Changing the atmosphere: shifting conceptions of air pollution in South Africa, with special reference to the Witbank coalfield, 1948-1978

Déplacer l'atmosphère : la vision changeante de la pollution de l'air en Afrique du Sud, 1948-1978

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Abstract

This environmental history of South African air pollution, with special reference to the Witbank coalfield, interrogates the emergence of diverse discourses that ultimately resulted in the promulgation of the Atmospheric Pollution Prevention Act of 1965 (APPA). The study traces responses to these changing conceptions by the State, local industry, civil society, as well as Witbank's local residents, thereby opening up the enigma surrounding the appearance of atmospheric changes during South Africa's post-war industrial growth. During this time, 'air perception' was largely conceived in light of visible environmental damage, and a growing public consciousness around scientific evidence linking industrial activity to the degradation of the atmosphere. Such conceptions of air pollution were instrumental in the formulation of legislation aimed at regulating the acute appearance of air pollution in post-war South Africa. Where attention was given to pollution in early legislation, regulations imposed were tentative, and rarely implemented. An assessment of post-war conceptions of air pollution in South Africa reveals 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. Fierce internal debates existed following the growing appearance of environmental changes as a result of ongoing coal mining activity. These early efforts to define and monitor air pollution had significant ramifications for the Witbank industry. Regulations set by the APPA placed pressure on local collieries and factories to conform to environmental control and monitoring by the State, and to introduce efforts geared towards environmental mitigation. The limited scope of the law is magnified within a framework of rapid and intensive industrialization throughout the 1970s. The switch from underground to opencast methods of extraction, coupled with the exponential growth of foreign demand for coal, made regulating pollution more complex.

Keywords

coal, pollution, South Africa, Atmospheric Pollution Prevention Act of 1965, Witbank, fossil fuels, conceptions of coal-based pollution.

Résumé

L'Afrique du Sud est l'un de premiers pays producteurs et exportateurs de charbon à travers le monde, mais la perception locale et internationale de la pollution à base de charbon en Afrique du Sud reste lourde de tergiversations. Cette histoire environnementale de la pollution de l'air en Afrique du Sud, avec une mention spécifique pour le bassin minier Witbank Coalfield, sert à interroger la nature de ce phénomène. Elle cherche aussi à contextualiser l'émergence de différents discours qui ont finalement donné lieu à la promulgation du *Atmospheric Pollution Prevention Act* de 1965 (APPA). Cette étude évaluera les changements dans la vision de la pollution de l'air pendant l'ère d'après-guerre de l'Afrique du Sud. Elle retrace les réponses à ces changements de conception par l'État, l'industrie locale, la société civile et les riverains de Witbank. « La perception de l'air » est principalement conçue en termes de dommages environnementaux visibles et une prise de conscience croissante du public des preuves scientifiques qui relient l'activité industrielle à la dégradation de l'atmosphère. De telles conceptions de la pollution de l'air ont joué un rôle important dans la formulation de la législation qui visait à réguler l'apparition aiguë de la pollution de l'air dans l'Afrique du Sud de l'après-guerre. De telles lacunes dans la compréhension de l'époque trahissent la manière dont les signes précoces de pollution due au charbon étaient très largement ignorés. Lorsque la pollution était concernée par les premières lois promulguées, les régulations imposées étaient timides et rarement appliquées.

Mots-clés

charbon, Afrique du Sud, Atmospheric Pollution Prevention Act de 1965, Witbank, combustibles fossiles, conceptions de la pollution au charbon.

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Une évaluation des conceptions d'après-guerre de la pollution de l'air en Afrique du Sud met en évidence des changements significatifs dans la façon dont l'exploitation des mines de charbon était associée à la pollution. Il s'agissait principalement de résultats de preuves physiques de la pollution de l'air, de la destruction des sols et des inlassables incendies souterrains. Cette étude fait le résumé des débats internes autour de l'émergence croissante des changements environnementaux causés par l'activité continue de l'exploitation des mines de charbon. La pollution par le charbon de zones isolées où les incendies souterrains faisaient rage sous une surface effondrée et desséchée ne posait pas problème aux autorités locales de Witbank, ceci ne perturbait pas l'activité économique, et donc ne méritait pas l'attention de l'État ou de l'industrie. Au contraire, l'apparition de niveaux aigus de pollution atmosphérique au début des années 1950 partout en Afrique du Sud était plus difficile à ignorer.

Après l'intensification de l'industrie locale à la suite de la Deuxième Guerre mondiale, l'État a nommé le premier des nombreux comités à parties prenantes multiples pour enquêter sur les preuves scientifiques et empiriques accumulées, dans le but de confronter le problème toujours croissant de la pollution de l'air. L'APPA, voté en 1965, remettait en question les structures organisationnelles implicites dans une industrie qui n'avait jamais été auparavant soumise à la surveillance de l'État. Cette législation anti-pollution mettait en demeure des industries telles que les mines et la sidérurgie de contrôler les émissions de fumées et de s'en prendre au problème de la pollution de l'air à la source. Il fournissait aussi le moyen de classer les industries considérées comme étant les principaux pollueurs, y compris l'industrie houillère, comme des industries « listées ». L'APPA était la première législation environnementale de l'Afrique du Sud à s'attaquer aux questions de la pollution. Elle a eu des ramifications significatives pour l'industrie de Witbank. Les mines de charbon et les usines locales devaient se conformer au contrôle et à la surveillance environnementale de la part de l'État et introduire des efforts vers l'atténuation environnementale. La dernière partie de l'étude fera une évaluation de l'efficacité relative des régulations introduites par l'APPA, surtout à la lumière de la croissance continue de l'échelle de production du charbon Witbank. L'évaluation de l'APPA montre qu'il a réussi à obliger l'industrie houillère de l'Afrique du Sud à réguler ses méthodes d'extraction et à étudier de plus près la composition chimique du charbon. Il a eu peu d'effets sur la croissance exponentielle de l'industrie houillère en 1978, avec l'introduction de méthodes d'exploitation à ciel ouvert dans le Witbank Coalfield et la construction de *Richard's Bay Coal Terminal* en 1976. Cette étude conclut donc que les changements dans la conception de la pollution de l'air ont été fortement influencés aussi bien par l'apparition de la pollution de l'air que par l'augmentation significative de la compréhension scientifique de ses causes. Cependant, ceci n'a eu que peu d'effets sur le changement significatif dans un contexte d'industrialisation rapide et intensive.

Introduction

South Africa is a major global producer of coal. Its coalfields provide some of the most accessible, shallow seams worldwide.[1] The study is located in the Mpumalanga province, specifically the Witbank coalfield, considered to be one of the most heavily mined, and densely polluted, regions in the world.[2] This paper seeks to represent the shifting landscape of perception around South African coal mining, particularly in revealing how these ideas were shaped by the appearance of air pollution. The study interrogates these changing conceptions in light of acute environmental damage, and overwhelming scientific evidence linking coal mining to pollution by the middle of the twentieth century.[3] Such conceptions were instrumental in the emergence of regulations targeting air pollution in South Africa. Policies and practices governing pollution have thus relied heavily on a shifting paradigm of 'air perceptions', which were instrumental in the formulation of legislation aimed at regulating the acute appearance of air pollution in post-war South Africa.

This paper focuses on the Atmospheric Pollution Prevention Act first passed in 1965 (APPA) in response to mounting pressure upon the South African government to respond to acute urban pollution. By the late twentieth century, the regulatory scope of the APPA was rendered inadequate and scientifically outmoded. This paper interrogates some of these limitations, but also reflects on how the promulgation of the APPA represented a great shift in the way air pollution was conceived in South Africa: for the first time, it was considered to be a matter of national concern that needed to be contained. [4] The law thus sought to measure, mitigate and prevent air pollution in South Africa. This paper will reflect on the nature of knowledge and understanding held by government, industry and civil society in framing this law and how this was influenced

(1) Appenzeller, T. 2006. 'The high cost of cheap coal – the coal paradox', National Geographic, p. 101.
(2) A recent European Union team found it to contain "one of the worst air qualities in the world." See Kings, S. 2014. 'Eskom makes Mpumalanga sick', Mail and Guardian, July 2.
(3) This paper is based on a dissertation submitted to the Faculty of Humanities of the University of the Witwatersrand, Johannesburg, in 2010, in fulfilment of the requirements for the Degree of Master of Arts in History.
(4) In 2004, the APPA was replaced by the National Environment Management: Air Quality Act, as part of a broader governmental response toward natural resource management and pollution mitigation.

by the appearance of acute forms of air pollution by the mid twentieth century. It also seeks to demonstrate the limited capacity of this regulatory approach in containing the exponential growth of industry by the late 1970s, amid ongoing atmospheric pollution.

1. Introducing the burden of uncertain risk: 1906-1948

The township of Witbank emerged with the establishment of the Witbank Colliery in 1903 by surveyor Samuel Stanford. The rich coal seams were "anything but a secret" in the district, but Stanford was the first to expand the scale of mining "from the mere picking up of stray pieces to systematic exploitation."[5] The overall output of Witbank coal for 1921 was 6 947 362 tons.[6] The town was one of the first in South Africa to be supplied with electricity. A newly electrified Witbank was marketed as a national "landmark in the history of electricity."[7] The South African government prioritized industrial expansion before and during the Second World War, particularly in steel production through its twin parastatals, the Electricity Supply Commission (Escom, later Eskom) and the Iron and Steel Corporation (Iscor). By the late 1940s, over two thirds of the Transvaal's collieries were situated in Witbank. The town was surrounded by an industrial complex of chemical processing plants, often bordering long-abandoned mining areas.[8] Witbank's coal industry rapidly expanded to meet the demand of both local and foreign consumption of coal.

Coupled with the abundance of cheap, shallow seams of coal, the region soon emerged as one of the province's leading industrial centres.[9] Coal mines most commonly employed the 'pillar and bord' method of production, which involved sinking underground shafts, and securing the overburden by leaving behind pillars of the coal seam to protect the surface from sinking. In this way, the soft bituminous coal was easily retrieved from the relatively shallow seams at a depth ranging between fifteen and fifty metres.[10] High demand placed pressure on collieries to increase coal output, which in turn compromised attention to mitigating occupational hazards ranging from daily safety concerns to long term epidemiological risks.[11] With over fifty thousand underground coal miners working in post-war South Africa, the risk of fatal or debilitating occupational exposure had become a major concern.[12] In 1947, the South African Government Mining Engineer reported that almost forty two percent of mine-related fatalities were a result of exposure to fumes in accidental explosions.[13]

The largely unregulated and highly exploitative nature of labour relations in postwar South Africa meant that mines could employ rural African men for short term contracts before their repatriation. This made it difficult to assess long-term health implications of intensive exposure to coal-based pollution, including the ingestion of coal dust, the insipid effects of chemical exposure, and the prevalence of tuberculosis and silicosis.[14] According to Thomas Mbeki, Secretary of the regional Industrial and Commercial Workers' Union (ICU), the African workforce existed in a "state of drudging toil, and wearing poverty."[15] 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.[16] 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. Near the emerging coal town of Witbank, informal settlements had emerged along the periphery of the district to accommodate the migrant population.

2. Saddled with the burden of uncertainty: 1948-1960

In 1944, a letter published in the *Witbank News* described "the atmosphere of a city of many tens of thousands of people … it [was] closely packed and congested to the point of bursting in a place where there should be room to breathe."[17] Finding a mechanism toward ame-

(5) 'Electrical engineers visit Witbank', Witbank News, August 16, 1935, p. 5.
(6) 'Progressive coal totals', Witbank News, September 25, 1925.
(7) Editorial, Witbank News, August 27, 1926.
(8) Lang, J. Power Base: coal mining in the life of South Africa, Jonathan Ball Publishers, Johannesburg, 1995, p. 128.
(9) 'All Coal Records Broken,' Witbank News, August 27, 1943.
(10) Filitz J.K. 2011. 'Mining for development? A socio-ecological study on the Witbank Coalfield', Masters Dissertation in Development Studies, University of Kwazulu-Natal, Durban, p. 37.
(11) 'Coal dust: Hazards, control', Coal age, March 1970, p. 86.
(12) 'Annual Report of the Government Mining Engineer', Mining Year Book, 1947.
(13) Ibid.
(14) 'Notes on basis of approach to appeal', South African National Tuberculosis Association (SANTA), National Appeal, 1962-1963, Johannesburg, p. 1.
(15) Letter from Thomas Mbeki, Industrial and Commercial Workers' Union (ICU), to Editor, Witbank News, May 7, 1926.
(16) 'Notes on basis of approach to appeal', South African National Tuberculosis Association (SANTA), National Appeal, 1962-1963, Johannesburg, p. 1.
(17) Letter to editor, Witbank News, September 8, 1944, p. 3.

liorating this congestion was placed squarely on those residing in close proximity to the source of pollution. In spite of the high incidence of atmospheric degeneration in the postwar industrial region, there remained a paucity of scientific evidence citing air pollution as a source of pollution. As a result, the burden of this uncertainty was deflected from the coal industry itself, raising significant questions about the "nature of scientific knowledge in a political context, (and) about the way interests and values influence scientists' judgments about social as well as scientific issues."[18] With reference to the burden of allocating blame for the long-term impact of South Africa's neglected history of asbestos mining, Thomas Murray has argued that the "language of uncertainty, probability, and tentativeness" was "habitual" to scientific conceptions of South African pollution.[19]

"In science, one usually speaks not about absolute uncertainty, but about relative certainty and uncertainty. Moreover, on whose shoulders should rest the burden of dispelling the uncertainty … where there is the likelihood, although not the certainty, that dangers will persist under current circumstances … allocation of the burden of uncertainty becomes a matter with potential for enormous political impact."[20]

The burden of uncertainty that arose as a result of such scientific conceptions of the incidence of air pollution throughout South Africa hindered clarity and efficacy in the development of clear policy directed at coal-based pollution. In 1948, the Committee of Enquiry on the Bacteriological and Chemical Pollution of Water Supplies presented its findings in Parliament.[21] The report of this committee was the first to tackle the difficulties of implementing existing legislation dealing with mining and industry-based pollution. Notably, it sought to formulate categories of 'listed' industries responsible for the 'chemical', 'bacteriological/organic' and 'mechanical' appearance of pollution.[22] Listed industries would become subject to regulation in an effort to ameliorate further impact on natural resources, but the report only partially grasped the largely hidden environmental implications of coal production processes. While it conceded that "absolute prevention of pollution was not realistic … by tightening up the present powers" it was possible to reduce pollution "down to reasonable limits without a serious charge to industry."[23] Moreover, the report did not provide guidelines for resolving the problem. In spite of its limited success, these efforts to measure and monitor air pollution brought the issue into the realm of public discourse.

South African public perceptions of air pollution were heavily influenced by the international recognition of smog as an international pandemic in the early 1950s. The most prominent incident of 'fatal' smog had occurred in December 1952, when London's micro-climate was struck by inert weather conditions that "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."[24] Coal had been a staple energy source for over a century, but the impact of the five-day-long 'pea-soup' smog rapidly changed the way atmospheric pollution was conceived by English authorities. The Clean Air Act of 1956 banned the consumption of coal in London. This law set an international precedent for protective legislation in the fight against atmospheric pollution.[25] It also broadened the paradigm of environmental awareness toward more effective measure and regulation of air quality control. The calculations of one scientist had even begun to surmise the possibility of global warming through continued consumption of fossil fuels, particularly coal.[26] Technological advances even included initial measurement of rising global carbon dioxide levels.[27]

In South Africa, the early 1950s also saw a dramatic rise in smog related to industrial emissions. In 1953, the port city of Durban experienced a severe bout of smog, but the ability of the Durban Town Council to mobilize was limited under existing legislation; the Health Act gave the Durban Town Council power to act only when dealing with a distinct health "nuisance."[28] 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."[29]

The South African Ministry of Health appointed the first National Air Pollution Committee in 1955 to "investigate… and to make recommendations regarding the steps to ameliorate and, ultimately, eliminate the prob-

(18) Murray, T. 1986. 'Regulating Asbestos: ethics, politics and scientific values', Science, Technology and Human Values; n° 11(3), p. 1.
(19) Ibid. p. 4.
(20) Ibid.
(21) National Archives of South Africa (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'.
(22) Ibid.
(23) Ibid.
(24) 'Pollution and Your Health', US Environmental Protection Agency, Office of Public Affairs, 1976, p. 5.
(25) NASA, Secretary of Foreign Affairs (1919-1944) (BTS) 79/107 Letter by W. Malan, South African Ambassador in London, 'Congress on the Pollution of the Atmosphere'.
(26) Joubert, L.S., 2006. Scorched: South Africa's Changing Climate, Witwatersrand University Press, Johannesburg, p. 4.
(27) Kolbert, E. 2006. Field notes from a catastrophe: man, nature and climate change, Bloomsbury, p. 163.
(28) 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.
(29) Ibid.

lem."[30] The committee recommended that legislation be swiftly introduced "for the effective prevention and elimination of air pollution not only for persons working in mines and industries, but also for those in the vicinity."[31] Ameliorating pollution was now beyond the capacity of local authorities, and could only be dealt with at a national level. The Committee's main achievement was the preparation of a draft bill largely influenced by measures applied in England and the United States. The draft bill was presented to a Select Committee, which resulted in the formation of a Commission of Inquiry into the Air Pollution Prevention Bill (APPB).

This Commission was 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."[32] Most vocal in the deputation was Dr Eric Clifford Halliday, a senior scientist associated with the National Physical Research Laboratory of the Council for Scientific and Industrial Research (CSIR).[33] Other notable members included representatives of the South African Railways, the City Council of Durban, the Department of Mines, and the Government Mining Engineer. 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."[34] This created 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)".[35] The Commission saw joint discussion between state and industry to be the only way to avoid "conflicting instructions" over various pieces of legislation."[36] The industry official was seen to be "saddled with a burden … in regard to the manner in which he (had) to carry on his industry."[37] This 'burden' of responsibility included the Witbank coal industry, which was forced to respond to growing dissatisfaction with atmospheric conditions in the town. Long after its closure, the disused smoke stack of the local power station, situated in the middle of the town, dispersed black, gritty dust throughout the area, as its tip was left exposed, with growing concerns about the health implications for local residents.[38] According to Eric Halliday, the "cautious attitude" to adopt was that "it constituted 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."[39]

Halliday argued that air pollution mainly took the form of smoke, caused "mostly by the incomplete burning of coal."[40] 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.[41] He argued that "the blackness of smoke (had) a direct relation to the total quantity of materials going up the stack."[42] This meant 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."[43] It was especially important to show that atmospheric pollution could be controlled, and that the cost of the control would "not cripple industry or the local authority."[44] The language of tentativeness used here demonstrates Murray's analysis of the relative usefulness of scientific conceptions in facilitating clear accountability in response to industrial pollution.

3. Assigning the burden of blame: 1960-1965

Local published accounts provide limited insight into the local conceptions of air pollution in Witbank, particularly the long term implications. In 1960 a winning high school entry in the Witbank Union Festival Essay Competition asked whether it was possible to imagine "what it (would) look like in fifty years … man's imagination has not the scope to undertake a projection of such a vast scene of

(30) NASA, (GES) 1642/116/26/D 'Report on the Commission of Enquiry into the Air Pollution Prevention Bill'.
(31) Ibid.
(32) Ibid.
(33) Eric Halliday was an international authority on atmospheric pollution. In 1963, he was appointed to the World Health Organization's Expert Advisory Panel on Air Pollution on Environmental Health.
(34) NASA, (GES) 1642/116/26/D 'Report on the Commission of Enquiry into the Air Pollution Prevention Bill'.
(35) Clarke, J. 1974. Our fragile land: South Africa's environmental crisis, Macmillan South Africa, Johannesburg, p. 47.
(36) NASA, GES/1642/116/26/D 'Report of the Commission of Enquiry into the Air Pollution Prevention Bill'.
(37) Ibid.
(38) Interview with Malcolm Suttill, by Michal Singer, Witbank, June 3, 2008.
(39) NASA, (GES) 1642/116/26D 'Minutes of Evidence from the Select Committee on the Subject of the Air Pollution Prevention Bill', March 8, 1961.
(40) NASA, (GES) 1642/116/26D 'Minutes of Evidence from the Select Committee on the Subject of APPB', March 8, 1961.
(41) 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.
(42) Ibid.
(43) Ibid.
(44) Ibid.

utter desolation."[45] This dystopic vision of a future destroyed by pollution was not widely shared. In contrast, an August 1963 letter in the *Cape Times* argued 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."[46] The letter writer further argued that action was needed before authorities had to "wake up in smog one day and have to spend millions cleaning it up."[47] The presence of air pollution throughout the country was undeniable, especially in densely industrialized and heavily mined areas.

The central challenge for policy makers was to find a way to pin down the *source* of most air pollution. Coal consumption topped the list. Two other contested sources of atmospheric pollution included diesel-based exhaust fumes from motor vehicles and dust from mine dumps. The Anti-Diesel Pollution Society based in Natal aimed at raising awareness of the dangers of diesel, specifically its relationship to lung cancer.[48] This organization was well represented at meetings of the Commission of Enquiry. It argued that it was "not good enough" to pollute the air which South Africans had "no choice but to breathe."[49] D.C. Myddelton, a representative of the Society, argued that scientific and medical evidence connecting diesel fumes and lung disease was undeniable.[50] He referred to the attempt by the Director of the Medical Research Council Group for Research on Atmospheric Pollution to publicly denigrate the "many ill informed attempts to incriminate the diesel engine" which, in his opinion, did not "merit serious discussion."[51] Myddelton argued vehemently that the "possible connection between diesel fumes and lung cancer certainly merit(ed) serious consideration."[52] Previously, air pollution had only been "equated with smoke…which (was) obvious to the eye."[53] This association was thus revealed to be misleading since "all sorts of gases and vapours, many of them irritant and harmful, (were) completely invisible and exist(ed) quite apart from smoke."[54] One set of carcinogenic chemical constituents included the full variety of "aromatic polycyclic hydrocarbons", the most "famous" and "notorious" being benzpyrene.[55] The measurement of benzpyrene was, in fact, used as a "guide to the degree of general polycyclic hydrocarbon pollution."[56] At this stage, the national incidence of lung cancer had risen dramatically, but no single cause of the disease had been scientifically demonstrated. Coal-based pollution was seen to be central, but not singularly important, in the production of atmospheric pollution. Numerous amenities of modern living, including the production of power, tobacco and motor vehicles, were now being connected to the introduction of powerful carcinogens into the atmosphere. This expanded the scope for discussion on air pollution and its dire repercussions.

The Commission was presented with opposing viewpoints on the source of pollution and its links to both environmental and health problems. R. Mitchell, town engineer of the Springs Municipality, was extremely outspoken about the dust problem from mine dumps. The Springs district had long been a site of both coal and gold mining, but the dumps had not even warranted enough attention to be considered a problem. 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."[57] There were more towns in South Africa affected by dust from dumps and slimes dams than there were towns with a "smoke problem."[58] This was a national problem, covering the Witwatersrand, Western Transvaal, Eastern Transvaal and the Free State. The situation was simply getting worse with time, and would continue to degenerate to such a degree that : "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 the mines (had) ceased to function … as 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."[59]

Mitchell's description was true of the mine dumps circling both Springs and Witbank. This localized form of air pollution was more alarming in its intensity. The potential damage was dire, and most often, there existed a considerable delay between the closure of mining operations and the appearance of pollution.[60] It is likely that the worst of ecological damage through

(45) Batteson, M.A, 1960. 'A Study in Contrasts', Winning high school entry in the 1960 'Witbank Union Festival Essay Competition', published in the Witbank News, May 13.
(46) 'Cleansing Our Air', Cape Times, August 17, 1963.
(47) Ibid.
(48) 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.
(49) Ibid.
(50) NASA, (MPA) 1/4/7/3/69/D1/37/A, Myddelton, G.C. 'Diesel Fumes & Lung Cancer'.
(51) Ibid.
(52) Ibid.
(53) Ibid.
(54) Ibid.
(55) Ibid.
(56) Ibid.
(57) NASA, (GES) 1642/116/26D 'Minutes of a meeting of the Commission of Enquiry with Mr. R. Mitchell, town engineer of the Municipality of Springs, April 19, 1961'.
(58) Ibid.
(59) Ibid. My italics.
(60) Ibid.

past coal mining activity had not been foreseen by the industry; the dust problem had only started "when dumps were abandoned."[61] However, the Bill remained vague on the mitigation of pre-existing land damage, and apparent pressure not to appear unfairly critical of the mining companies limited the capacity of opposing perceptions around air quality control. The collective process of shaping the new law was limited in its scope of understanding the health problems posed by air pollution. Without being equipped with medico-scientific proof of the relationship between air pollution and coal mining, little could be done, and the majority of the local populations in towns such as Witbank, Springs and Durban were forced to continue tolerating the atmosphere of smog, dust and particulates.

4. Adapting to change: 1965-1978

The APPA passed in 1965. The strength of its regulatory mechanisms was ultimately limited, and it was later regarded as "outdated and ineffective" for numerous reasons.[62] Gradual implementation of the APPA was seen as the most effective way of adapting to shifting environmental conditions. Monitoring the prevention of pollution became a competency of the national mining department, but this did little to change the gravity of more localized problems within a rapidly expanding industrial complex. The APPA relied on the ability of local authorities to enforce control measures, including the right to enter the premises of suspected industries to inspect fuel burning appliances.[63] Action 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."[64] Unsurprisingly, the inherent lack of clarity of the APPA over defining what level of pollution was reasonably practicable resulted in considerable conflict of interest.

In Witbank, asserting local authority was made more difficult because power stations were added to the scheduled list of 'noxious industries', which meant that they came under the central control of the Chief Officer and not the local authority. Officials tasked with regulating emissions were thus required to report concerns to the Chief Officer who would then deal directly with the power station. This was conceived as a means by which to support the official, relieving him of the burden of dealing directly with factory owners.[65]

The establishment of the National Air Pollution Advisory Committee was seen as a crucial component for effective policy implementation. Standardizing maximum smoke density required the development of instruments capable of measuring atmospheric composition.[66] 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 the standard measuring device, known as the Ringelman's Chart.[67] Representing different shades of grey, the chart would be held such "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."[68] The small monocular instrument was aimed at the top of the chimney or smoke stack, and 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.

Critics challenged the precision and efficacy of methods used to measure the density of smoke, which consequently compounded the burden of uncertain environmental risk. Testing did not take into account smoke emitted during the start-up or overhaul of a fuel burning appliance, nor during any breakdown or unforeseen disturbance of factory appliances. This undermined the efficacy of determining permitted maximum smoke density.[69] The lack of general expertise in the field was also considered to be a challenge to the Act, and inspectors were officially advised that court cases were "big trouble".[70] With only five inspectors to control 745 industries operating more than 1000 scheduled processes, "it (was) inevitable they (were) overworked."[71] 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."[72]

(61) Ibid.
(62) 'South Africa Country Report: Fourteenth Session of the United Nations Commission on Sustainable Development', Department of Environmental Affairs and Tourism, September 2005.
(63) 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.
(64) NASA, (TRB) 2/4/93B 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.
(65) NASA, (TRB) 2/4/93 E.C. Halliday, 'Address on air pollution prevention', Walmer Town Hall, March 10, 1967.
(66) NASA, (MPA) 1/4/7/3/69/D1/37/A Letter from Chief Traffic Officer to Town Clerk, Medical Officer, Pretoria, 1965.
(67) 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.
(68) Ibid.
(69) Ibid.
(70) Ibid.
(71) Ibid.
(72) Ibid.

Such shortcomings around the implementation of the APPA paved the way for the emergence of an independent air pollution lobby by 1968. The Clean Air Society advocated for recognition of the link between clean air and public health, and soon aligned with organisations such as the Institute for Public Health."[73] J.L. Easterbrook, Chairperson of the Clean Air Society, argued that the need for such a forum was underscored by the recognition that the existence of the APPA was not sufficient. 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."[74] Opposition from the Coal Bureau and the Air Pollution Research Group was founded on their alleged redundancy, but Easterbrook argued that the society provided a unique opportunity for communication between stakeholders. The Clean Air Society continued to function during the 1970s, and eventually became known as the National Association for Clean Air. The strength of this body grew alongside a widespread acknowledgement of the relationship between lung disease and coal-based pollution was alarming to the public.

5. The capitulation of nature: 1971-1978

The success of regulations aimed at monitoring air pollution was significantly undermined by the growth in the coal industry within the first decade after the APPA was passed. The law was amended in 1973 and 1981, and ultimately repealed with the passage of the National Environment Management: Air Quality Act No. 39 of 2004.

Further developments in global production led to massive growth in the export-driven coal industry. This resulted in significant changes, both in the nature of production and the capacity of industry to produce and export more coal. By the early 1970s, the introduction of open cast mining, employing the dragline method, triggered a dynamic shift in the nature of production. Stripping the surface of the ground to extract coal was easier with shallower seams such as those in the Witbank coalfield, and the method provided for greater extraction. By 1974, there were more than twelve draglines "on order" in South Africa.[75] The ecological ramifications were extremely severe, triggering further pollution of topsoil and ground water.

This method did not replace traditional underground methods of mining. Rather, this expanded the scale of production for national and foreign markets, which had opened up with the construction of the Richard's Bay Coal Terminal in 1976. Demand for coal also grew as a result of 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.[76]

Environmental responses focused on exposing ongoing environmental damage caused by coal mining, with media campaigns including the *Star* newspaper's Cleaner Air, Rivers and Environment (CARE) campaign. CARE campaign journalist John Jordi recognized the irreversible damage to the South African environment. He argued that : "it was a massive task at first – foolhardy almost, but now we have emerged totally victorious … our victory was too total. In places nature has capitulated, leaving behind poisoned, lifeless streams; exhausted infertile soil; and each spring becomes more silent."[77]

According to James Clarke, another *Star* journalist, "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.[78]

Conclusion

This paper has highlighted evolving understandings of South African coal, from a valued commodity and source of energy, to a destructive source of pollution with severe health ramifications. Conceptions of air pollution (among other forms of pollution) were brought into the realm of public discourse through the work of the CSIR, as well as preliminary discussions on the APPA. Policy resulting in the promulgation of the APPA relied heavily on scientific conceptions grounded in a language of uncertainty, making the allocation of responsibility for pollution more difficult, and consequently externalizing the burden of environmental and occupational risk. By the time the APPA was passed in 1965, the destructive capacity of coal mining and related industrial growth was widely known. This uncertainty limited possible legal ramifications for industry. Nonetheless, the APPA challenged implicit organizational structures within an industry never before subject to state scrutiny.

(73) NASA, MPA/1/4/7/3/69/D1/37/A Newsletter, Institute for Public Health, September 12, 1972.
(74) NASA, TRB/2/4/93 Letter from J.L. Easterbrook, Chairman, Action Committee on the Clean Air Society to Dr. J.S. De Leeuw, re: Proposed National Clean Air Association, undated, c. 1968.
(75) Filitz J.K. 'Mining for development? A socio-ecological study on the Witbank Coalfield', Masters Dissertation in Development Studies, University of Kwazulu-Natal, Durban, 2011, p. 37.
(76) Hudson, M.S. 'To play the hegemon: fifty years of US policy towards the Middle East', The Middle East Journal, 50, 3, 1996, p. 333.
(77) Jordi, J. The Star, 10 March, 1970.
(78) Clarke, J. Our Fragile Land, p. 62.