
52 Bell, F.G., Bullock, S.E.T., Halbich, T.F.J. & P. Lindsay, *Environmental impacts associated with an abandoned mine in the Witbank Coalfield, South Africa*, Elsevier Science, 2001, p. 1.
53 'Mine fire' (Reprinted from The Star), *Witbank News*, August 9, 1946, p. 5.

the narrowest possible safety margin".[54] While the original rate of extraction was approximately 75 per cent of underground coal, subsequent pillar robbing resulted in only 25 per cent of the original pillars being left behind. This created a higher likelihood of collapse.[55] When the pillars were robbed, what remained of them had to hold up the weight of the mine ceiling, placing tremendous pressure on the strata above and below the mine.[56] If the compression was too great, subsidence would occur. This meant that the surface layer of compressed topsoil would drop down to the floor level of the underground workings. The release of oxygen into the workings through crevices, or crown-holes, would feed smouldering underground fires, increasing the density of steam and toxic smoke visible at the surface.

Even as closed mines in the Witbank coalfield were robbed of pillars during the war years, up to two thousand tons of duff and low grade coal were dumped daily at Witbank's numerous waste sites. Despite "the immense tonnage of good coal that (was) dumped as waste in Witbank", it was neither economically viable nor technically feasible to rehabilitate the dumps.[57] While 'recycling' waste coal for local markets may have sufficed, the quality required for foreign markets was generally higher, and the technique was not put into place.

The influence of the war on the steel industry was noted by Dr. van der Bijl in 1940. He argued that "no special steels" had been produced prior to the war.[58] The war had stimulated economic conditions for the production of "steels considered by experts to be equal in quality to the finest steels produced in any part of the world".[59] The "destruction of plant and equipment" in Britain had resulted in pressure placed on the South African Union to "supply a very wide area" with steel.[60] Iron and steel showed the greatest expansion in the manufacturing sector, doubling net output from 9 to 18 per cent of total industrial output during the war years.[61] In light of this, the SA Coal Estates (Witbank), whose contract with Iscor had been successfully maintained, was exhorted to speed up production. To ease pressure at the Pretoria steel works, the company erected a crushing and washing plant for preparing coking coal on site. This plant was, at the time, "the largest of its kind in the southern continent".[62] By December, 1940, "the largest particular increase" in the supply of coking coal was to Iscor, which had passed the ½

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54 Ibid.
55 Bell, F.G. *et al*. 'Environmental impacts', p. 1.
56 Ibid.
57 Letter to the Editor, '1820 Settler', *Witbank News*, September 15, 1944.
58 'War effort increased – full capacity not reached', *Witbank News*, July 12, 1940, p. 3.
59 Ibid.
60 Malherbe, G. (Government Mining Engineer) Annual Report, Union Government Mining Engineer, 1946.
61 Feinstein, C.H., *Economic history of South Africa*, p. 124.
62 'Big Coal Contract 25 000 tons a Month,' *Witbank News*, June 17, 1932.

million tons mark.[63] The Navigation pit was worked extensively, yielding an annual output of ¾ of a million tons – apparently "without strain".[64] The new Iscor contract came into effect in 1942, increasing output expectations "to capacity of about one million tons, all of which (would) be coking coal for the steel works in Pretoria".[65] Between 1940 and 1942, total annual output grew at an average of 556,423 tons per annum.

The Witbank Colliery more than doubled the yield from its reserves between the mid 1930s and the mid 1940s. While 68,934 tons were produced in February, 1935, representing an average monthly output figure, by April, 1943, the average monthly output figure was just over 108,000 tons.[66] The available monthly average output figures for the Coronation Colliery reveal a similar rapid expansion during this decade, coinciding with war-related economic expansion. Coal output for February, 1935, was 48,563. This more than doubled to 103,018 tons by December, 1943. By the early 1940s, both collieries of the Transvaal and Delagoa Bay Investment Company, including the Transvaal and Delagoa Bay Colliery and the Douglas Colliery, were worked to their maximum capacity.[67] Increased demand for coal related to the war-time economic conditions did not always result in accumulated profits for the coal companies. The Transvaal and Delagoa Bay Investment Company complained that working at maximum pressure had incurred "considerable capital expenditure".[68] As far as the shareholders were concerned, colliery owners had responded to government calls for increased production. They had delivered on their responsibility, but received "no benefit whatever in the way of additional profits" and sensed that they were "depleting (their) reserve of coal entirely in the interests of the state".[69] Colliery owners also complained about heavy taxation, and the extent to which it was "wise or equitable to tax so heavily a company … which (was) exploiting a wasting asset".[70]

According to the available coal figures, the height of wartime coal production took place between 1942 and 1944, after which it began to tail off (see Graph 3.1). Out of the four coal companies presented, only the South African Coal Estates (Witbank) experienced sustained growth during the years immediately following the war. Specific surges in coal production during the Second World

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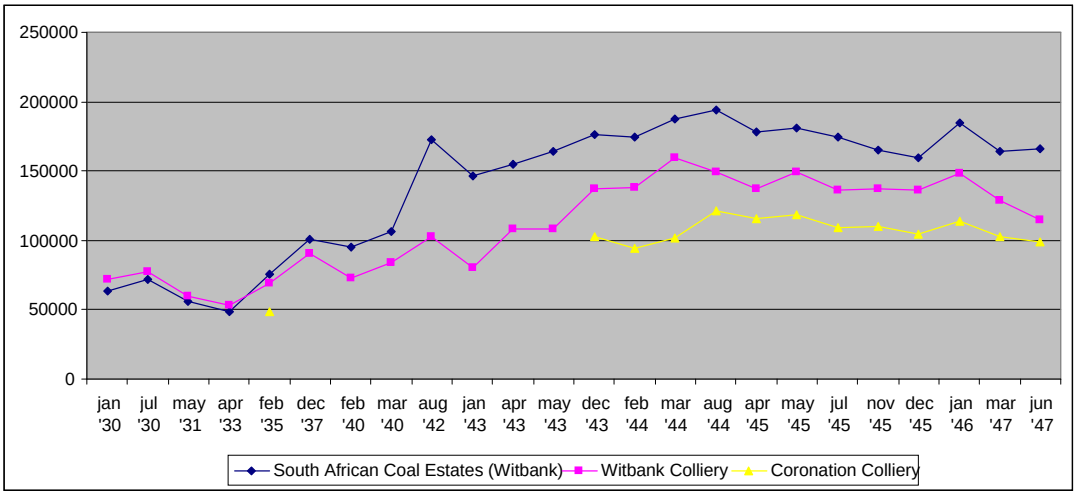
63 SA Coal Estates 2Oth Annual General Meeting, December 13, 1940, *Witbank News*, December 13, 1940, p. 1.
64 Ibid.
65 Ibid.
66 'Coal Output', *Witbank News*, May 7, 1943.
67 Transvaal and Delagoa Bay Investment Annual Report, *Witbank News*, December 14, 1944, p. 4.
68 Ibid.
69 SA Coal Estates (Witbank) 22nd AGM, 'Increased taxation exceeds advance in year's profits', *Witbank News*, December 11, 1942, p. 2.
70 SA Coal Estates, 22nd annual general meeting, *Witbank News*, December 11, 1942, p. 2.

War led to further expansion of the town and industry, but this did not correlate with the capital expenditure of sinking new shafts, since costs were generally reduced through the wartime practice of pillar robbing in abandoned underground mines.



Graph 3.1 Monthly coal output figures (in tons), 1930-1947.
Source: Published data from the *Witbank News* between 1930 and 1947.

The end of the war signalled a shift in the industry. Many collieries had exhausted their reserves. While some underground fires continued to burn, coal companies systematically exhausted the available coal reserves on their expansive land holdings. Mounting pressure during the war to produce coal, irrespective of economic or environmental constraints, had resulted in severe environmental implications.

This included underground fires, water pollution and the collapse of the ground surface at exhausted mines, including Middelburg Steam, Station, Uitspan, Apex, Transvaal and Delagoa Bay Colliery and Coronation Colliery.[71] Where it was observed, collieries had little space or incentive to remedy coal-based pollution. The demands of the war had taken a toll on the natural resources of the Witbank district.

Post-war conceptions of coal-based pollution

The political significance of the Witbank coalfields during the war meant new threats of military attack by Italian or German forces from the north of Africa.[72]

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71 Goldswain, Zita. 'No future plans for burning mines', *Witbank News*, November 22, 2002.
72 'Blackout: Witbank's next trial announced', *Witbank News*, June 5, 1942, p. 2.

Security officials argued that there would be at most thirty minutes warning of enemy planes approaching from the coast before the town was "plunged into inky blackness".[73] Fears existed that the Witbank blackout would be rendered futile because of the self-sustaining mine dump fires. They became "beacons … not only to Witbank, but Pretoria and the Witwatersrand".[74] The Axis powers never did invade Witbank, but a trial thirty minute blackout took place in 1942.[75] This attempt to make Witbank disappear – and, with it, the fruits of rapid industrial progress – was wholly disorienting. One pilot witnessed the attempt to hide the town in the countryside. He later described seeing the town "popping out here and there like bursting bubbles … there was the last section of street lights in Witbank off and – absolute blackness".[76] His account provides insight into the way electricity was conceived by the mid-twentieth century: a return to wilderness, through the removal of power sources like electricity, seemed surreal, and "for a moment, (he) was assailed with the erie (sic) feeling of having lost the world".[77] After having momentarily lost the world, the pilot was "comforted by the mine dumps glowing cosily, seemingly flirting with one another as the flames winked in the breeze".[78] From an aerial vantage point, the dumps took on an ethereal dimension, 'cosily' framing the product of their own making: the coal town of Witbank.

The harsh socio-economic conditions of the war popularized the idea of economizing resources. Rations existed for everything from petrol to paper. Natural resources, and their relative scarcity, were reconceived. The reclamation of abandoned workings for alternate land uses was never enforced by government, even when agricultural interests were compromised. The gravity of the pollution, which involved loss of arable land, clean air and potable water for sustainable urban development, was only partially understood. The immediate impact of coal-based pollution was evident in the aging coal dumps and smoky Witbank horizon, but the diffusion of pollution was not as extensive as it would later become.[79] A silent process of acid mine drainage (AMD) had been triggered by the extensive mining of the war years: the oxidation of pyrite from displaced strata within the coalfields gradually altered the pH balance of the water, result-

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73 'CPS: Civilian Protective Services: How a blackout is carried out', *Witbank News*, March 6, 1942, p. 4.

74 'Blackout', *Witbank News*, June 12, 1942.

75 'CPS', *Witbank News*, March 6, 1942, p. 4.

76 'The blackout from the air', by Skylark, *Witbank News*, April 24, 1942, p. 3.

77 Ibid.

78 'The blackout from the air', p. 3.

79 See Bullock, S.E. & F.G. Bell, 'Some problems associated with past mining at a mine in the Witbank Coalfield, South Africa', *Environmental Geology*, 33, 1, December 1997, p. 1; Adler, R.A., Claassen, M., Godfrey, L., & A.R. Turton, *Water, mining and waste: An historical and economic perspective on conflict management in South Africa*, The Economics of Peace and Security Journal, 2, 2, 2007, p. 34.

ing in highly acidic polluted waters entering the streams and catchments supplying the town. In turn, acidic surface water would enter river catchments, leaching particles out of the soil, including various heavy metals like iron, aluminium and magnesium. Abandoned shallow underground coal shafts were often recharged as a result of rain water, affecting water tables in the district. The collapse of underground structures were contributing factors in the rising occurrence of acid mine drainage into river catchments leading into the town and surrounding district.

With the war-time growth of urban settlements, the severity of pollution increased. One resident later associated a "time when there (were) not so many companies" with a "good environment".[80] The danger of subsidence was not restricted to the remote industrial outskirts of the town – but also affected the town itself. By the mid-1940s, new regulations were established regarding land "which would have been of great value for building on".[81] Buildings were not allowed because they were undermined, posing the risk of subsidence "several feet below the surrounding level".[82] By 1944, the town had

> the atmosphere of a city of as many tens of thousands of people … it [was] closely packed and congested to the point of bursting in the place where there should be room to breathe.[83]

The war had accelerated the gradual build up of pollution which could no longer be ignored. Government Notice No. 871, dated the 2nd of June, 1944, constituted a significant shift in State conceptions of coal-based pollution. The notice announced the establishment of the inter-departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies. It was appointed by the Minister of Welfare and Demobilization

> to enquire into, report upon and make recommendations … in connection with the incidence throughout the Union of bacterial and chemical pollution of water supplies used or which may be used for domestic purposes, including livestock, both in urban and rural areas.[84]

Chaired by Dr A.J. van der Spuy of the Health Department, this committee included a team of experts from the Departments of Health, Public Works, Irrigation and Agriculture. This research body made use of extensive "oral evidence tendered by the Government Mining Engineer".[85] Existing legislation was analyzed – revealing that while "wide legislative powers exist(ed) for the prevention of pollution … there (was) little machinery to implement these powers".[86] In particular, the Public Health Act of 1919 placed the onus of

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80 Interview with Sarah Mabena, Thushanang, Emalahleni District, June 4, 2008.
81 'Mine Fire', p. 5.
82 Ibid.
83 Published letter, *Witbank News*, September 8, 1944, p. 3.
84 'Report on Pollution of Water Supplies', p. 1.
85 Ibid.
86 'Protective Measures', Ibid. p. 7.

preventing pollution of local water supplies upon local authorities for purifying supplies which had become polluted, and for taking legal measures against "any person polluting any such supply … so as to be a nuisance or danger to health".[87] No regulations existed to guide local authorities on how they could both prevent and mitigate waste water pollution of streams and rivers. None of this was made public – an undated letter from the Secretary of Health to the Deputy Chief Health Officer confirmed that this concern was being treated "as strictly confidential" as the government had "not yet considered it fully".[88] By 1948, the Report of the Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies was presented in parliament.[89] This report was the first to tackle the difficulty of implementing existing legislation dealing with mining and industry-based pollution. It constituted an official state recognition of the inability of local authorities to control the effects of industrial waste, particularly mining.

The report listed industries culpable in the production of waste water. Gold and coal mining were notably placed at the top of this rather lengthy list of polluters. The pollution was linked to a wide range of industrial production, revealing to the Committee the "large number of industrial processes in which problems of treatment and disposal of polluting waste waters have to be considered".[90] Contributing factors towards water pollution were classified under three headings, including chemical, bacteriological/organic, and mechanical. This did much to emphasize the relationship between coal mining and pollution, but the rather narrow formulation of categories of pollution only partially grappled with the multifarious, largely hidden, environmental implications of coal production processes. Coal was cited in two out of the three technical classifications, including 'chemical' and 'mechanical'. While mechanical pollution was attributed to the process of coal washing, the Committee argued that this could be "obviated by the simple method of sedimentation".[91] Chemical pollution was defined as the

> discharge of industrial effluents into rivers or streams, either directly or indirectly and in addition many underground sources of supply [were] naturally polluted by an excess of chemical salts which render the water unfit for consumption by man or beast or agricultural purposes. The discharge of such effluents, especially those from gold and coal mines, [had]

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87 Ibid.

88 NASA, GES/2069/107/3 Correspondence (unofficial) between the Secretary of Health to the Deputy Chief Health Officer, Undated, found with documentation related to the Report of the Departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies, 1943-1948.

89 NASA, GES/2069/107/33 Report of the Departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies, 1943-1948.

90 Ibid.

91 Ibid.

> caused acute and chronic poisoning in stock and has also rendered excellent arable land totally unsuitable for agricultural purposes.[92]

The report did not provide guidelines for resolving the problem, but it was an ecological turning point in state conceptions of the environmental impact of the South African coal industry. For the first time, the state fully acknowledged the adverse influence of mining over alternate forms of resource management, such as agriculture. This provided some agency to farmers, both black and white, whose livelihood had been devastated through poisoned water sources and diminished land quality. The process of urbanization was accelerated as farmers recognized the long-term implications of ceding mineral rights to companies like the Witbank Colliery – after all, their land had become 'totally unsuitable' for anything other than mining. With the loss of land use, a growing contingent of Witbank residents, especially farmers, began to seriously question the viability of coal mining in the district.

The relative impotence of agricultural bodies in preventing water pollution is reflected in a 1946 Memorandum on the Irrigation Amendment Bill which was sent from the Director of Irrigation to the Secretary of the Treasury. The Department of Irrigation complained that it was "hampered in its operations by a lack of certain legislative powers" despite recognition "that the conservation of water (was) an undertaking of national importance".[93] This had the effect of disempowering the Department from assisting in the maintenance of irrigation works on riparian land affected by mining.

As collieries such as the SA Coal Estates and the Witbank Colliery exhausted their existing reserves during the war, they abandoned shafts, either before or after extracting the remaining reserves. By the late 1940s, many of these sites began to decant acid water onto the surface, with the result that the Committee recognized that "many rivers and streams, particularly those flowing through industrial areas, (were) badly polluted".[94] The Committee cited Section 137 of the Irrigation Act (No 8) of 1921, in an attempt to "draw particular attention to the immunity enjoyed by the mines in discharging chemically contaminated water into streams".[95] With continued industrial growth, and the "provision of more houses with modern conveniences … there [was] certain to be an appreciable increase in the next few years in the quantity of water of good quality required".[96] Local authorities, particularly in Witbank, were neither politically

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92 Ibid., p. 9.

93 NASA, Secretary of the Treasury, 1904-1974, (TES) 2743/10/188 Memorandum on the Irrigation Amendment Bill 1946, sent from the Director of Irrigation to the Secretary to the Treasury, Cape Town re: Amendments to Irrigation Act, 1912.

94 NASA, GES/2069 107/33 Report of the Departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies, 1943-1948'.

95 Ibid.

96 Ibid., p. 13.

nor financially equipped to take on the dual responsibility of facilitating urban growth and ameliorating coal-based pollution. The Witbank coal industry was largely unwilling to do so, as the cost of rectifying water sources would be large and time-consuming. The compilers of the Report had sensed "general apprehension" from the coal industry, which had come to regard the pollution as an inevitable opportunity cost of coal production. While the report conceded that "absolute prevention of pollution" was not realistic, it maintained that "by tightening up the present powers", it was possible to reduce pollution "down to reasonable limits without a serious additional charge on industry".[97]

By accepting that pollution, on some level, was an inevitable part of industry, the Committee abated the criticism of pro-mining government officials. At the same time, the discussion introduced the complicated task of reducing and regulating pollution. In a district with ongoing industrial activity, and widespread environmental damage, the polluter was often tricky to isolate. It was not possible to blame the TCOA or Chamber of Mines, and expect these representative organizations to deal with the accumulated pollution that had begun to spread throughout the district.

Individual collieries were hardly ever held liable, even if the relationship could be proven, as this was generally "impossible to do after the impact occurred, the mine had been closed or the company was dismantled".[98] The Committee argued that "the average member of the community hardly realize(d) the problems of water supply and the precautions necessary in protecting gathering grounds and wells from being polluted".[99] The reason for lack of interest in urban areas was attributed to the reliable supply of clean water from local authorities. This argument suggested that there was little incentive for urban dwellers to question the availability of water, especially in a town like Witbank, where most industry – and employment – was somehow connected to the coal industry. With only limited impact on natural resources, many chose not to notice the gradual changes in their environmental conditions.

The 'tightening up of power', as suggested by the Committee to reduce the risk of water pollution, included setting up regional water control boards which would represent populations. This proposal was aimed at creating "a greater interest being taken by the people".[100] One of the main duties of the water control boards would be to enforce existing legislation in the prevention of "undue pollution of water sources".[101] The Committee did not outline what constituted a

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97 Ibid.

98 Bosman, C. & L.J. Kotze, 'Responsibilities, liabilities and duties for remediation and mine closure under the MPRDA and NWA', Unpublished paper, Water Institute of South Africa, p. 3.

99 Report on Pollution of Water Supplies, p. 13.

100 Ibid.

101 Ibid.

'reasonable' level of pollution, demonstrating limited scientific conceptions of the capacity of coal mining to pollute. Future generations would bear the brunt of this invisible scourge.

By the time the pollution became noticeable, the mines had "typically closed or become insolvent".[102] There was, in fact, no one to be held accountable. They could not be impelled to "contribute to remediation, either financially or through other actions".[103] Mine closure meant little more than abandoning shafts. These sites effectively became waste lands, whose potential for productive use was compromised, and ultimately destroyed, by unchecked pollution. The industry thus "took advantage of weak governmental regulations by externalizing costs".[104] Environmental factors played a very significant role in determining the "bio-physical limits"[105] of economic growth, but these were largely hidden from the public, and obscured in the balance sheets of the Witbank coal companies. The absence of regulation in the selection of land to be mined – resulting in indiscriminate mining – reflects the failure of the government to recognize long-term ecological damage, and the strength of public perception that the benefits of coal outweighed its costs.

Conclusion

Remnants of abandoned mines had become a regular feature of the town by the mid 1940s. Smoke stacks and massive conveyer belts worked in tandem to create a uniquely industrialized vista. This was celebrated as a part of the financial windfall of coal mining activity between the early 1930s and late 1940s, with little focus on the growing phenomenon of localized coal-based pollution, including underground fires, subsidence and coal dumps. Evidence of pollution did little to persuade views related to the benefits of intensified coal production and combustion in the district. The Report of the Departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies reflected changing views which saw the need to control and monitor coal-based pollution. However, its existence in the industrial region was seen as impossible. The Report highlighted a list of major polluters, including the coal industry. Post-war reconstruction thus involved research to develop policies which would assist in the monitoring and control of pollution. The next chapter will assess debates around these decision-making processes, which ultimately led to the emergence of South Africa's first legislation aimed at minimizing pollution.

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[102] Ibid.
[103] Ibid., p. 35.
[104] Adler, R.A., Claassen, M, Godfrey, L. & A.R. Turton, 'Water, mining and waste: An historical and economic perspective on conflict management in South Africa', *The Economics of Peace and Security Journal*, 2, 2, 2007, p. 34.
[105] Omo-Fadaka, J, 'Economic growth and sustainable development', p. 227.

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Responses to the changing atmosphere of post-war Witbank, 1948-1965

Introduction

Post-war reconstruction involved significant shifts in the way pollution was understood. The evolving systems of knowledge related to the coal industry now expanded in both general scope and depth of understanding. This interest was no coincidence in the post-war economy, which continued to experience growth on a massive scale. Pollution had become widespread after the war. The profusion of air pollution in cities throughout the world had pushed local scientists to interrogate the relationship between the mining industry and its contribution to air pollution. This chapter will evaluate debates around pollution that took place in the decades immediately following the Second World War, resulting in the emergence of South Africa's first legislation aimed at minimizing pollution.

Witbank simultaneously experienced loss – with the abandonment of exhausted coal shafts – and gain – with the injection of new capital investment into mining and industry. New factories opened, and several state-funded power stations were built to support the national grid that delivered electricity to towns throughout the country. With its sprawling expansion of urban and peri-urban residential and industrial development, the large population of the Witbank coalfield had become plagued by atmospheric pollution, contributing to high rates of lung disease, particularly bronchitis, asthma and tuberculosis. This chapter will outline the findings of the national committees, scientists and task teams who worked towards passing of the Atmospheric Pollution Prevention Act in 1965. The research conducted before any parliamentary decision could be made regarding its promulgation was pivotal in changing conceptions of coal-based pollution.

Growth, prosperity and environmental change in the post-war coal town, 1948-1952

By the late 1940s, coal-based pollution had become a regular part of life in industrial Witbank. Soon after the war ended, several Johannesburg-based journalists from the *Star* newspaper drove to Witbank to investigate rumours of an underground fire which had broken to the surface near a public road en route to the town. The fire had raged for a week, with "flames shooting up out of the earth".[1] The arrival of the journalists was met with surprise by residents, who found it difficult to comprehend "why any fuss was being made of the latest blaze".[2] Sites such as the Apex mine described in the national daily were common throughout the district. They were isolated, and thus did not disrupt growth of the town. The visit of these journalists was thus significant in demonstrating the complacency of both the industry and residents of the coal town to localized signs of coal-based pollution.

Demand for Witbank's coal had been largely uninterrupted after the Second World War ended. Bunker trade was adversely affected by the fuel-conversion of ships from coal to oil, but local demand continued to grow.[3] The local industry was thus largely protected from a post-war slump that hindered other economic activity, and maintained a competitive advantage after the war. The state relaxed numerous restrictions that had held back capital expansion during the war, thus stimulating a new era of coal exploration. New shafts were sunk throughout the coalfield, and by the end of the decade, over two thirds of the Transvaal's collieries were situated in Witbank.[4]

A number of chemical processing plants emerged along the edge of the town, often bordering long-abandoned mining areas. This new economic activity helped secure Witbank's emergence as a regional manufacturing centre.[5] These plants often served the mines. One notable example was Rand Carbide, which had been built "out in the sticks", away from residential areas.[6] The factory produced carbide, a compound fusion of carbon and metal used in the headlamps of miners. The Cynamid factory was also established in the district, producing cyanide, a poisonous acid used to extract gold from ore in refineries. Another notable plant was Ferrometals, built close to the old Transvaal and Delagoa Bay Colliery.

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1 'Mine fire', *Witbank News*, August 9, 1946, p. 5.
2 Ibid.
3 Sealey, A., 'The Coal mining industry of South Africa', *Mining Engineer*, 151, 361, October 1991, p. 1.
4 Lang, J., *Power base: Coal mining in the life of South Africa*, Jonathan Ball Publishers, Johannesburg, 1995, p. 128.
5 'All coal records broken', *Witbank News*, August 27, 1943.
6 'Rand carbide sets the record straight', *Witbank News*, July 14, 2000.

Escom had grown significantly during the war years. As the nature of coal production changed, so did that of energy, thus affecting the relationship between the energy parastatal and the state. By 1947 the Electricity Act of 1922 was amended to suit the changing policies of an increasingly protectionist state. It soon monopolized South African energy, such that pre-existing bodies such as the Victoria Falls Power Company were outmoded. Domestic and industrial sale of units of electricity had finally grown large enough to warrant a national grid – serviced by Escom, and largely powered by Witbank coal. The massive demand for munitions during the war had also increased steel demand. Production thus expanded to facilitate further output. Several Iscor plants emerged throughout the district as the company grew. Witbank coal, as part of the ever-growing Transvaal coal industry, was one of the few coal centres able to increase output to meet the demand of local and foreign consumers after the war. The greatest problem at this point was not the availability of coal, but rather the lack of adequate transportation to carry coal to markets. By 1951, shortages were experienced as the railways were unable to deliver coal to markets. The state responded during the winter of 1951 by placing an embargo on the export of coal, temporarily relieving local markets.[7] This embargo was short-lived, but transport problems would continue to plague the Witbank coal industry for decades to come.[8]

New corporate structuring characterized the growth of Witbank's coal trade in the second half of the century. A major economic turning point for local industrial growth was the involvement of the Anglo American Corporation in Witbank after it experienced a massive financial windfall with the discovery of gold in the Orange Free State in 1949. The mining finance house soon amassed enormous profits, allowing it to dabble in other mineral interests, purchasing land throughout the coalfield. At least three collieries had opened since the middle of the war to supply Iscor with coking coal, including the Springbok Colliery.[9] The company also took over several pre-existing coal companies, including the SA Coal Estates. Many other collieries closed down as they exhausted their reserves. Damage to mined land was written off by both the companies and the local municipality. General industrial practice was to level the cost against capital gain; public officials thus had little choice but to regard such land as 'undermined'. The term soon took on several layers of meaning: not only did it allude to the subterranean pillar and bord mining methods widely employed, but also implied the loss of land use as a result of the advancing signs of surface degradation. Signs of this included the hardening and subsidence of the land, which

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7 Lang, J., *Power base*, p. 131.

8 The greatest development in transport of coal to markets took place in 1976, with the opening up of the Richard's Bay Coal Terminal on the east coast of South Africa.

9 *Witbank News*, November 20, 1964.

had become too dry and desiccated to sustain life, as well as acid mine pollution of varying intensities. Areas where coal mining had taken place were usually affected in some way, and thus long-term localized coal-based pollution played a significant role in the urban development of Witbank and its surrounding areas.[10]

Growth of the town – and informal townships – was thus determined by the bio-physical limitations of this unusable land. These sites had become desiccated blights of brown patchy terrain, "woefully short of trees" in a place that was already "generally drab".[11] Locations surrounding the town had started emerging in the 1920s, but their size and population density was notably greater after the war.[12] These included Thushanang, Vosman and Lynnville, amongst others.[13] In these bustling working class townships built on the verge of underground fires and dumps, and down-wind from factories and power stations, the lives of African, Indian and foreign temporary and permanent migrants coalesced. The eclectic population included the families of the African miners living in long brown brick mine compounds built relatively close to accessible coal seams. As the locations developed, they verged dangerously closer to mining sites. The physical separateness enshrined in the Group (Urban) Areas act of 1952 was entrenched by the insurmountable borders created by these relics of pre-war mining activity. Pollution, or disruption, thus took on a political nature. Apartheid thus entrenched the racialized "geographical isolation" of these locations.[14]

Witbank prospered after the war, providing both industrial and agricultural output to a growing economy. The two economic enterprises simultaneously made use of available natural resources, but it soon became apparent that these two activities were incompatible, particularly when it came to the pollution of natural water sources. In its ecologically monumental report of 1948, the Departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies had argued that the welfare of the South African economy was "bound up" with the health of her natural resources.[15] Without access to potable water, post-war urban expansion would be severely compromised. Evidence

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[10] Bullock, S.E.T. & F.G. Bell, 'Some problems associated with past mining at a mine in the Witbank Coalfield, South Africa', *Environmental Geology*, 33, 1, December 1997.

[11] *Witbank News*, February 18, 1949.

[12] Notes on discussion with Isaac Mampane, Witbank, Emalahleni, June 2, 2008.

[13] NASA, Department of Native Administration and Development (1924-1976); (Archives of the Departments of Bantu Administration and Development, Co-operation and Development, Plural Relations and Development Aid) (1958-1993) (BAO) 3/544/A2/17/4/1/K120 The informal settlements verging on the town of Witbank were granted separate town status in 1982, under Section 2 of the Black Local Authorities Act of 1982. See 'Establishment of the town council of Kwa Guqa', Government Notice, Department of Cooperation and Development.

[14] 'Abandoned coal mine lands in South Africa: Case Study', *Mining Environmental Management*, July 2000.

[15] NASA, GES/2069/107/33 'Report of the Departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies, 1943-1948'.

linking mining and mine-based water pollution already existed. These included reports that rivers such as the Komati, which formed part of the catchment entering the Loskop Dam, were being "badly polluted" by "mining going on in the upper regions".[16] Despite this, further investigation was necessary, with emphasis on the coordination of research into the full arena of environmental problems related to "the purity and suitability of surface and underground water".[17] The need for coordination of policy planning around natural resources had already been realized by 1947, with the formation of the national Natural Resources Development Board (NRDB).[18] This directorate was preoccupied with South Africa's natural resources, but its intent was not to prevent pollution or conserve resources for posterity. The NRDB was formed to investigate the most effective means of exploiting and developing natural resources, and was largely concerned with small town growth planning to attract more industry and thus balance out the distribution of enterprise throughout the country.[19]

A regional NRDB was formed in Witbank in 1949. This representative body reflected a new consciousness concerned with better utilization and control of local resources, particularly in light of the vast demand for South African natural resources during post-war reconstruction in Europe, Britain and the USA. In 1953, F.G.J. Du Toit, chairman of the council, argued that South Africa should "not be so eager to sell all its raw materials".[20] This included coal, which had gained value amid global shortages. The efforts of both regional and national bodies thus changed public conceptions of raw materials.

Conceptions around natural resource conservation related to the war-time mentality of scarcity. Conservation was thus understood to be based on the need to conserve in case of future conflict, which would adversely affect access to resources. The notion that coal was super-abundant was thus replaced with a mentality bent on resource conservation for local use. However, even as conceptions changed, little attention was given to the pollution of resources affected by the extraction of raw materials, particularly coal, which had been listed in the 1948 Report of Enquiry as a chief pollutant. The question of coal-based pollution remained secondary, and largely ignored, but this period did see some change in attitudes towards natural resources as the relative scarcity of this valuable fossil fuel was brought to the fore.

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16 NASA, Native Affairs Commissioner, Johannesburg, 1924-1978 (KJB) 466/N3/12/2/15 (16) Letter from C.A. Rawe, Assistant Native Commissioner, Barberton, to Mining Commissioner, Barberton, re: Pollution of the Komati River, 1940-1941, August 20, 1940.

17 Ibid.

18 'Development-regional planning of natural resources', *Witbank News*, July 22, 1949.

19 'Natural resources', *Witbank News*, November 11, 1949.

20 'Conserving raw materials', *Witbank News*, September 4, 1953.

Public health and coal-based pollution in the industrial age, 1946-1955

Soon after the war the Government Mining Engineer (GME) reported that almost 42 per cent of deaths on mines were a result of exposure to fumes in accidental explosions.[21] The frequency of gas-related fatalities forced the mining industry to pay greater attention to its occupational health policies. The pre-existing structure tasked with training selected miners in fire-fighting and underground rescue operations was first centralized under a management committee, and taken over by the Transvaal and Orange Free State Chamber of Mines in 1946.[22] This Central Rescue Training Station trained selected underground mine workers to deal with the fumes encountered during operations. These included carbon monoxide, carbon dioxide and methane, amongst others.

These revelations irrefutably debunked earlier conceptions that the Witbank coal seams were free from spontaneous combustion. Not only were these fumes responsible for many unprecedented and deadly underground explosions, but mere inhalation could have dire health implications. Coal workers were constantly at risk of damaging their lungs through dust inhalation. The health risk of exposure included a host of coal-dust-related diseases, whose relative severity depended on the chemical composition of the coal dust itself.[23] Considerable inhalation of dust over an extended period was likely to result in common pneumoconiosis, a relatively mild condition. The more intensive version of this was known as coal workers' pneumoconiosis, which could develop into progressive massive fibrosis, where a "dense mass of fibrous tissue (could) occupy much of, if not the entire, lung".[24] Less debilitating was athrocosis, a black deposit of carbon particles on the lungs. Coal and rock dust containing considerable volumes of free silica caused anthrocosilicosis, a condition resulting in "extensive fibrosis with associated functional changes".[25] With over fifty thousand coal miners in South Africa, the risk of fatal or debilitating occupational exposure had become a major concern.[26]

South Africa's post-war industrial era was, in part, characterized by the image of smoke billowing out of smoke stacks situated within its numerous industrial complexes. These were often engulfed by a haze of smoke and airborne chemical compounds released from any number of industrial and chemical processes. Hence, the risk of exposure to harmful smoke and gases was not restricted to those employed in mining. Although not as intensive as experienced by workers

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21 Annual Report of the Government Mining Engineer, Mining Year Book, 1947.
22 Rescue Training Station Handbook (Revised), Chamber of Mines of South Africa, 1972, p. 1.
23 'Coal dust: Hazards, control', *Coal age*, March 1970, p. 86.
24 Ibid.
25 Ibid.
26 Annual Report of the Government Mining Engineer, Mining Year Book, 1947.

underground, environmental exposure was widespread. The increase of air pollution heightened the risk of lung cancer for residents, and also had deleterious effects on those suffering from ailments such as asthma. By 1953, tuberculosis had escalated to the level of a national epidemic – with a daily death rate of fifty five for all races. Air pollution had a particularly harmful effect on sufferers of tuberculosis, whose lung capacity was gravely compromised within a context of diffuse smoke and harmful airborne chemicals.[27] The high altitude of the Highveld region exacerbated the rapid degeneration of air quality in Witbank, where particularly harmful particles released from power stations, factories and chemical plants had affected local air quality.

Local experiences and responses to atmospheric pollution were likely influenced by the international wave of scrutiny to this problem. In fact, the topic of atmospheric pollution had grabbed the attention of scientists worldwide. The problem was underscored after it became apparent that smog – and its dangers – was becoming an international pandemic. The most noted incident of 'fatal' smog had occurred in December of 1952, when the city of London was struck by smog whose toxicity was unprecedented. According to a subsequent report, inert weather conditions had "held the city's air close to the ground and … prevented the formation of winds which would have dispersed the pollutants that were accumulating heavily at ground level".[28] In a city where coal had been a staple energy source for over a century, the impact of the five-day-long 'pea-soup' smog was pivotal in changing conceptions of coal-based pollution. The changes were not merely those of perception, but directly affected the consumption of coal in the city. By 1956, the Clean Air Act had been passed, banning the burning of coal in the city of London. It also removed "much of the visible pollution from Britain's skies".[29] The Clean Air Act set a global precedent in the fight against atmospheric pollution.

The mid-1950s presaged a turning point in environmental consciousness. The calculations of one scientist had even begun to surmise the possibility of global warming through continued consumption of fossil fuels, particularly coal.[30] During this time, scientist Charles David Keeling developed the technology to measure global carbon dioxide levels. His measurements showed that these levels were steadily rising.[31] According to Kolbert, the fact that the rise in carbon dioxide levels was measured so long ago lends credence to the notion that "the

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27 'Notes on basis of approach to appeal', South African National Tuberculosis Association, 1962, p. 1.

28 'Pollution and your health' (published report), US Environmental Protection Agency (EPA), Office of Public Affairs, 1976, p. 5.

29 NASA, Secretary of Foreign Affairs (191901944) (BTS) 79/107 Letter by W. Malan, South African Ambassador in London, 'Congress on the Pollution of the Atmosphere'.

30 Joubert, L.S., *Scorched: South Africa's changing climate*, Witswatersrand University Press, Johannesburg, 2006, p. 4.

31 Kolbert, Elizabeth, *Field notes from a catastrophe: Man, nature and climate change*, p. 163.

changes that can be seen lag behind the changes that have been set in motion".[32] With over one century of rising global consumption of fossil fuels, it was only by the mid-twentieth century that the visible changes began to garner government attention. In South Africa, the stimulus for radical legislative reform was rooted in the Council for Scientific and Industrial Research (CSIR). One CSIR liaison officer, Mr. Masson, based then in Washington DC, began to study the effects of air pollution in the United States. He was motivated by the belief that "something should be done".[33] The preliminary research conducted by the CSIR was emphasized in 1953, when the port city of Durban experienced a severe bout of smog related to industrial emissions. The ability of the council to mobilize was limited under existing legislation. The Durban Town Council had little legal influence other than the Health Act. This Act was limited, as it gave local authorities powers to act only when dealing with a distinct health "nuisance".[34] This excluded ameliorating the exigent conditions of "general smokiness" plaguing Durban's environment. This dealt a significant blow to the municipality, as it was almost impossible for them to isolate industries in a complex where any number of companies could be the "causer of the nuisance".[35] This case embodied the air problem throughout the country. The CSIR had been the first national body to recognize that the problem was only getting worse, and began to lobby the Ministry of Health.

The Minister of Health was receptive to these calls for state action, and appointed the first National Air Pollution Committee in 1955 to "investigate … and to make recommendations regarding the steps to ameliorate and, ultimately, eliminate the problem".[36] The committee was made up of numerous relevant government department representatives, the CSIR, provincial administrative representatives, local authorities and industrial representatives. After conducting the research, the committee reported that smoke had become a major problem in residential areas. It recommended that legislation be swiftly introduced "for the effective prevention and elimination of air pollution".[37] The Committee's main achievement was the preparation of a draft bill largely influenced by measures applied in England and the United States. The report presented dealt with various kinds of air pollution, including coal and asbestos. The reference to asbestos

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[32] Ibid.
[33] NASA, GES/1642 116/26/D 'Minutes of evidence from the select committee on the subject of the air pollution prevention bill', March 8, 1961.
[34] Ibid.
[35] Ibid.
[36] NASA, GES/1642/116/26/D 'Report on the Commission of Enquiry into the Air Pollution Prevention Bill'.
[37] Ibid.

reflected an awareness of the dangers of environmental exposure – "not only for persons working in mines and industries, but also for those in the vicinity".[38]

Smoke was seen by the State as a local problem which could be dealt with by local authorities. However, the Committee argued that emission of gases and fumes from myriad industrial processes was beyond the capacity of local authorities, and could only be dealt with at a national level. The draft bill was presented to a Select Committee, whose task it was to "take evidence and call for documents".[39] This committee was unable to complete its work before parliament went into recess. It thus recommended that a commission be formed to deal with the continued implementation of findings related to atmospheric pollution.

The newly formed Commission of Inquiry into the Air Pollution Prevention Bill was crucial in the debate around air pollution that ensued over the following decade. It would be small, and the process of implementation gradual, as the problem was not yet considered to have "assumed such proportions" as to justify the participation of "a large number of officials".[40] Most vocal in the deputation was Dr E.C. Halliday, a prominent scientist belonging to the National Physical Research Laboratory of the CSIR. It also included several notable members, including representatives of the South African Railways, the City Council of Durban, the Department of Mines, as well as the Government Mining Engineer. The inclusion of industrial representatives, who were the main polluters, in the Commission was significant. It seemingly overrode the potential conflict of interest created by such a move. Nonetheless, the draft bill provided "for the recognition of the interests of industries, the mining industry and local authorities in connection with the administration of the Act".[41] This had the result of creating tremendous mistrust between state and civil society as the Department of Health gave "the impression of protecting bad polluters from the public rather than the other way about (sic)".[42]

Nonetheless, the report defended this move. It saw joint discussion between state and industry to be the only way to avoid "conflicting instructions of various pieces of legislation".[43] After all, private industry was "saddled with a burden" in having to gain approval from several authorities when embarking upon endeavours that could pollute.[44] The sphere of the prospective legislation was broad, affecting a range of legislation dealing with factories and mines, as well as local

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38 Ibid.
39 Ibid.
40 Ibid.
41 Ibid.
42 Clarke, J., *Our fragile land: South Africa's Environmental crisis*, MacMillan South Africa, Johannesburg, 1974, p. 47.
43 Ibid.
44 NASA, GES/1642/116/26/D 'Report on the Commission of Enquiry into the Air Pollution Prevention Bill'.

and municipal by-laws. Under existing legislation, the simultaneous enactment of different laws resulted in conflicting instructions, often holding back any form of resolution. It was thus desirable to implement "effective correlation" between the different forms of legislation as they all had "a bearing on the operation of the same industrial processes".[45] The realm of industry and mining in the process of enacting legislation was thus an accepted, and presumably important, part of dealing with the problem of air pollution.

In spite of the considerable evidence of water pollution as a result of industrial activity, little attempt was made to minimize the damage of water pollution.

Securing against the pollution of South Africa's 'wholesome' water supply

The Report of the Departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies had also granted special attention to the sustenance of "wholesome" water supplies.[46] The Committee was influenced by the growing international interest in water quality, as well as water quantity, citing "similar bodies … constituted in countries overseas for administering the Rivers Pollution Prevention Acts".[47] The "purity of water supplies" was "generally recognized" as a "major factor" in public health – and lack of knowledge was seen as the common obstacle to any policy implementation and the "precautions necessary in protecting gathering grounds and wells from being polluted".[48]

Regional water boards were recommended in the report: their key feature would be "to see that … undue pollution of water courses (was) not taking place in the regional areas under their respective control".[49] The report went on to argue that there was "certain to be an appreciable increase in the next few years in the quantity of water of good quality required in this country".[50] The report challenged how this "increase in demand" would be met, and recognized that "unfortunately many rivers and streams, particularly those flowing through industrial areas, (were) badly polluted".[51] The proliferation of "small" acts related to water resource management between the 1930s and 1940s had gradually increased state control over water resources, "culminating in the promulgation of

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45 Ibid.
46 NASA, GEN/2069/107/33 Provision of wholesome water supplies', Report of the Departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies.
47 Ibid.
48 Ibid.
49 Ibid.
50 Ibid.
51 Ibid.

the 1956 Water Act".[52] Not only did the Act give rise to the Department of Water Affairs, but Section 23 of the Act empowered the Minister of Water Affairs to take preventive measures against pollution "as a result of seepage or drainage from any area on which mining operations have been carried on after such operations have been abandoned".[53] The United Municipal Executive of South Africa argued that water be "divided" between agriculture, industry, municipal use and mining such that "a balanced development" could take place".[54] The Minister of Irrigation argued that pre-existing bodies such as the Natural Resources Development Council be used to implement new water management policies, despite the fact that the structure was not originally constituted for this purpose. This reflected a rapidly changing set of conceptions around water conservation and management, and that "in future specific provision … [is] made for the important aim of balanced development in the domain of water". Nonetheless, the 1956 legislation failed to conceive of the long-term incompatibility of simultaneous land practices.

Changing conceptions of the post-war environment, 1956-1960

Someone once remarked to me that 'once the coal dust gets into your hair, you never get it out.' How true! It seems if you are born on a coal mine, or have lived a number of years on one or near one, you usually die in the same vicinity.[55]

The first half of the 1950s saw unprecedented expansion in Witbank's industry. The region continued to produce approximately half of the national output of bituminous coal destined for both local and foreign markets. A new trend in coal stockpiling developed amongst local consumers. These were geared towards protecting against backlogs from railway truck shortages, particularly over the winter months. The problem of inland coal transportation had affected coal supply so badly that by 1956 the state had placed an embargo on coal export that lasted until late 1958. Despite the relative self-sufficiency of local industry, no power station equipment was manufactured in South Africa. Escom thus still had to rely on foreign suppliers. With the construction of the Wilge Power Station near Kendal, Witbank coal now fed at least two power stations in the growing

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[52] Burns, M., Findlater, K., Funke, N., Hattingh, H., Nortje, K., Turton, A. & A. Weaver, 'Redressing inequality, South Africa's new water policy', *Environment*, January 4, 2007, p. 2.

[53] NASA, CT/103/116/26 Letter from secretary for health outlining views on atmospheric pollution prevention bill by Collieries committee of the chamber of mines, 1965.

[54] NASA, TES/2743/10/188, September 27, 1956 Letter from Minister of Economic Affairs presented by the Director of the South African Agricultural Union at the Annual Meeting of the United Municipal Executive of South Africa, February, 1957.

[55] 'Dusty' column, 'Coal dust in my hair', *Witbank News*, July 1, 1960.

industrial complex.[56] This had a hugely disruptive effect on the balance of the local atmosphere.

Air pollution involved both aesthetic and chemical changes. The pale horizon was now laced together by outlines of jutting cement smoke stacks and faded ash-black clouds of smoke. The proximity of these power stations to the town now hastened the quick-step of general environmental degradation within an already-compromised natural environment. Smoke was a definite concern amongst local residents, but it merely contributed to the growing list of local problems related to coal mining and coal-based pollution. Since 1948, the clout of the coal industry had been challenged by the implementation of new racially-oriented land policies. It retained strength in places like Witbank where thousands of land plots were owned by mining companies. In spite of state attempts at regulation and control, informal locations had amassed upon private mine company holdings, beyond the control of regional land policy makers. These locations were spread out around a relatively uncontained urban sprawl, interspersed with mining wasteland, pristine grassland, residential development and industrial sites.

Local authorities, tasked with removing these locations and implementing the Group (Urban) Areas Act, had thus encountered numerous difficulties, to the annoyance of local farmers for whom private mine land already posed a threat. One disgruntled white farmer, Sgd. H.J. Stevens, wrote his complaints to the Department of Native Affairs in Pretoria.[57] He was frustrated with the lack of regulation over mushrooming locations on privately owned land. He implored the state to take action, asking "why make a law if you have no control over it?"[58] He had spent years trying to secure labour for his farm, to no avail. He could not compete with private land owners who charged workers far less for accommodation on a so-called "private location", as opposed to farm land.[59] The relative autonomy of the mining industry in determining land use was demonstrated by this case. Local authorities had little control over the use of mine-owned *terra firma* – and even less control over the use of the carboniferous wealth that lay beneath the surface.

Undermined land continued to restrain development in an expanding settlement, and this was only further complicated by the implementation of Apartheid. Five decades of migrancy to and from the labour district had invariably led to a

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[56] During the 1950s, other power stations were built throughout the Eastern Transvaal, including Taaibos, Hendrina, Arnot & Kriel. These were not all necessarily fed by Witbank coal. Many had contracts with associated collieries in the Vaal Triangle and Natal.

[57] NASA, *Secretary of Native Affairs, 1880-1975* (NTS) 7151/971/323/5(G) Handwritten letter from H.J. Stevens, Witbank, to Department of Native Affairs, Pretoria, December 8, 1954.

[58] Ibid.

[59] Ibid.

more permanent state of African settlement, resulting in higher mortality rates *in situ*. Not only did this complicate the implementation of the Group Areas Act, but it raised the matter of establishing separate burial sites for this marginalized yet populous grouping. By mid-1955, the Witbank town council was adamant that no more municipal land be used for the burial of "deceased non-European employees" of the Witbank Colliery.[60] The Witbank Colliery and regional Native Affairs Department were thus jointly tasked with resolving this gloomy problem. Under strict regulations of racial separation, the chosen site had to conform to "the stipulated distance of 1,000 yards" from "the nearest European dwelling".[61] To further complicate matters, the responsible parties were forced to take into account the ensuing problem of undermined land. It would have been physically impossible to establish a burial site out of the subsided sections of the Witbank Colliery land holdings. Pollution was understood in racial terms, and served as a powerful metaphor around white fears of being 'contaminated' by Africans, in spite of both races living in the same ecologically polluted region.

The difficult experience of establishing the cemetery clearly demonstrated the rigidity and deep inhumanity of racial separation in Witbank. It was also a revelation of the long-term effects of pillar robbing, which had destroyed the possibility of alternative use of the land after mining. By July, the Wolwekrans section of the company's property was offered for burial purposes. It was "situated on ground which [had] not been undermined, and under which no mining [would] take place in the future".[62] The local Director of Native Labour wrote to the Chief Native Commissioner the following month, suggesting that one morgen of ground should be granted for every 1,000 burials "for every 20 years of estimated existence of the colliery".[63] The required distance of '1,000 yards' from any 'European dwelling' could not be met – thus limiting options for both the municipality and the coal company. Witbank Colliery's manager, G. Sowry, asked for this condition to be waived. He argued that "considerable difficulty would be experienced in selecting an alternative site on ground which (was) not undermined, or likely to be undermined in the future".[64] Eventually, a representative of the Peri-Urban Areas Health Board confirmed that the chosen site was "satisfactory from a health point of view and (was) not likely to detract from the

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[60] NASA, NTS/10034/606/408K C. Sowry, Manager, Witbank Colliery to Native Commissioner, 'Cemetery – Witbank Colliery Ltd' Wolwekrans, July 21, 1955.

[61] Ibid.

[62] Ibid.

[63] NASA, NTS/10034/606/408/K Letter from Lambley, L.V.D.B., Director of Native Labour to Chief Native Commissioner, 'Subject: Non-European Cemetery', August 19, 1955.

[64] NASA, NTS/10034/606/408/K G. Sowry, Manager, Witbank Colliery to Native Commissioner, September 30, 1955.

amenities of the neighbourhood".[65] The cemetery plan could thus go forward, as it was not in conflict with any town planning scheme or health by-laws.

The growing demand for graveyards reflected the high level of mortality in post-war industrial Witbank. The region had transformed into an industrial network with a burgeoning population. The environmental impact of intensive industrial production, particularly coal consumption in the two power stations, was undeniable. It had the effect of exacerbating conditions of the lung, particularly tuberculosis, which had, by the time the war ended, become a national epidemic. Tuberculosis was later described as being the "product of socio-economic conditions, poverty, over-crowding (and) malnutrition".[66] It has thus been termed a "social disease … intrinsically linked to industrialization".[67] According to Tremblay, it is the disease "most closely associated with World War II".[68] In Witbank this related to the arrival, *en masse*, of a migrant work force seeking employment in the coal mines and factories of the coalfield. The needs of the war had taken precedence, giving "no time" for the development of "housing schemes and social services generally, increas(ing) the problem to a very great extent".[69] Witbank and its surrounding locations showed no exception in the presence of tuberculosis. The Southern Transvaal Tuberculosis Association, an early public health body, had complained in 1950 that there was "almost complete lack of facilities for the treatment of our tuberculosis (sic)".[70] This began to change in 1952 with the establishment of the South African National Tuberculosis Association (SANTA) "as a result of the generosity of the public in response to an appeal for £1,000,000".[71] The formation of this early non-governmental body was the culmination of a form of loose networks of voluntary community-based organizations around the country.[72] SANTA thus saw itself not only as a charitable public health organization, but as a "social movement in the field of health".[73] In practice, however, it mainly owed its origins to the work of volunteers in the Natal Anti-Tuberculosis Association.

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65 NASA, NTS/10034/606/408/K Secretary of the Peri-Urban Health Board to Native Commissioner, undated.

66 'Notes on basis of approach to appeal', South African National Tuberculosis Association (SANTA) National Appeal, 1962-1963, p. 6.

67 Tremblay, G.A., 'Historical statistics support a hypothesis linking tuberculosis and air pollution caused by coal', *International Journal of Tuberculosis and Lung Disease*, 11, 7, 2007, pp. 722-723.

68 Ibid. The link between tuberculosis and coal-based pollution – specifically, atmospheric pollution, was not scientifically proven, but the prevalence of the disease in Witbank during this time supports later claims arguing that "carbon monoxide in lung macrophages promote the reactivation of Mycobacterium tuberculosis", as well as the concept that "a specific workplace pollutant is involved in the reactivation of the disease". Ibid, p. 728.

69 'Notes on basis of approach to appeal', p. 6.

70 'The TB Tangle', *Witbank News*, July 8, 1960.

71 'Notes on basis of approach to appeal', p. 2.

72 Ibid.

73 Ibid.

The SANTA branch in Witbank was formed at a public meeting held on March 9th, 1955, with the election of Dr H.J.E. Schultz as the chairman. Its main goal was the establishment of a SANTA clinic for "non-Europeans" in order to "alleviate the serious local TB problem".[74] Progress was slow. Initial efforts saw the local Rotary Club of Witbank negotiating with SA Coal Estates and its principal, the Anglo American Corporation, to secure the compound buildings of their Schoongezicht Colliery. Despite cooperation from the industry, a permit for occupation from the Native Affairs Department and the Land Tenure Board was officially refused in 1957. A site was only found in 1958 when the municipality of Witbank offered the use of "suitable ground south of the Non-European hospital and a fresh application for a Group Areas Permit was made".[75] This permit was eventually granted the following year. The first patients were only admitted in November 1959. The new H.J.E. Schultz SANTA Centre no doubt brought comfort to many sufferers of tuberculosis, but it is possible to question the suitability of the ground granted by the municipality for use by non-Europeans. The brown-brick building complex could be found on the left driving into Witbank, situated on the Ferro Metals Road. It was also adjacent to the barren site of the defunct Transvaal & Delagoa Bay Colliery.

The hospital was a place of refuge for terminally ill patients, but this was compromised by its proximity to industry. Depending on weather conditions, smoke and airborne chemicals floated around the local atmosphere, often landing up in the airways of those who could least afford it.[76] It soon became apparent that "you [couldn't] put people near the … industries".[77] These areas were "full of dust … and this smoke [sic] … every night, after about six, seven o' clock".[78] Dust entering lungs infected by the bacilli of tuberculosis was relentless. Nonetheless, the organization sought to affect positive change. The case of this hospice thus highlights the relationship between coal-based air pollution and tuberculosis, and begs the question of SANTA's value in an area affected by severe air pollution.

By the end of the decade, concerns over coal-based pollution had begun to infiltrate the local press. More information was provided about the dangers of mining to safety and wellbeing. In 1960, one local columnist went as far as asking his readers if they had

> ever seen anyone affected by carbon monoxide, the deadly gas given off from coal? … the real danger lies in it being so difficult to detect, for the gas is colourless, tasteless and odourless. Frequent symptoms are headache, weakness, nausea, paralysis of the nervous

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74 'H.J.E. Schultz Centre, Witbank', *Witbank News*, January 29, 1960.
75 Ibid.
76 Notes on discussion with Isaac Mampane, Witbank, Emalahleni, June 2, 2008.
77 Ibid.
78 Interview with Sarah Mabena, Thushanang, Emalahleni, June 4, 2008.

> system, and slowing down of pulse and respiration … in spite of numerous warnings that are issued each winter, it would be surprising to learn the exact number of non-Europeans … who perish through carbon monoxide poisoning.[79]

The dangers of carbon monoxide had been well-known to industry insiders, and even workers, but it was only at this point that such discourse infiltrated the public arena. The problem continued to grow with the increasing rate of coal consumption. Generation of electricity had grown by 8 per cent per annum throughout the 1950s, and by 1963 this showed "no sign of slackening".[80] Escom constructed the Komati Power Station at this point, situated midway between Middelburg, Witbank and Bethal. It was lauded as the largest thermal station in Southern Africa at the time of its construction, with the completed station consuming coal at the rate of 10,000 tons per day.[81] Despite the use of lower-grade 'duff' coal in the process of consumption, dumps continued to grow throughout the district. Coal extraction retained a steady pace, but occasional contractions of demand resulted in the "heavy dumping of surplus duff coal". Such a reduction in requirement took place from December 1961, and continued at least until 1963.

The low grade waste was prone to sporadic flaming. None of this was new to Witbankers, but the profusion of the dumps led to new concerns within a growing populace. The simultaneous growth of dumps and urban residence had the effect of radically altering perceptions of the dumps which had previously been taken for granted within the community. When children started using abandoned collieries as playgrounds, community members began to complain. The abandoned sites were tempting to children seeking unconventional revels in the disused shafts and unregulated coal mountains. One particular instance of this was in the Outspan area of Witbank, where children were "going down into the disused shafts and old workings" of the abandoned Tavistock Colliery in order to collect coal and play games like 'hide and seek':

> The danger of these children being buried in a 'fall of earth' or overcome by gases [was] ever present. Some of them join(ed) a couple of ladders together and descend(ed) into these old shafts, if one should slip from these ladders, there [was] no knowing what the result [would] be – perhaps death.[82]

The abandoned coal dumps had become crucial sources of energy for cooking food and providing fuel for warmth for residents of the numerous locations excluded from Escom's distribution of domestic electrification. A new vocal

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79 'Dusty column – Coal dust in my hair', *Witbank News*, July 15, 1960

80 Gray, A., Report on the Republic, 1963.

81 'New Komati power station', *Witbank News*, June 23, 1961.

82 Letter – Safety first – 'danger at old Tavistock Colliery', *Witbank News*, August 18, 1961.

group called for the prevention of a "disaster" by sealing off the shafts "somehow before it (was) too late".[83]

Both the coal industry and local municipality had, until then, disregarded the environmental effects of long-term coal-based pollution – with even less attention given to the very real and physical dangers that existed at the surface. The Witbank Colliery soon started taking measures to "reduce the underground production of duff coal", such that only 23,197 tons of saleable duff coal were dumped in 1964, as opposed to 63,164 tons in the previous year.[84] Nonetheless, by the 1960s, the cumulative impact of coal-based pollution had irrefutably changed conceptions of the coal industry and its environmental legacy. Despite the incidence of innumerable environmental problems in Witbank, the most overwhelming claim against the entire coal-based industrial complex at this point regarded the proliferation of atmospheric pollution.

State, science and the question of pollution, 1961-1965

> Can any person living in this fair country of ours imagine what it will look like in fifty years hence … no, man's imagination has not the scope to undertake a projection of such a vast scene of utter desolation.[85]

Knowledge of atmospheric pollution, from coal and a host of other sources, had become more pronounced during the 1960s. Many felt that there was "no need to become panicky about air pollution" because South Africa's climate still had "the space and the wind to swallow up or dissipate the mess that man (made) of his air".[86] On the other hand, the state had now recognized that action was needed unless authorities wanted to "wake up in smog one day and have to spend millions cleaning it up".[87] Momentum had already been generated in the mid-1950s with the appointment of a special committee to research atmospheric pollution. The consequent formation of the Commission of Inquiry into the Atmospheric Pollution Prevention Bill (APPB) had been a continuation of a select committee of parliament unable to complete its work by the end of the parliamentary session. Its work was largely driven by the work of the CSIR, which had lobbied with urgency for a "technical investigation of certain specific aspects of air pollution in South Africa".[88] This national study would involve an assessment of "the technical and economic implications of the use of alternates to

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83 Ibid.

84 Review by Mr. T. Reekie, Witbank Colliery, Annual General Meeting, *Witbank News*, January 22, 1965.

85 Batteson, M.A, 'A study in contrasts', Winning high school entry in the 1960 'Witbank Union Festival Essay Competition', published in the *Witbank News*, May 13, 1960.

86 'Cleansing our air', *Cape Times*, August 17, 1963.

87 Ibid.

88 NASA, GES/2420/359/38 Secretary of the Treasury to J.J. Due Pre Le Roux, Secretary of Health, (quoting the CSIR), 1960.

bituminous coal from the point of view of smoke production".[89] More particular to Witbank, the study would explore the "question of the diffusion of pollution".[90] This would require significant investment. An estimated £15 000 would be required in the first year. Funding would be sourced from the CSIR, urban local authorities affected by pollution, as well as the state. Many felt that it would be "more equitable" if the research was mostly funded by the state.[91]

International pressure to tackle the problem of atmospheric pollution had led to the formation of multi-national groupings such as the World Health Organization (WHO) Meeting of Experts on Air Pollution, the United Nations for the Fight against Noise and Smog (NANS) and the Congress of Nations "for the fight against pollution of the atmosphere caused by exhaust gases of motorized vehicles".[92] Emphasis was placed on the cumulative emission of pollutants; coal-based air pollution was merely one of many. Hence, the numerous meetings of the Commission of Inquiry had included debates around the relative gravity of particular sources of pollution. The inclusion of a wide variety of public constituents in debates thus illuminated the perpetually changing, and often conflictual, conceptions of pollution.

Minutes of a meeting regarding 'Evidence from the Select Committee on the Subject of APPB' that took place in March 1961 was revealing in this regard. Halliday had argued that air pollution mainly took the form of smoke, "caused by a large number of things, but mostly by the incomplete burning of coal".[93] He thus implored that this faulty combustive process be remedied through greater efficiency; sufficient exposure to oxygen and high temperature would facilitate the full combustion of fuel. The only remnant would be "hot air, carbon dioxide and sulphur dioxide".[94] According to this prominent CSIR scientist, the relative danger of smoke diffusion could thus be accorded "on the basis of its blackness".[95] He cited "a large amount of research" that "demonstrated that the blackness of smoke (had) a direct relation to the total quantity of materials going up the stack".[96] On this basis, Halliday defended the clause of the APPB which gave local authorities the power to create by-laws to deal with smoke. These by-

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89 Ibid.
90 Ibid.
91 NASA, GES/2420/359/38 Letter of inquiry from the Honourable Secretary of the Municipality of Vereeniging in the Transvaal (undisclosed recipient)
92 NASA, *Secretary of Foreign Affairs (1919-1944)* (BTS) 79/107 'Congress on the Pollution of the Atmosphere', 1961 re: World Health Organisation (WHO) Meeting of Experts on Air Pollution, Geneva, 15-21 October, 1963, July 10, 1963.
93 NASA, GES/1642/116/26D 'Minutes of Evidence from the Select Committee on the Subject of APPB', March 8, 1961.
94 Ibid. The fact that carbon emissions were not problematized as a major contributor to global warming reflects a limited conception of coal-based atmospheric pollution in the above-mentioned legislation.
95 Ibid.
96 Ibid.

laws would thus impose restrictions for the emission of smoke "of above a certain blackness for limited periods only".[97] Halliday's specification that smoke control would take place for limited periods reflected the weighty influence of industry in drawing up the legislation. Even this internationally renowned authority on the prevention and control of pollution was willing to accede that total smoke prevention was impossible since "any factory or furnace or boiler burning coal must, from time to time, have the ash removed and when this (was) done, you cannot avoid making smoke".[98] The production of dark, undulating smoke in routine industrial processes was inexorable within the confines of affordable technology. The Commission of Inquiry had been adamant that in the promulgation of the bill, control would be "secured by agreement rather than compulsion".[99] Most important was to show that atmospheric pollution could be controlled in the "selected areas … and that the cost of such control (would) not cripple industry or the local authority".[100] This would necessitate the cooperation of state, provincial and local authorities and various industrial role players.

The work of the Commission of Inquiry into the APPB was groundbreaking, but did not resolve the entire problem of atmospheric pollution. When, during the March gathering, Halliday was asked for his opinion "on gases coming from motor car exhausts being a cause of cancer", his "position here [was] similar to that of dust from mine dumps":

> The National Committee did not attempt to deal with it because it did not know of any technical solution.[101]

Halliday's response was terse, reflecting certain limitations in the drafting of the APPB. The drafting of the APPB was, in fact, complicated by stiff debates around this limited span of legal recourse around pollution. It had remained unclear which source of pollution made the most severe contribution to atmospheric pollution. As emphasized by Halliday, the scope of the Bill was thus limited to restrictions and guidelines for which a known technical remedy could be found. There was no doubt that the combustion of coal was a main contributor – it had topped the list of the 1948 Report of the Departmental Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies – but the scope of the problem of air pollution had expanded.

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97 Ibid.

98 Ibid. E.C. Halliday was regarded as an international authority on atmospheric pollution. This is demonstrated in his 1963 appointment to the World Health Organization's Expert Advisory Panel on Air Pollution on Environmental Health. See also NASA, BTS/79/107 'Congress on the Pollution of the Atmosphere, 1961-1962', August 18, 1963.

99 'Cleansing our air', *Cape Times*, August 17, 1963.

100 Ibid.

101 NASA, GES/1642/116/26D 'Minutes of Evidence', March 8, 1961.

Two other main sources of atmospheric pollution had included diesel-based exhaust fumes from motor vehicles and dust from mine dumps. The dialogue facilitated by the meetings of the Commission of Inquiry had brought these problems to the surface. The growth of consciousness around the relationship between environmental degradation and public health had already been revealed in the formation of SANTA. This organization focused on tuberculosis, which was directly affected by atmospheric pollution. More revealing of responses to changing conceptions of pollution was the formation of the Anti-Diesel Pollution Society in Mayville, Natal.[102] The organization aimed at raising awareness of the dangers of diesel, specifically its relationship to lung cancer. This organization was well represented at meetings of the Commission of Enquiry. It emphasized the "very strong evidence" that revealed that the diesel engine was harmful to health and argued that it was "not good enough" to pollute the air which South Africans had "no choice but to breathe".[103] It was obvious to the organization that an urgent "adjustment" to popular conceptions of diesel use was necessary.[104] In a pamphlet written by G.C. Myddelton entitled 'Diesel Fumes and Lung Cancer' he argued against the mainstream view still held that saw little merit in existing scientific or medical evidence connecting diesel fumes and lung disease.[105] The pamphlet had been written in response to a statement made by Dr P.J. Lawther, Director of the Medical Research Council Group for Research on Atmospheric Pollution, who had publicly denigrated the "many ill informed attempts to incriminate the diesel engine" which, in his opinion, did not "merit serious discussion".[106] Myddelton argued that the "possible connection between diesel fumes and lung cancer certainly merit(ed) serious consideration".[107] The Anti-Diesel Pollution Society was thus pivotal in reshaping the way atmospheric pollution was conceived.

New knowledge presented by this group included expanding the scope of understanding of air pollution – which had previously only been "equated with smoke … which (was) obvious to the eye".[108] This association was thus revealed to be entirely misleading since "all sorts of gases and vapours, many of them irritant and harmful, (were) completely invisible and exist(ed) quite apart from smoke".[109] One set of carcinogenic chemical constituents included the full variety of "aromatic polycyclic hydrocarbons", the most "famous" and "notorious"

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[102] NASA, *Town Clerk, Pretoria (1897-1975)* (MPA) 1/4/7/3/69/D1/37/A Formation of the Anti-Diesel Pollution Society in Mayville, Natal, undated.
[103] Ibid.
[104] Ibid.
[105] NASA, MPA/1/4/7/3/69/D1/37/A Myddelton, G.C. 'Diesel Fumes & Lung Cancer'.
[106] Ibid.
[107] Ibid.
[108] Ibid.
[109] Ibid.

being benzpyrene.[110] The measurement of benzpyrene was, in fact, used as a "guide to the degree of general polycyclic hydrocarbon pollution".[111] At this stage, the national incidence of lung cancer had risen dramatically, but no single cause of the disease had been "scientifically demonstrated".[112] He felt that "every possible factor should be investigated".[113] Myddelton was adamant that adhering to the theory that there was only one cause was obscuring the fact that there may be other, and far more powerful, causes of lung cancer.

Conceptions of pollution had become far reaching; coal-based pollution was now seen to be central, but not singularly important, in the production of atmospheric pollution. Numerous amenities of modern living, including the production of electricity, tobacco and motor vehicles, were now being connected to the introduction of powerful carcinogens into the atmosphere – but without definitive proof these remained largely unregulated. Such questions certainly had the effect of expanding the scope of understanding of pollution and its dire repercussions. Despite this, mining remained the major source of pollution, with broad representation in the discussion of the Commission of Enquiry.

The Commission was riddled with opposing viewpoints on the source of pollution and its links to both environmental and health problems. Some members were more radical than others. Mr R. Mitchell, the town engineer of the Springs Municipality, was extremely outspoken about the dust problem from mine dumps.[114] He criticized the fact that the dumps had not even warranted enough attention to be considered a problem, "so much as being merely a nuisance".[115] Mitchell also corrected the misconception that mine dump dust was a "local problem".[116] He unequivocally regarded this as a national problem, covering "the Witwatersrand proper, the Western Transvaal, the Eastern Transvaal from Springs to Kinross and part of the Free State".[117] This certainly did not fit the description of 'local.' He went on to argue that there were "more towns in South Africa affected by dust from slimes dams at present, than there (were) towns with a smoke problem".[118] The situation was simply getting worse with time, and would continue to degenerate to such a degree that

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[110] Ibid.
[111] Ibid.
[112] Ibid.
[113] Ibid.
[114] Springs had long been a site of both coal and gold mining. In fact, one common geological nomenclature for the Witbank coalfield is the 'Springs-Witbank coalfield.'
[115] NASA, GES/1642/116/26D Minutes of meeting of the Commission of Inquiry with Mr. R. Mitchell, town engineer of the Municipality of Springs, April 19, 1961.
[116] Ibid. Referring to mine dump dust as a local problem meant that mitigation was thus leveled at local government authorities and civic organizations.
[117] Ibid.
[118] Ibid.

> in 40 or 50 years it [would] probably be impossible to live in the area … it is not the same as with other forms of atmospheric pollution where pollution stops when the agency producing it closes down … the reverse [was] rather true, because the real problem [was] created after a mine [had] ceased to function … the slimes dams and mine dumps steadily erode as time goes on and as rain and weather conditions break up the hard crust at the surface, so thick layers of dust become thicker and thicker. All dumps go through this process although they may differ as to the composition of the material.[119]

Mitchell's description was certainly true of the mine dumps circling the town and vicinity of Witbank. He went a step further by arguing that this constituted a "far more urgent problem than that created by smoke".[120] Dust was "more intensive and destructive".[121] His message was urgent, in that there was a

> limit to the time within which such measures should be applied namely before a mine is closed down. Otherwise, who is to be held responsible for such measures after the mine has closed down and who is going to finance them?[122]

Mitchell's argument must have frustrated the core group of the Commission of Inquiry, who were already tasked with a massive set of concerns in tackling coal-based atmospheric pollution. Despite his renegade attitude and incisive critique, Mitchell fell in line when it came to the role of the mining industry. He deferred to this sector by specifying that "he did not want to be interpreted … as being unfairly critical of the mining companies".[123] He even defended the damage already done by the industry by arguing that the pollution by the mid 1960s had not been anticipated by them. The dust problem had only started "when dumps were abandoned".[124]

The Air Pollution Prevention Bill was approved by the Minister of Health on August 6, 1963. Copies were printed in both official languages and made available to individuals and organizations to give time for comments on the Commission's recommendations before the draft legislation was introduced to parliament. By 1965, the Minister of Health announced the promulgation of the Atmospheric Pollution Prevention Act (APPA). Its central objective was the control and amelioration of the "health and amenity implications of air pollution".[125] The administrative powers of the APPA would be vested in the Ministry of Health. Much of the work related to the implementation of the Act was of an "engineering or a chemical engineering nature, or else … mechanical and combustion engineering".[126] Thus, a National Air Pollution Advisory Committee was

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[119] Ibid.
[120] Ibid.
[121] Ibid.
[122] Ibid.
[123] Ibid.
[124] Ibid.
[125] NASA, GES/1643/116/26E 'Point 1, Air pollution prevention bill', House of Assemby/Volksraad, 1965.
[126] Ibid.

established to assist the Department of Health with technical information and advice. The Act in effect empowered the Minister of Health to take action over atmospheric pollution by declaring any area to be a 'controlled' site in terms of the Act.

The human cost of the coal mining industry

> Nobody will deny that … the air is rotten … they say you don't have to smoke in Witbank, you just walk outside and take a … deep breathe.[127]

The 1950s and 1960s saw tremendous changes in the way pollution was understood. Both social and scientific connections were being made around the numerous environmental and health implications of ongoing uncontrolled atmospheric pollution. Air pollution was affecting the health of the environment, with indelible implications to the health and general well-being of off-mine communities windswept by the dust and particulates released in the process of industry. Often, these effects were indistinguishable. Throughout the Witbank coalfield, this was felt in terms of the health and general quality of living of those nearby active or underground mines, smoke stacks of power stations, dust-blown coal dumps and industrial sites.

Malcolm Suttill, an English engineer for whom Witbank had recently become home through his recruitment by Anglo's subsidiary, Highveld Steel & Vanadium, remembered his initial arrival in the area in mid 1968. His first winter was spent in the single compound accommodation made available for professional industrialists looking to permanently settle in the town. He vividly recalled the misery of regular invasions of black, gritty dust blowing out of the smoke stack of the Witbank power station. This power station had closed by the time of his arrival, "but the tip was totally open".[128] His single quarters were quite close to it:

> in windy weather I mean there was all-sorts blowing off this … ash tip … horrible … and that continued for a lot of years before they seemed to get some good grass on it and then they, they got rid of most of it and um … it was horrible, it used to blow all over the place . I can remember that (it) was so cold when the wind blew in and seeing the wind blowing and then blowing this ash up as well … it was pretty horrible living anywhere near that thing at the time … yes, that was bad.[129]

Suttill and his family had joined a wave of English technical experts and miners who settled in the town during this time. He recalled that they were "quite concerned about the health of (their) children".[130] Lungs in small children were more prone to damage as they were not yet fully formed. Inhalation of excessive dust and smoke was particularly unhealthy for this age group. He recalled that

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[127] Interview with Le Clus Taute, Goedehoop Colliery, Mpumalanga, June 5, 2008.
[128] Interview with Malcolm Suttill, Witbank, June 3, 2008.
[129] Ibid.
[130] Ibid.

bronchitis, asthma and other lung-related ailments were "a bit of an issue".[131] His diminution of the gravity of the health implications echoed E.C. Halliday's curious hesitation in proclaiming a clear link between pollution and lung disease. During one discussion, he had been asked by a member of the Commission of Inquiry whether he thought that "pollution of the air adversely affect(ed) health to such an extent as to justify the introduction of machinery for the control of industries". In response to this, Halliday had argued that

> the cautious attitude to adapt towards air pollution would be to say that it constitutes a hindrance to good health … generally, when a person is ill, pollution of the air prevents him from getting well easily because there is no doubt that air pollution restricts breathing, although less with some persons than with others.[132]

Proclamations made by scientists and health experts were not based on exhaustive research. In fact, very little research had been conducted outside of the realm of occupational health – particularly in relation to environmental exposure. The question of absolute knowledge had become significant in establishing the relationship between air pollution and respiratory disease. Any level of doubt made it difficult for advocacy groups to isolate blame to any of the 'scheduled industries', including energy, steel and mining. In May, 1965, the *Star* published a letter from H. Nelson, a Medical Officer of Health. This formed part of a cautionary discourse around polluted air and its ramifications. While he was aware of its possible effect on young children, very little was known "about what effect it (could) have on the unborn child".[133] Most pre-natal deaths observed by him were "due to prematurity and atelectasis of the lungs", but he was "quite unaware of polluted air being the cause of either of these".[134] The limited conception of air pollution was clearly linked to a lack of knowledge. Without being equipped with medico-scientific proof of the relationship between air pollution and coal mining, little could be done, and Witbank continued to change. Ignorant of the long-term health effects of smoke exposure, and largely reliant on an industrial economy, the majority of the local population was forced to tolerate the unpleasantness of the smoggy town. Two companies cited were Rand Carbide and Cyanamid. One of the complaints leveled at Cyanamid was

> not about the smoke so much … we used to get what we called tomcat smell … they were making cyanide for one thing. They were making some of the products going into pharmaceuticals as well, from sort of carbon and nitrogen type products … and um, and some of that stuff … was … some of the early antibiotics … they were burning off some of their rubbish all the time. It was a constant thing … it was horrible … that was really, really bad pollution

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131 Ibid.

132 NASA, GES/1642/116/26D 'Minutes of Evidence from the Select Committee on the Subject of the Air Pollution Prevention Bill', March 8, 1961.

133 NASA, MPA/1/4/7/3/69/D1/37/A Letter from H. Nelson, Medical Officer of Health, to the assistant to the Editor, *Star*, Johannesburg, May 12, 1965.

134 Ibid.

> … people wanted to move it was so bad and they wouldn't own up to it and we all got it … whenever the wind came in our direction it was horrible … *we didn't think that was detrimental to health … (although) it was affecting our standard of living* … it was that nasty.[135] (my italics)

The APPA set a new precedent for environmental regulation, forcing industries to measure their levels of air pollution. However, it was not simply the smoke from a single industry that needed to be halted. Pollution in Witbank came with a myriad of sources. The strength of the APPA was limited in dealing with the full impact of pollution. It would remain difficult to relieve the grumblings of local residents complaining over the aesthetic and olfactory pollution of their air.

Conclusion

In the decades following the Second World War, conceptions of coal-based pollution had changed beyond recognition. Local and global experiences of acute pollution during the 1950s had raised awareness and fortified the call for research around atmospheric pollution and water conservation, as well as the implementation of systems of control. In many instances, research involved merely citing the appearance of industrial towns such as Witbank, which not only produced at least half of the nation's coal, but also hosted the majority of its conversion into electric power. Witbank also hosted other industries, creating an amalgam of smells and fogs which covered the town. Despite the fact that pollution had been decisively conceived as something to be dealt with by the state, measures remained restricted by the economic and political prioritization of coal mining and industrial production. The following chapter will evaluate how far legislation promulgated in the mid-1960s was implemented, and how these policies manifested within the pre-existing industrialized ecology of the Witbank coalfield.

[135] Interview with Malcolm Suttill, Witbank, June 3, 2008.

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Adapting to change: Conceptions of pollution in Witbank, 1965-1978

Introduction

> "I am sure we can adapt to the dirt, pollution and noise … but that is the real tragedy – we can adapt to it."[1]

By 1965, the steady expansion of heavy industry, particularly the establishment of Highveld Steel and Vanadium in the town compounded environmental problems in the town and surrounding veld land. After two decades of debate over the scope of its mandate, the Atmospheric Pollution Prevention Act (APPA), South Africa's first major legislation on pollution, was finally passed. Monitoring the prevention of pollution became a competency of the mining department of the state, but this did little to change the gravity of coal-based pollution. As a result of growing international interest, the opening of Richard's Bay Coal Terminal and the introduction of open cast mining methods, coal production had grown exponentially by the late 1970s. Pollution was now no longer ignored by the state – but economic growth made it impossible to prevent. Responses of government, industry and civil society stakeholders to new protective legislation such as the APPA and the amended Water Act of 1966 reflected new conceptions of pollution and highlighted the need for new ways of monitoring pollution. This chapter addresses the effects of these new conceptions on Witbank between 1965 and 1978, when the Witbank coal industry was swung in a new direction by the successful implementation of opencast mining methods in the region.

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[1] R. Dubos, *Life*, 'Mere survival is not enough for man', *Life* (Special Environmental Issue), 49, 3, August 3, 1970.

Responding to the APPA, 1965-1968

The implementation of the APPA changed the nature of legal control over the environment. Local and national authorities became regulatory bodies for the control of air pollution. Disciplinary measures were set in place for contravention of APPA regulations. This included, on first conviction, a fine not exceeding R200, or a prison term not exceeding six months. A second conviction resulted in a fine not exceeding R1,000, or up to one year of imprisonment.[2] The Act thus recognized and reconceived the liability of industry for pollution they had created. Despite this breakthrough, some of its terms remained vague, reflecting certain difficulties in implementation.

In terms of monitoring private industry, the APPA relied on the ability – or the capacity – of local authorities to enforce control measures, and punishments were rarely meted out. According to Sections 14(1) and (11) the Minister of Health was empowered to grant local authorities jurisdiction to control atmospheric pollution by smoke.[3] This would include the right to "enter upon premises and to inspect fuel burning appliances".[4] Action against coal-based smoke pollution could be taken at four levels, including making use of powers without promulgating regulations; promulgating only one or two regulations; promulgating a considerable number of regulations – and promulgating regulations and establishing a "smoke control zone".[5] Lack of clarity over defining what level of pollution was 'reasonably practicable' led to conflict of interest between various stakeholders.

In Witbank, the ability of the local authority to ameliorate smoke conditions was obstructed by the fact that power stations had been added to the "schedule of noxious industries".[6] This meant that they came under the control of the Chief Officer and not the local authority. Smoke officials were thus required to report concerns to the Chief Officer who would then deal with the power station. This was conceived as helping the local smoke official, supposedly relieving him of the burden of dealing with factory owners.[7]

The state was now responsible for the adequate implementation of air pollution prevention methods of scheduled industries. Understanding of pollution

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2 NASA, *Transvaal Council for the Development of Peri-urban Areas (1936-1981)* (TRB) 2/4/93 Circular (No. 9 of 1966) to all local authorities in the Republic – regarding the Atmospheric Pollution Prevention Act of 1965, re: 'Standard smoke control regulations', August 12, 1966.

3 Ibid.

4 Ibid.

5 NASA, TRB/2/4/93 Circular (No 21 of 1966) from Department of Health to All Local Authorities in the Republic, re: 'Four Levels at which Local Authorities could operate Part III of the APPA', December 22, 1966.

6 NASA, TRB/2/4/93 E.C. Halliday, 'Address on air pollution prevention', Walmer Town Hall, March 10, 1967.

7 Ibid.

was now guided by definitions laid out in the APPA – particularly relating to the definition of 'scheduled industries' subject to government control. The establishment of the National Air Pollution Advisory Committee was seen as a crucial component for effective policy implementation. Gradual implementation of the APPA was seen as the most effective way of adapting to shifting environmental conditions. The implementation of the Act was thus guided by a principle of tiered application. Explaining the strategy behind the 'gentle' process, E.C. Halliday argued that

> as time goes by the situation cannot get better, it must get worse … if you pass an Act and you start taking advantage of the Act, you can do it gently; you don't have to be so severe as you would have to be if you had to control and try to reduce smoke nuisance at a stage where the smoke concentration had become worse, where you had to have a very much more violent reaction and be very much harder on the general public.[8]

One of the first tasks of the newly formed National Air Pollution Advisory Committee was to standardize maximum smoke density.[9] It was thus necessary to develop a "prescribed instrument for measuring and comparing … smoke emission with the standard".[10] Without this, "any enforcement action would be based on personal opinion".[11] Critics challenged the methods used to measure the density of smoke based on the imprecision of the method. The scientific basis for determining reasonable maximum smoke density was that smoke emissions could not appear to be "of a shade equal to or darker" than the second shade on Ringelman's Chart.[12] This chart was one of a number of rudimentary methods specifically developed "to determine whether smoke emissions (were) excessive or not".[13] The chart was held in position by a first person at an "appropriate distance" from the second person, who acted as the observer. The chart, representing different shades of grey, would then be held "so that the top of the stack appear(ed) over the edge of the chart so that the observer (could) compare the blackness of the smoke with that of the squares on the chart".[14] A second method involved optical instruments, and was known as the "miniature smoke chart".[15] The small monocular instrument was aimed at the top of the chimney or

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8 Ibid.

9 NASA, MPA/1/4/7/3/69/D1/37/A Letter from Chief Traffic Officer to Town Clerk, Medical Officer, Pretoria, 1965.

10 Ibid.

11 Ibid.

12 NASA, TRB/2/4/93 Memorandum from Secretary of the Department of Health to All Local Authorities in the Republic, re: 'How to determine the density of smoke', February 10, 1967.

13 Ibid. Other devices on the market during this time included the British Telesmoke, and the US Mine Safety Appliance Company's Smokescope. They were generally measured against the Ringelman Chart, which was regarded to have a "high accuracy".

14 Ibid.

15 Ibid.

smoke stack.[16] The images would then be adjusted so that the filters could be seen with an image of the smoke in the clear space beside them. This made it possible to compare the darkness on the chart with the darkness of the smoke. Testing did not take into account smoke emitted during the start-up or overhaul of a fuel burning appliance, as well as any breakdown or unforeseen disturbance of factory appliances. These diminished the efficiency of the process of determining permitted maximum smoke density.[17]

The lack of general expertise in the field of smoke and general pollution control was a latent burden for the implementation of the APPA. In a 1966 national circular from the Department of Health to all competent local authorities, the "real problem" was seen as being the lack of experienced personnel.[18] Even when the operator of the boiler causing unduly black smoke emissions was requested to comply, "considerable difficulty" was often encountered within the factory or power station.[19] The Department of Health thus recommended to local authorities that owing to a lack of technical skills, "purely legal action, such as sending a demand to the owner, (was) not likely to have the required effect".[20] The owner, suddenly forced into a system of smoke control, was, in any case, unlikely to be equipped. The employment of a smoke control officer within larger local authorities with more sophisticated industries was seen as "indispensable".[21] The local authority had a right to say whether or not an industry could build a factory on a certain site – if they allowed it they could "cause their own area of jurisdiction more or less trouble".[22] Hence, additional technical staff with genuine expertise in pollution mitigation and prevention was highly recommended. Despite this, Halliday advocated a policy of compromise and settlement, arguing that

> the important thing (was) if possible not to get to the Court Case … it means you've failed. An Inspector who gets to that stage has lost his friendship and now has got a real enemy and is in big trouble. If you can persuade, push or encourage the industrialist to reduce his smoke output without a Court order, he is doing very much better.[23]

The APPA was thus "not designed to make a sudden change".[24] This placed pressure on local authorities who were urged to get "experience" with small

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16 Ibid. A monocular is a magnifying glass device for use through only one eye.
17 Ibid.
18 Ibid.
19 Ibid.
20 NASA, TRB/2/4/93 Circular (No 21 of 1966) from Department of Health to All Local Authorities in the Republic, re: 'Four Levels at which Local Authorities could operate Part III of the APPA', December 22, 1966.
21 Ibid.
22 NASA, TRB/2/4/93 E.C. Halliday, Address on air pollution prevention, Walmer Town Hall, March 10, 1967.
23 Ibid.
24 Ibid.

concerns before trying to declare smoke control zones.[25] In Witbank, the void of environmental control measures in the town was made more explicit, as were the financial implications of implementing such controls. The difficulty of enforcing legislation was compounded by a number of factors, including the strength of the industry, South Africa's ongoing reliance on coal as a staple source of energy, and the scientific uncertainty around defining 'reasonably practicable' methods of pollution reduction.[26]

The mandate of the Atmospheric Pollution Prevention Act of 1965 gave power over only certain industries designated as 'scheduled.' One major critique of the Act was the way in which it conceived industry: 'scheduled' industry was generally understood to be "carrying out certain processes … mostly producing strategic materials which involve(d) a certain amount of secrecy".[27] Such prescriptions made monitoring and reducing smoke emissions difficult.

Responsibility for air pollution from other sources, including non-scheduled industries, still fell upon local authorities, who also had to control domestic smoke and diesel exhaust fumes. In a letter to the Parliamentary Secretary of the Department of Health concerning the definition of 'noxious and offensive gases' to be included in the Act, Halliday argued that it was beyond practicability to include "all the different gases the health officials wish(ed) to put in".[28] For the purposes of the APPA, the proposed definition included a host of substances, when in gaseous form, including "hydrocarbons, organic nitrogen sulphur or halogen compound, beryllium, chromium, mercury, varidium [and] dust from asbestos processing".[29] Prevention was understood in relation to the 'best practicable means' that could be taken to abate pollution.

This policy had been successfully followed in Britain, setting a useful precedent for South Africa. Item 15 of Part 2 of the APPA declared that no fuel burning appliance was to be installed "in or on any premises" unless it was "reasonably practicable" that the appliance could be "operated simultaneously without emitting dark smoke or smoke of a colour darker than may be prescribed regulation".[30] Part IV related to dust control, whereby relevant authorities would "take the prescribed steps or (where no steps ha(d) been prescribed) adopt the best practicable means for preventing such dust from becoming so dispersed or causing such nuisance".[31] This even applied to the height of chimneys and smoke

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25 Ibid.
26 Ibid.
27 Ibid.
28 NASA, GES/1639/116/26A, Halliday, E.C. General Physics Research Laboratory, CSIR to Mr. Marr, Parliamentary Secretary, Department of Health, (undated).
29 Ibid.
30 NASA, GES/1643/116/26E Part II, Item 15, 'Control of Noxious or Offensive Gases', January 22, 1965.
31 NASA, GES/1643/116/26E Part IV, 'Dust Control', January 22, 1965.

stacks, which were to be "as far as practicable … sufficient to prevent smoke or any other product of combustion from becoming prejudicial to health or a nuisance to occupiers of premises in the surrounding areas".[32] Following the 'best practicable means' ultimately meant demonstrating to the inspectorate of the Department of Health that "taking into consideration the technological remedies available, local conditions and the company's financial position, it (was) doing the best it (could) to abate pollution".[33] This also meant refining budgets to include the cost of environmental fallout.

E.C. Halliday, architect of the APPA, had anticipated resistance from the mining industry over the added cost of controlling smoke pollution.[34] He argued firmly that members of the National Air Pollution Advisory Committee should not represent any "particular industrial group" as this would create "some degree of compulsion to support their 'constituency'".[35] It would thus be the job of the non-technical members of the national air pollution prevention task force to tackle resistance from this influential sector, forcing them to adapt to new regulations.

Communication between state and industry representatives was crucial at this point in order to comply with new industry standards. These challenges were reflected in correspondence between the Department of Health and the Collieries Committee of the Chamber of Mines in June 1965, whose interest was founded on the effect that the APPA provisions would have on the coal industry, particularly Witbank, where

> the control of air pollution [was] recognized by all responsible persons and bodies as desirable … at the same time, it present(ed) difficult problems which [could] best be solved with the cooperation and goodwill of all interested parties.[36]

The Collieries Committee emphasized the importance of ongoing coal production, being the "only indigenous source of fuel in the Republic", supplying 90 per cent of national fuel needs.[37] Since most large industrial users were able to comply with smokeless combustion techniques, such users were not regarded as an obstacle.[38]

The blame for ongoing smoke emission was levelled at "small industrial concerns" – and most of all with domestic users, whose total combined coal con-

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32 Ibid.
33 Clarke, J, *Our fragile land*, p. 47.
34 NASA, CT/719 Memorandum (related to the application of the APPA), June 28, 1965.
35 Ibid.
36 NASA, CT/103/116/26 Letter from Secretary for Health outlining views on atmospheric pollution prevention bill by Collieries Committee of the Chamber of Mines, 1965.
37 Ibid.
38 Ibid.

sumption was 4.8 million tons, equal to around ten percent of the annual national tonnage of fuel consumed each year.[39]

As a cheap staple fuel source, coal was popular for heat and energy in segregated African townships throughout South Africa. This included the locations surrounding Witbank, which would "completely disappear under smoke" during the dry barren winter months of the Highveld.[40] With almost no investment in infrastructural development of these locations, it was difficult for the state to enforce pollution control measures, or even to switch to electricity or gas, such that even local authorities had "given up this idea".[41] This environmental racism was plainly accepted by the Act, revealing the partiality of the its scope. This meant that there was no "nice solution" for controlling such pollution.[42]

Witbank in the 'pollution game', 1971-1978

In Witbank, energy production was still the backbone of the town's local economy. The APPA now required each municipality to "ensure the burning of solid fuel smokelessly in all Municipal undertakings".[43] It also placed pressure on the Witbank municipality to assert control over emissions. Debates arose over whether it was possible to replace, or at least supplement, coal consumption with an alternative solid smokeless fuel. The financial burden was emphasized by the Collieries Committee of the Chamber of Mines. It argued that the minimum production cost of such a shift would be R4 per ton over and above the cost of the coal which it would replace. This would thus involve consumers in a minimum additional cost of nearly R20 million per annum.[44] Considering local reliance on the coal industry, the Committee felt that this would be catastrophic for the local economy.

The use of anthracite, a hard, solid combustible fossil fuel, was thus advocated by the South African Anthracite Producers Association. A pamphlet produced by this association soon after the APPA was passed, explored the benefits of burning anthracite, a harder version of coal. Compared to bituminous coal, anthracite was

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39 Ibid.

40 NASA, TRB/2/4/93 Halliday, E.C., Address on air pollution prevention, Walmer Town Hall, March 10, 1967.

41 Ibid.

42 Ibid. Reference to 'Bantu' locations surrounding Witbank was based on the provisions of Section 2(1) of the Bantu (Urban Areas) Consolidation Act of 1945, which had determined Witbank's location as being "the land situate(d) within the area of jurisdiction of the urban local authority of Witbank, which (had) been defined and set apart as a Bantu residential area and Bantu village." See NASA, BAO/3/544/A2/17/4/1/K20 Notice to Municipality of Witbank, signed by B. Coetzee, Deputy Minister of Bantu Administration and Education, re: 'Description of Bantu Residential Area and Bantu Village', July 14, 1967.

43 NASA, CT/103/116/26, Letter from Secretary for Health outlining views on atmospheric pollution prevention bill by Collieries Committee of the Chamber of Mines, 1965.

44 Ibid.

relatively free of impurities, making consumption more efficient. Anthracite usually burned evenly, making it necessary to refuel only every twelve hours. Anthracite could thus be "relied upon … at whatever time during the day or night".[45] Replacing coal with carbon-rich staples such as anthracite threatened the relative monopoly of the coal industry over a rapidly growing energy sector. The best way to minimise Witbank's coal-based pollution would be to develop mechanisms which enabled smokeless consumption.[46]

Comparisons between the quality of South African carbon-based fossil fuel and more mature coal industries in the United Kingdom and Europe were common. South African anthracite, mined from the Vryheid region of Northern Natal, was compared to "Welsh Dry Steam Coal".[47] Such parallels were not restricted to the quality of coal, but also extended to popular perceptions of environmental dangers and hazards. Mature in age and experience, the British industry had placed "a lot more attention to the environment earlier", and Witbank's imported skilled personnel were usually familiar with the "pollution game".[48] This included hired officials of the local Highveld Steel and Vanadium factory. With its patented synthesis of iron and vanadium to produce reinforced steel, Witbank's Highveld Steel and Vanadium was, in many ways, a strong candidate for environmental control by the APPA. Employing hundreds by the late 1960s, it represented a significant growth trend for local industry.

The process at Highveld was unique: vanadium would be used to make beams smaller, with the same strength.[49] As a subsidiary of Anglo American, Highveld was expected to maintain international industry standards related to controlling pollution. Within the company, there existed a "bit of grumble … about looking after the environment", but it was never considered to pose a threat or "major situation".[50] By 1967, there was little question of the significance of the Air Pollution Research Group, a state-subsidized trust set up to support the implementation of the APPA. The centrality of the CSIR in the continued control and management of the fund was underscored at the sixth general meeting of the body in October of that year, where the CSIR sought to obtain inclusion of the basic budget of the Air Pollution Research Group in the general parliament grant made to the CSIR. N. Stutterheim, vice president of the CSIR, argued for this move based on the fact that the "group (was) now largely supported by the CSIR out of

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45 NASA, CT/103/116/26 'The burning of anthracite', a pamphlet produced by the Anthracite Producers Association, 1965.
46 Ibid.
47 NASA, MPA/1/4/7/3/69 D1/37/A, Letter from chairman of SA anthracite to town clerk, Pretoria, May 12, 1965.
48 Interview with Malcolm Suttill, Witbank, June 3, 2008.
49 Ibid.
50 Ibid.

other revenue".[51] A request was thus made to dissolve the Standing Committee of Contributors to the Air Pollution Research Fund to facilitate incorporation into the CSIR. The financial report of the Air Pollution Research Group (APRG) of the CSIR for the second quarter of 1967, specifically April until July, reflected that the CSIR contribution of R4,943 was more than the combined contribution of R4,870 from external bodies.[52] The APRG budget for 1968-1969 projected more than R30,550 coming from the CSIR contribution.[53] The CSIR argued for greater control over the work of the APRG; in any case, the onus fell on them.[54]

Another active body was the Solid Fuels Advisory Bureau, which held a conference in Johannesburg in February, 1968, to assist municipalities with the practical application of the APPA.[55] This featured a range of speakers, including the Medical Officer of Health from Johannesburg, the Director of Environmental Sciences Library of the Chamber of Mines, an economist from Wits University, industrial representatives, as well as two Air Pollution Control Officers, and even a number of delegates from the Witbank municipality.[56] Chaired by E.C. Halliday, the proceedings revealed shifting conceptions of the relationship between pollution and public health, the economic cost to South Africa and to the consumer, as well as effective use of the APPA. It also covered new techniques in combustion and gasification, as well as ways in which to establish and operate an industrial environmental control section. The seminar ended off with a workshop on how to measure pollution, what levels of control to use, when and how to implement such controls, approving appliances and effectively using smoke indicators such as the Ringelman Chart.[57] Symposiums also targeted specific industries, including one held in August, 1968, for the South African Institute of Foundrymen.[58] This symposium was appropriately technical in nature, dealing with the control of gaseous emissions from iron and steel foundries, assessment of dust and fume inside factories and foundries, evaluating the value of fabric filter dust collectors, as well as understanding foundries in relation to dust diseases. The initiative brought together speakers from the Air Pollution Research Group, under E.C. Halliday. Concerns over the relationship between smoke and

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[51] NASA, TRB/2/4/93 Notice on the 6th general meeting of contributors to the Air Pollution Research Fund, October 26, 1967.

[52] Ibid.

[53] Ibid.

[54] Ibid.

[55] NASA, MPA/1/4/7/3/69/D1/37/A Letter from S. Thomas, General Manager, Coal Bureau, Solid Fuels Advisory Bureau, Johannesburg, to the Medical Officer in Pretoria, re: Seminar: 'The Practical Application by Municipalities of the Atmospheric Pollution Prevention Act of 1965', February 15, 1968.

[56] Ibid.

[57] Ibid.

[58] NASA, MPA/1/4/7/3/69/D1/37/A *reminder notice*, SA Institute of Foundrymen, air pollution Symposium, CSIR, Pretoria, August 1, 1968.

lung disease were presented by Dr J. Webster, head of the national Pneumoconiosis Research Unit.

Such visible interventions by the CSIR dramatically changed the way coal-based pollution in Witbank was understood, but this did little to dispel the idea that achieving an APPA clearance certificate was "nothing more than a license to pollute".[59] Another general shortcoming was that no set standards had been laid down, so that the "sole arbiter of whether a factory is applying 'the best practicable means' [was] the chief officer of the Industrial Hygiene Division of the Department of Health".[60] Without laid-out standards, the credibility of the APPA was undermined, "so it [was] purely a rule of thumb decision by one man".[61] With only five inspectors to control 745 industries operating more than 1000 scheduled processes, "it [was] inevitable they [were] overworked".[62] In addition, inspectors conceived of themselves as "advisors … first and foremost, [so] they tend(ed) to get pretty pally with polluters and address(ed) them by their first names".[63]

Such shortcomings paved the way for an independent air pollution lobby from the civil sector, which was visibly active by 1968. By March an action committee was formed to establish an environmental non-governmental organisation to fight against atmospheric pollution. The chairman of the committee, J.L. Easterbrook, argued that the proposed 'Clean Air Society' would provide a forum for "airing differences of opinion between controllers and controlled".[64] It would also ensure that industries, organisations and the general public were "equipped to speak publicly when it was necessary that a lead should be given to public thinking".[65] After all, the existence of environmental legislation certainly did not mean that pollution would be "simply removed".[66] Such an association would, in fact, benefit industry, providing a "channel" to facilitate the implementation of air pollution control. The Clean Air Society would serve as a "buffer" between government authorities and scheduled industries who feared making direct enquiries "lest unfavourable attention be directed to their activities".[67]

Opposition to the formation of such a group came from the Coal Bureau and the Air Pollution Research Group, who felt that the Clean Air Society was

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59 Clarke, J., *Our fragile land*, 1974, p. 47.
60 Ibid.
61 Ibid.
62 Ibid.
63 Ibid.
64 NASA, MPA/1/4/7/3/69 D1/37/A 'Proposal for National Clean Air Association', Action Committee on Clean Air Society, March 5, 1968.
65 Ibid.
66 Ibid.
67 NASA, TRB/2/4/93 Letter from J.L. Easterbrook, Chairman, Action Committee on Clean Air Society to Dr J.S. De Leeuw, re: Proposed National Clean Air Association, undated, c. 1968.

redundant. Countering such claims, Easterbrook argued that the society provided a unique opportunity for communication between stakeholders. Easterbrook referred to Witbank's immense problems of pollution, specifically the outlying residential zone of Clewer which formed part of the local municipality. Here, local air pollution had become a matter of serious concern. Clewer's natural water resources were already compromised, particularly the water mine pollution of the Brugspruit stream before it entered the Olifants River destined to the Loskop Dam. With the arrival of numerous factories in the vicinity of the district by the late 1960s, pre-existing conditions of pollution in the area already affected began to spiral.[68] Community representatives, namely the regional secretary of the Clean Air Society, were adamant that "grave measures should be adopted as a requirement".[69] South Africa's Chief Medical Officer had even committed to investigating Clewer's air pollution problem and to take measures to resolve the problem.

This pressure from the civil sector forced the Transvaal Board for the Development of Peri-urban Areas to investigate the issue. Upon closer inspection, the Board found that the major local polluter was Highveld Steel and Vanadium, close to Clewer on the northern side of Witbank. This industrial enterprise periodically emitted smoke which looked like "red smoke clouds".[70] The properties of the smoke were harmful, raising concerns over the poison gases contained in Highveld's scheduled processes.[71] Wind blowing "dangerous" smoke and particulates into Clewer meant that the community had to regularly "endure" these conditions.[72]

By 1968, the definition for "noxious or offensive gas" was extended, and published in the South African Government Gazette.[73] It aimed to more clearly sketch out the content of smoke emitted from industrial and mining concerns. The more scientifically precise definitions included polycyclic hydrocarbons, smoke, grit and dust. Most notably, the amended definition reflected the idea that not only visible smoke pollution was dangerous.[74] By October 1968, the Chief Medical Officer of Health (MOH), who had visited Highveld Steel and Vana-

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68 NASA, TRB/2/4/93 *Memorandum*, from Regional Secretary, Action Committee, Clean Air Society, re: Air Pollution in Clewer', May 31, 1968 (Translated from Afrikaans).

69 Ibid.

70 Ibid.

71 NASA, TRB/2/4/93 Letter from the Transvaal Board for the Development of Peri-Urban Areas re: 'Air Pollution in Witbank', June 7, 1968 (translated from Afrikaans).

72 Ibid.

73 NASA, TRB/2/4/93 'Extension of definition for noxious and offensive gas', *Government Ga*zette, No. 2117, July 5, 1968, p. 11.

74 Ibid. The extended list defining noxious and offensive gas included "fumes containing iron, nickel, aluminium, magnesium, molybdenum, titanium, tungsten, selenium, potassium, sodium, silicon, calcium, phosphorous and compounds, carbon monoxide, acetylene, benzene, aminos, pyridine (derivatives), polycyclic hydrocarbons, smoke, grit and dust."

dium the previous month, wrote to Mr Visser, then-General Manager of Highveld.[75] He informed him that processes at Highveld had now been included under a second schedule of industries subject to the regulations in the APPA. He emphasized the need to more closely monitor carbon dioxide, and suggested that "in view of the particularly hazardous nature of this gas a few canaries would possibly serve a useful purpose".[76] He also argued that because of the high vanadium content of Highveld's ore, representing the "whole world consumption about 30 years ago", there was a dire need for monitoring.[77] The MOH further recommended the introduction of "periodic vanadium estimation in urine of employees" as the toxic effect of the element had not been established.[78] The MOH was also concerned with how Highveld managed its iron ore dust, sewage and sludge disposal – as well as the way it controlled pollution when installations broke down. This alluded to the "massive amounts of red dust and smoke" emitted during emergency shut-downs or repairs.[79] By that December, Highveld had restored its smoke prevention devices, but the process had begun to draw attention to the need for more civil participation in the protection of Witbank's local natural resources. These were being compromised by coal-based pollution, as well as growing awareness of "poisonous gases" that were becoming fully recognized as "harmful to people and animals" with which they came into contact.[80]

The Clean Air Society continued to function during the 1970s, and eventually became known as the National Association for Clean Air. This group recognised the link between clean environment and public health, and even hosted a conference in October, 1972, entitled 'Smoke, the Citizen and Control.'[81] It soon aligned with organisations such as the Institute for Public Health, whose first newsletter gave advice to both domestic and industrial coal users regarding air pollution. The newsletter identified that "smog or smoke-filled air (was) the cause of the lowering of the resistance of our bodies to colds, bronchitis and other chest ailments".[82] The newsletter advised domestic coal users to replace the ordinary coal stove with a smokeless one, to use anthracite or oil burning heaters, and not to burn refuse.

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75 NASA, TRB/2/4/93 Report to Action Committee of the Clean Air Society, re: Air Pollution in Clewer, November 13, 1968.

76 NASA, TRB 2/4/93 Assistant Secretary Report to Action Committee of the Clean Air Society re: MOH inspection of Highveld, December 6, 1968.

77 Ibid.

78 Ibid.

79 Ibid.

80 Ibid.

81 NASA, MPA/1/4/7/3/69 D1/37/A Symposium of the National Association for Clean Air, August 22, 1972.

82 NASA, MPA/1/4/7/3/69/D1/37/A *Newsletter*, Institute for Public Health, September 12, 1972.

Awareness campaigns drew attention to the plight of those suffering from dust-related disease, including tuberculosis sufferers. The medico-scientific link between air pollution and lung disease had not been proven, but there were clear indications that "it certainly aggravate(d) their symptoms and increase(d) the frequency and severity of asthma attacks".[83] The belief that early childhood exposure to heavy atmospheric pollution contributed to a "lowered pulmonary reserve capacity in adults" meant that children from Witbank "suffered a greater risk of developing lung disease as adults than children raised in cleaner communities".[84]

The acknowledgement of the relationship between lung disease and coal-based pollution was no doubt alarming to members of the community. Already faced with ample evidence of the degradation of quality of air, the pollution of local water supplies seemed too onerous to face.

Silent spring: Mine water pollution in Witbank

> Like air, water is not limitless, nor free, nor somehow immune to the pollution which affects other aspects of the environment.[85]

The recognition that pollution was not only based on what was visible to the eye changed conceptions of pollution, and, in many ways, revolutionized responses to it. The Institute of Public Health continued to remind coal users to "be pollution conscious".[86] This attitude went beyond pollution from any specific source, and began to serve as the basis for responses to water pollution as a result of exposure to effluents found in industrial undertakings or produced as a result of mine water pollution. Some of these changes are reflected in the amendments made to the Water Act of 1965 throughout the 1960s.

The Water Act set in motion new debates of mine water pollution, and its first amendment was enacted in 1961. It specified that anyone wishing to start an industrial undertaking had to advise the Secretary of Water Affairs of the "nature and the method of purification of the waste water, effluent or waste" which would be produced.[87] It also specified that water use for industrial purposes which, on average, exceeded 50,000 gallons per day had to apply to the Minister for a permit.

By 1966 another amendment was made, mainly affecting the nature of responsibility held by local authorities regarding water rights. The Commission of Enquiry into Water Matters created the Water Research Commission (WRC) in

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83 'Pollution and your health', EPA, 1976.
84 Ibid.
85 Ibid.
86 NASA, MPA/1/4/7/3/69/D1/37/A *Newsletter*, Institute for Public Health, September 12, 1972.
87 NASA, TES/2743 10/188 Letter from S.S. Morris, Cape Town City Engineer, to Town Clerk, Cape Town, re: Water Amendment Bill, 1969.

1966 to "fund strategic water research". This had a profound effect on the way water pollution was conceived, and exposed new knowledge about pollution which had "previously been classified and thus out of the public domain".[88] One of its first research projects involved the analysis of human health implications from polluted groundwater. This paved the way for further amendments in 1969, including a section giving consent to local authorities to "take over the rights to water from a public stream from an owner of property within its area of jurisdiction, subject to compensation being paid".[89] It was anticipated that this change would help local authorities obtain water supplies. Section 23A of the third clause of the amendment, which was soon promulgated as Act No. 77 of 1969, provided the Minister of Water Affairs the right to take "steps against farmers" whose agricultural activities polluted public or private water.[90] These new harsh terms of regulation upon farmers reflected a considerable shift away from previous state protectionist policies. It highlighted new influences affecting the agenda of state support. Growing reliance on multinational industry for trade and expansion within the mining sector set in motion a period of exponential growth in production and pollution in the Witbank coalfield. This growth would invariably have environmental impacts, but the town was not in a position to resist this. The over-reliance of Witbank's economy on coal production reinforced the idea that pollution was not something to be prevented, but rather to be managed. Such ideas were increasingly being met with continued resistance from a growing international environmental movement which had, by then, drawn more attention to new ideas around pollution – including the existence of the greenhouse effect and the long-term impact of water acidification.

Local scientists and policy makers were not isolated from the global body of ideas around water pollution. Correspondence between departments suggests profound governmental awareness and keen interest in global environmental control measures. These included scientific interventions in the mineral composition of water to supposedly remove impurities.[91] South African research initiatives were lauded internationally, and South African scientists participated in gatherings of the International Association for Water Pollution Research.[92] The work of the

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88 Turton, A., 'SA water and mining policy: A study of strategies for transition management', April 20, 2009, received draft copy from author.

89 NASA, TES/2743/10/188 Letter from S.S. Morris, Cape Town City Engineer, to Town Clerk, Cape Town, re: Water Amendment Bill, 1969.

90 Ibid.

91 One example included the February, 1978, Silver Institute Letter (Information on Silver for Industry) which outlined the attempt of Swiss scientists to electrolytically add "a minute quantity of silver ions to the water … toxic to bacteria but harmless to higher organisms". See NASA, DCD 2415 27/2/3/7 Letter from Secretary for Commerce to Secretary for Planning and the Environment, re: enclosed information on 'silver as a water purifier,' February, 1978.

92 NASA, URU/6123/1893 Letter from Executive Council, Department of the Prime Minister, re: Dr G.J. Stander, vice president of the Water Research Committee, December 1, 1971.

South African Water Research Committee changed how water pollution was understood, but the rhetoric of water pollution prevention did little to ameliorate the exploitative strategy of industrially-oriented water management. It reflected a significant adaptation to a new reality of reduced water quality and availability.

By the early 1970s, environmental concern had spilled over into mainstream media. The *Star's* Cleaner Air, Rivers and Environment (CARE) campaign during this period was the platform for a new legion of environmental journalists to draw attention to the way in which the apartheid state had "subdued the land, fenced in its creatures and harnessed its wild rivers".[93] Environmental journalist John Jordi argued that

> it was a massive task at first – foolhardy almost … but now we have emerged totally victorious. And it might be our trouble: Our victory was too total. In places nature has capitulated leaving behind poisoned, lifeless streams; exhausted infertile soil; and each spring becomes more silent.[94]

James Clarke, another *Star* journalist, argued that "even if one could magically wave a wand" to make the mine dumps disappear, including those of Witbank, the veld and river beds were so "impregnated" with mine dump sand that it would take another century before the contaminated soil recovered.[95] Clarke referred to another phenomenon related to water pollution, Eutrophication, whereby a water source such as a dam or lake begins to "die" because of oxygen starvation after its plant life becomes boosted, or over-stimulated, by the fertilizing properties of certain pollutants.[96]

Debate around water pollution soon became as contentious as the still-ongoing negotiations around mitigating atmospheric pollution. Val Bolitho, regarded by environmental specialists during the 1970s as a "top brain on water purification", argued that there was now a "very real danger of disturbing the 'pollution equilibrium' to a disastrous degree".[97] This term implied the perceived balance between "man's capacity to pollute and nature's to purify".[98] This referred to the diminishing capacity of the environment to receive pollution and absorb it. Harsher measures by the state against major polluters were strongly advocated, leading to the amendment of Section 23 of the Water Act in 1974.[99]

South Africa's policy of separate development, specifically the Group (Urban) Areas Act, compromised this pollution equilibrium. Unless it was permitted by the Minister of Water Affairs, Clause 29 of the Water Amendment Act of 1975

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93 Jordi, J. *The Star*, 10 March, 1970.
94 Ibid.
95 Clarke, J., *Our fragile land*, p. 62.
96 Ibid. p. 64.
97 Ibid. p. 65.
98 Ibid.
99 NASA, TES/2743/10/188 'Amendment of Section 23 of Act 54 of 1956, as amended by Section 3 of Act 45 of 1972', 'Papers dealing with water research', 1974-1975.

stipulated that "no township (could) be established on riparian land" unless it was permitted by the Minister of Water Affairs.[100] The definition of "riparian" land was "not all that easy to apply" as the definition was, in itself, vague.[101] Riparian land, according to the Act, referred to land bordering a 'public stream'.[102] This was defined as a

> natural stream which flows in a known and defined channel … even if the channel is dry during any period of the year and even if its conformation has been artificially changed … one would have great difficulty and would, in fact, require expert knowledge to know whether a stream was a public stream.[103]

The Niemand Commission, created specifically for the purpose of "speeding up" the declaration of black townships, was thus faced with the challenge of demystifying vague legal definitions. It opposed the amendment, which sought to direct all township applications pertaining to land "bordered by a stream or water" to the Department of Water Affairs.[104] This would prolong the decision making process, running contrary to the commission's mandate of speeding up township proclamations.[105] It seemed that the "best way" to make Section 23 work was to "bring out a narrower definition of riparian land".[106] This formed one of numerous tense debates around accurately defining natural resources in line with their capacity to withstand pollution.

Such contention resulted in the further amendment of the Water Act in 1975, where the purpose was specifically to "further define a certain offence regarding the pollution of water".[107] Only Clause 29, which dealt with "the establishment and extension of townships on riparian land likely to be inundated by public streams, attracted comment".[108] In Witbank, the cost of developing dense residential housing near water flowing downstream from active and abandoned coal mining operations was placed upon the African population in townships dotting the coalfield. Long term water acidification would result in constant shortages and reduced quality of supply.

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[100] NASA, TES/2743/10/188 Letter from Mr. Collins, Town Clerk, Johannesburg, to Mr. Strydom, United Municipal Executive, Pretoria, 1975.

[101] Ibid.

[102] Riparian rights generally denote the legal rights of the land owner on a river bank. With regard to the Water Amendment Bill of 1975, this applied to legal rights granted under an original grant or deed of transfer, or state land.

[103] Ibid.

[104] Ibid.

[105] NASA, TES/2743/10/88 United Municipal Executive presentation on 'Report of the Bills Committee on the water amendment bill,' February 12-13. 1974.

[106] NASA, TES/2743/10/188 Letter from Mr. Collins, Town Clerk, Johannesburg, to Mr. Strydom, United Municipal Executive, Pretoria, 1975.

[107] NASA, TES/2743/10/188 Water Amendment Bill of 1975, February 26, 1975.

[108] NASA, TES/2743/10/88 Minutes from United Municipal Executive Minutes, August, 1975, re: Water Amendment Act of 1975.

Debates around environmental legislation were thus conceived and defined according to principles fundamentally at odds with pollution prevention. South African environmental protection was determined by a policy of selection and exclusion: Apartheid inalienably prejudiced those not classified as white by denying them access to public health and access to information around pollution and environmental health. Policymakers had admittedly 'given up' the idea of ameliorating the conditions of townships caught without access to services such as irrigation and electricity demonstrating the prejudicial conception of what was then regarded as 'reasonably practicable'.

The City of Coal, 1970-1978

> … people are leaving this place because … of this pollution … we are losing good people … this pollution is killing.[109]

By 1970, the limitations of pillar-and-bord production were determined by the nature and depth of rock strata overlying the coal, as well as the thickness and composition of the coal seam itself. Opencast mining had become a viable alternative, especially with the development of more efficient earth moving and excavating machinery.[110] The "dreadful waste" of mounting coal dumps incurred by contemporary mining methods would be "avoided".[111] This technical innovation was thus seen as being "particularly suitable" for South African coal.[112] The introduction of open cast mining in 1971 thus triggered a dynamic shift in the nature of production in the Witbank coalfield.[113] Open cast mining was seen as being both more effective and economical. By comparison, pillar-and-bord was seen as ineffective: opencast required less engineering dexterity, and produced more. The method involved the use of large earth-moving machinery which removed the land surface, removing plants and denuding fragile topsoil. The ecological ramifications of extracting coal in this way were severe.

Variants of opencast mining methods had been in operation in Britain since 1942. The method had first been employed in the United States during the 1940s, where it was seen as far more convenient for removing thick seams of coal trapped in the steep ranges of the North American terrain. As methods developed, strip mining became increasingly more employable; it was easier and more profitable most of the time – and by the late 1970s, a variety of techniques had been developed to suit the specific formation of diverse coalfields worldwide.[114] This method made liberal use of explosives to access seams. The reduced capital

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[109] Interview with Kaizer Mabena, Thushanang, Emalahleni, June 4, 2008.
[110] 'Opencast coal mining practical in Republic', *Witbank News*, July 9, 1965.
[111] Ibid.
[112] Ibid.
[113] Ibid.
[114] Mitchell, J.G., 'When mountains move', *National Geographic*, March, 2006, p. 108.

cost of this method allowed for greater strategic intervention in engineering, leading to exponential growth figures in the local market.

By 1976 the South African mining industry experienced massive expansion as a result of engineering developments such as open cast mining, coupled with the construction of Richard's Bay Coal Terminal. Witbank coal demand was also stimulated by the "oil revolution" created by the Oil-Producing Export Countries (OPEC) embargo of 1973, which had increased the price of oil from approximately $2 to around $35 per barrel by the end of the decade.[115]

One early opencast mine included the R200 million Rietspruit mine, which began operations in 1978. The success of monitoring and evaluation of coal-based pollution of local major polluters like Rand Carbide was significantly undermined by the exponential growth of the coal industry within the first decade after the APPA was promulgated.[116] Knowing the environmental impact of underground mining, opencast mining was conceived as somewhat safer, as the process of rehabilitating the land after mining took place was considered to be easier. Topsoil and broken rock from explosives were piled up on one side, and after the layer of coal was removed, the land was supposedly left "the way it was".[117] Companies would often plant black wattles around the mines, so "no one (could) see that there (was) no rehabilitation".[118] The "back-fill" of soil and rocks broken from solid underground layers resulted in a trench which was "never as compact".[119] Land would generally sink as it settled, leaving a visible depression in the land; eventually, it filled up with water and overflowed, setting in motion the long-term process of water acidification known as acid mine drainage (AMD).[120] AMD referred to the reduced pH level of water retained in mines. When the underground water eventually seeps out of the mines, it leaches the soil, picking up minerals such as manganese and mercury. These particles, commonly known as total dissolved solids (TDS), pose a threat to public health when ingested.

Both local and international capacity to 'adapt' to pollution was becoming limited over the course of the 1970s. The broader impact of pollution on public health could no longer be ignored. The strength of the environmentalist lobby was consolidated with the emergence of statutory bodies such as the EPA. This body understood environmental disease to be the "disease of the century" and argued that environmental protection "must become the most important ingre-

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[115] Hudson, Michael S., 'To play the hegemon: Fifty years of US policy towards the Middle East', *The Middle East Journal*, 50, 3, 1996, p. 333.

[116] Rand Carbide began to implement pollution control measures in 1974. 'Rand carbide sets the record straight', *Witbank News*, July 14, 2000.

[117] Interview with Mohammed Dindar, Kwachibikulu, Mpumalanga Lakes District, June 26, 2007.

[118] Interview with Christelle Paul, Lake Chrissie, Mpumalanga Lakes District, June 26, 2007.

[119] Interview with Malcolm Suttill, Witbank, Emalahleni, June 3, 2008.

[120] Interview with Mohammed Dindar, Kwachibikulu, Mpumalanga Lakes District, June 26, 2007.

dient in any national health program".[121] In South Africa, organisations such as the South African Council for Conservation and Anti-Pollution vilified the "apathetic attitude of officialdom", reflecting significant cleavages between the state and civil society over environmental policy.[122] Pollution was still seen as something to which society could, and should, adapt, particularly in line with growing energy requirements. By 1978 the Secretary for Environmental Planning and Energy argued that the cost of energy derived from fossil fuels would continue to increase.[123]

Photo 5.1 Transporting bags of coal.
A resident of the Old Coronation Colliery informal settlement transporting bags of coal gathered from the ash heap of the abandoned pre-war coal dumps of the Coronation Colliery outside of Witbank, Emalahleni, June 2, 2008. [photo: Michal Singer]

[121] 'Pollution and your health', p. 1.
[122] 'Why not put that dam weed to use?', *Daily News*, November 21, 1978.
[123] NASA, DCD/2415/27/2/3/7 Letter from Secretary for Environmental Planning and Energy to Mrs P. Griffith, Kensington, re: water hyacinths, November 21, 1978.

Conclusion

Environmental conditions in the Witbank coalfield have steadily deteriorated, and will continue to do so, into the twenty-first century. However, conceptions of coal-based pollution had changed dramatically by the late twentieth century, particularly owing to the growing incidence of land decay and poor health. This chapter has demonstrated these changes through making reference to Witbank, where stakeholders had little choice but to adapt to new regulations governing pollution. This included both the introduction of industrial pollution control measures and the emergence of a more visible civil sector which made recourse to the APPA to affect local change. Despite the growing opposition to severe levels of coal-based pollution in the region, the control and prevention of pollution was obstructed by the continued economic centrality of coal.

Postscript

'Act local, think global': Environmental justice in the Witbank coalfield, 1978-2009

This study has placed changing conceptions of coal-based pollution in historical context. The narrative ends in 1978, when the switch to opencast provided exponential growth opportunities to the local industry, resulting in previously unprecedented scales of coal production, sales and related pollution. Issues around coal-based pollution have continued to gain momentum, causing significant levels of public concern. The study has provided a framework for understanding the complex and strained politics related to contemporary environmental justice in South Africa and, more specifically, in Witbank. This postscript briefly explores the environmental politics specific to Witbank, further demonstrating the relevance of this town as a unit of historical study. It addresses the need for a greater understanding of pollution and its role in South African energy politics.

Both local and global demand for coal had grown exponentially by the end of the 1970s, with seventeen separate active coalfields situated within the Witbank district.[124] The region had become South Africa's "energy nucleus", contributing to the majority of Richard's Bay's rising export figures, with 24.9 million ton coal export in 1980 and 25.7 million ton coal export by 1981.[125] By 1981, Witbank's opencast Rietspruit mine had already earned R300 million in foreign currency.[126] Opencast did not entirely replace underground production, and pillar and bord techniques were refined to enable more efficient rates of extraction. In fact, by October, the long-established Witbank Colliery had sold its highest ever

[124] *Witbank News*, November 6, 1981, p. 25.

[125] Chairman's statement, Witbank Colliery, Ltd. *Witbank News*, November 20, 1981, p. 59. By 1981, Witbank Colliery had become a subsidiary of the Barlow Rand Group.

[126] 'Rietspruit lets the money roll', *Witbank News*, December 11, 1981.

monthly tonnage, over a million tons.[127] By the middle of the decade, the proximity of new residential areas to abandoned mines had increased exposure to unrestricted, and often dangerous, sites. In response to a number of residents falling into burning pits close to dumps, efforts were made from this point by the Witbank town council to fence in the burning ground.[128] This did not satisfy a growing opposition of local residents, whose lives were overwhelmingly affected by coal-based pollution.

Photo 5.2 Exposed mine pit at the abandoned site of the Transvaal & Delagoa Bay Colliery, situated not far from the industrial complex bordering the town of Witbank, June 2, 2008. [photo: Michal Singer]

[127] 'More than a million in October', *Witbank News*, December 11, 1981.
[128] 'Children safe at last', *Witbank News*, October 2, 1981, p. 1.

By 1980 Witbank's pollution was reconceived in line with racial inequity.[129] These understandings linked coal-based pollution to the disproportionately high prevalence of diseases such as tuberculosis by the "black working class … as compared to the other economic sectors of the population".[130] Findings in Witbank have revealed that few residents understand the full implications of coal-based pollution. Many see it "as this normal thing – staying around a mine".[131] Contributing to the health implications of coal-based pollution is the pervasive lack of services and education to residents of informal settlements near sites of past mining activity. An evaluation of the impact of coal-based pollution in the Witbank district has demonstrated the dangers of ongoing South African coal mining activity. By 2000, tests showed that the quality of water flowing into the Witbank Dam was too polluted for use in power generation. Water had to be pumped from the Komati and Usuthu Rivers to the Witbank area.[132] With limited effect, numerous experimental rehabilitation projects have attempted to prevent rising underground water from workings, eliminating risk factors related to AMD.[133] South African scientists have predicted that the rising incidence of AMD running over the Witbank coalfield could take up to five hundred years to normalize.[134] In spite of such predictions, it is almost impossible to tell what the "exact impact will be until it actually hits".[135]

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[129] Cock, Jacklyn. 'Connecting the red, brown and green: The environmental justice movement in South Africa', a case study for the UKZN project entitled: Globalisation, marginalisation and new social movements in post-Apartheid South Africa, a joint project between the Centre for Civil Society and the School of Development Studies, University of KwaZulu-Natal, p. 2.

[130] Environmental Studies – Looking after home base', *Eraser – The Alternative Youth Magazine*, 1991, p. 35.

[131] Interview with Isaac Mampane, *Witbank*, September 25, 2008.

[132] *Presentation*, by Dr JP Pretorius, Director, Federation for a Sustainable Environment, to Portfolio Committee on Water Affairs and Forestry, June 8, 2008.

[133] *Press release*, 'Mining companies and municipality join hands to provide clean water', 2008, from the *Witbank News* collection.

[134] Turton, Anthony, 'Can we solve tomorrow's problems with yesterday's experiences and today's science?' Des Midgley Memorial Lecture, 2007, p. 8, received from author.

[135] Interview with Christelle Pauw, Lake Chrissie, June 8, 2007.

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Conclusion

This book has highlighted evolving understandings of Witbank coal, from a valued commodity and source of energy, to a destructive source of coal-based pollution. This has elucidated key responses to these changing conceptions by the State, local industry, the civil sector, as well as Witbank's local residents. The study has demonstrated how coal-based pollution was understood in light of visible environmental damage, as well as scientific knowledge of these changes. Based on findings, it therefore concluded that changes in understanding were strongly influenced by the appearance of pollution, but this did little to affect change within the framework of rapid and intensive urbanization.

Finding a comprehensive explanation for pollution remained a central challenge in producing this study. It was necessary to explore what was meant by pollution. An historical assessment of evolving ideas of coal-based pollution required some sense of its existence. This study has revealed the relationship between broader understanding of, and responses to, the pervasive problem of coal-based pollution. The first chapter has demonstrated this by depicting the early existence of coal trade in the town, as well as early observations of coal's properties. Reference to early twentieth century legislation has shown how coal-based pollution was conceived by law, and how this directly influenced regulations over industrial emissions and effluent. Archival references have revealed limited conception of the destructive capacity of industrial activity in the early twentieth century. Reports of tests conducted to test the quality of coal during combustion reflected a superficial understanding of its chemical composition. Such gaps in understanding reveal the way in which early signs of coal-based pollution were, to a large extent, ignored. Where attention was given to pollution in early legislation, regulations imposed were tentative, and rarely implemented.

Photo 6.1 Residents collect pieces of low-grade bituminous coal found along the ash heap of abandoned mine dumps of the old Coronation Colliery. Isaac Mampane, a key informant in Witbank, is featured on the right. Behind the dump, the edges of the old Coronation Colliery informal settlement can be seen, practically forming part of the dump itself. June 2, 2008. [photo: Michal Singer]

The first chapter provides an analysis of this early phase of coal, when the scale of coal production expanded to such an extent that new signs of pollution drew further attention to the destructive properties of the fossil fuel.

The establishment of Escom and Iscor in Witbank by the mid-1930s, as well as the steady militarization of South Africa, further marginalised existing concerns about coal-based environmental damage. These industries facilitated the growth of a steel market in Witbank, leading to unforeseen growth in the coal industry. The second chapter focuses on the patterns of this growth, exploring the relationship between industrialization and energy production, particularly in stimulating the scale of coal production. It thus demonstrates the development of different perspectives of Witbank's coal-based pollution within the context of a more developed industry.

With the diversification of industry in the Witbank region, coal mining activity expanded, with severe implications for the local ecosystem. The integrity of land surfaces at coal mining sites was compromised by the unorthodox nature of coal production during the Second World War. Sound engineering principles of popular pillar-and-bord mining methods were discarded in the war-time acceleration of industrial production. This shaped the way in which coal-based pollution came

to be understood during and after the war years. The most significant indication of these changes was the time and energy devoted by the state to the research of bacteriological and chemical pollution.

The third and fourth chapters reveal significant shifts in the way in which coal mining was associated with pollution. This was mainly as a result of physical evidence of air pollution, destruction of land, and the indefatigability of underground fires. The third chapter provides a summary of internal debates around the growing appearance of environmental changes as a result of ongoing coal mining activity. Coal-based pollution of isolated areas where underground fires raged beneath the sunken and desiccated land surface did not pose a problem to the local authorities of Witbank; neither did it disrupt economic activity, warranting attention by state or industry. The appearance of acute levels of atmospheric pollution by the early 1950s throughout South Africa was more difficult to ignore.

The second half of the twentieth century saw attempts both to define and monitor pollution. What became clear was the need for improved understanding of the phenomenon of coal-based pollution. The third chapter thus describes the process by which conceptions of coal-based pollution were brought into the realm of public discourse through the work of E.H. Halliday and the CSIR, as well as preliminary discussions on the APPA. Reference to documentation related to the creation of the Act reveal how much more closely definitions of pollution were founded on scientific understandings of pollution, particularly the impact of coal combustion. This again develops the overall argument by reflecting how greater understanding of coal-based pollution resulted in growing concern from local residents.

The fourth chapter deals with responses to the promulgation of the APPA, coupled with rapidly changing perceptions of environmental concerns. As South Africa's first environmental legislation directly tackling issues of pollution, the APPA set a precedent for renewed interest and altered perspectives on coal-based pollution. This had enormous ramifications for the way in which Witbank industry functioned. Local collieries and factories were now required to conform to environmental control and monitoring by the State, and also to introduce efforts geared towards environmental mitigation. This changed the way the local coal industry approached pollution, but did little to halt the scale of growth experienced by the coal industry by the late 1970s. The fourth chapter evaluates the efficiency of regulations introduced with the APPA, particularly in light of continued growth in the scale of Witbank coal production. With the introduction of opencast mining, the scale of coal production grew exponentially, in spite of more fully developed conceptions of the environmental implications of this activity, particularly in the already-compromised Witbank environment.

I have provided an historical analysis of changing ideas around coal and its environmental impact. It thus contributes to the growing body of knowledge on climate change. Its value is emphasized by the continued importance of coal in South Africa as a staple source of energy, in spite of common knowledge of its dire environmental implications. Recent claims that "declining coal reserves" are the root of energy problems in South Africa reflect considerable changes in the way coal has been understood as a natural resource.[1] Contemporary attitudes towards coal-based pollution remain fraught with misrepresentation and prevarication. Processes of pollution thus require further study in South Africa, as relatively little is known about the full extent of environmental impacts of early twentieth century coal mining. This work, therefore, is a first attempt at opening up the enigma that surrounds the environmental impact of coal mining in South Africa.

[1] 'Eskom to make coal stocks go much further', *Business Report*, April 24, 2008.

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These interviews were conducted by the author of this work, Michal Singer, in line with ethical codes of conduct of the Human Research Ethics Committee of the University of the Witwatersrand. Anonymous interviews are noted.

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CEN *(Chief Entomologist, 1902-1970)* Volumes 63-676.

CS *(Colonial Secretary, 1900-1910)* Volumes 332-375

CT *(Colonial Treasurer, 1900-1910)* Volume 442.

GES *(Department of Health, 1900-1973)* Volumes 1638-2522.

GNLB *(Government Native Labour Bureau, 1904-1950)* Volumes 5-304.
GOV *(Governor of the Transvaal Colony, 1901-1910, GOV)* Volumes 205-1202.
HEN *(Department of Trade and Industry, 1910-1972)* Volume 1846.
JUS *(Secretary of Justice (1899-1966)* Volume 296.
KJB *(Native Affairs Commissioner, Johannesburg, 1924-1978)* Volume 466 .
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MGE *(Private Secretary of the Minister of Health (1948-1978)* Volume 1.
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MPA *(Town Clerk, Pretoria, 1897-1975)* Volume 1/4/7/3/69.
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PM *(Prime Minister, Transvaal, 1907-1910)* Volumes 1/87-1/2/16.
PMO *(Provost Martial's Office, Pretoria, 1900-1903),* Volume 20.
PWD *(Public Work's Department, 1901-1914)* Volumes 425-897.
RRC *(Transvaal Representatives of the Railway Committee, 1903-1907)* Volumes 21-44.
SAS *(General Manager of the South African Railways and Harbours, 1902-1957)* Volumes 800-1514.
SMI *(State Mining Engineer, 1891-1900)* Volume 41.
TAD *(Transvaal Agriculture Department, 1900-1919)* Volumes 353-464.
TES *(Secretary of the Treasury, 1904-1974)* Volumes 5512-6920.
TPB *(Director of Local Government, Transvaal, 1897-1973)* Volume 1854.
TPD *(Registrar of the Supreme Court of South Africa, Transvaal Provincial Division, 1877-1980)* Volumes 5/2–8/294.
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