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Something in the Air: Civic science and contentious environmental politics in post-apartheid South Africa

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Abstract

In post-apartheid South Africa, the emergence of the environmental movement has involved the reframing of the environment as a 'brown' issue connecting to the discourse of social and environmental justice and a rights-based notion of democracy. Environmental movements have pursued a dual strategy of deliberation and activist opposition. Within these processes, environmental movements have used science to pursue the strategic task of democratic opposition and have established networks of environmental knowledge and expertise. This process has been highly developed in south Durban due to the history of political struggle and environmental racism. Ecological modernisation is the dominant approach to environmental governance and adopts a science-based policy approach. In this context the regulation and management of the environment is premised on the need for science, which provides the authoritative basis for a regulatory response. In local environmental movements, there exists a fundamental tension between a cumulative history of lay knowledge about pollution and the lack of official acknowledgement of qualitative narratives. This is accompanied by a lack and suspicion of reliable official data. Environmental movements have thus employed 'civic science' strategically to place the issue of air pollution on the political agenda. The paper uses the case of south Durban to reflect on the ways in which civic science and lay knowledge, as a form of community hybrid knowledge, is produced and disseminated to pressure the state and capital. In this case, the three ways in which knowledge is deployed are: to frame environmental problems, in strategies of oppositional advocacy, and in deliberative policy forums. The empirical evidence shows that civic science is produced through knowledge networks and both lay knowledge and civic science are alternately and opportunistically used both 'inside and outside' the state in strategies of opposition by environmental movements. This deployment of hybrid knowledge by environmental movements represents a broader opposition to the power of science and technology based on increasing evidence of the hazards and risks facing ordinary people in their daily lives.

Key Words: science, lay knowledge, environment, urban politics, South Africa, environmental movements

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1) Civic science and environmental justice

Since the late 1990s in post-apartheid South Africa, a wide range of social movements have emerged challenging the state around issues of political and socio-economic rights (Bond, 2002; Desai, 2002; McDonald and Pape, 2002; Ballard et al, 2004). In this broader context, there has been a growth of environmental movements in the post-1994 period in South Africa (McDonald, 2002; Cock, 2004). The environmental movement is part of this broader oppositional process and has involved the reframing of the environment as a 'brown' issue connecting to the discourse of social and environmental justice and a rights-based notion of democracy (Cock, 2004; Barnett and Scott, 2007a). Activism in the city of Durban has played a key role in the emergence of an environmental justice movement in South Africa. Here a history of forced removals based on environmentally racist planning led to the development of a core of heavy industry surrounded by low-income black residential areas since the early twentieth century (Scott, 1992; 2003a). South Durban has a history of civic struggle through which residential communities and workers fought for a better living environment, housing, jobs and other reproductive needs (Scott, et al, 2002). This combination of locational effects has resulted in the emergence of an environmental movement in south Durban, which is locally embedded, and has become nationally and internationally networked (Barnett and Scott, 2007a; 2007b). The South Durban Community Alliance (SDCEA) is an alliance of community organizations from former Indian, 'coloured' and white residential areas surrounding the industrial core of south Durban. It is an alliance of 14 civic and residents organisations which was established in 1996 and claims to be a multi-cultural organization (SDCEA, 1998; Reid and D'Sa, 2005). Building on the historical experiences of political activism in the black communities of south Durban, it has set out to counter the contemporary impacts of industrial expansion by mobilising the communities in south Durban across race and class lines, as well as networking with international organizations and funders. It has established itself as the largest and most influential environmental movement in South Africa. SDCEA has engaged in collective action to challenge industry and local government regarding the current problems experienced by communities and future development plans for south Durban (SDCEA, 2006). The current opposition strategies of 'advocacy and lobbying' are aimed at the impact of air pollution on health; current plans to expand the south Durban industrial zone and the relocation of residents (Reid and D'Sa, 2005).

In their oppositional strategies, SDCEA face a context in which the dominant environmental management practices are couched within the discourse of ecological modernization and consequently weak sustainability which is associated with the "principles of technical and institutional efficiency rather than the more democratic and socially oriented principles of strong sustainability" (Oelofse and Scott, 2002; Oelofse et al, 2006, 452). Despite the existence of a new participatory national framework of environmental management embodied in the National Environmental Management Act (NEMA) (Act 107 of 1998), daily environmental management practices remain

technocentric and managerialist. NEMA reflects a broader paradigm of environmental governance rooted in the assumptions of ecological modernization. Ecological modernization has become the hegemonic environmental management discourse and has been institutionalized in developed and developing countries (Hajer, 1995; Christoff, 1996; Lee and George, 1998). Within this approach, sustainable development is increasingly being used as a policy framework since the 1980s for environment and development decision-making (O’Riordan et al, 2000; Urquhart and Atkinson, 2000; Scott, et al, 2001). Ecological modernization is an approach to environmental policy-making that attempts to reconcile capitalist development and environmental protection (Hajer, 1995; Mol, 1995; Blowers, 1997; Blowers and Pain, 1999; Murphy, 2000). Ecological modernisation conceptualises the problem of environmental degradation as a matter of efficiency or management (Hajer, 1995; Dryzek, 1997). Environmental problems are therefore conceptualised as ‘structural problems’ that can be solved with better economic management (Dryzek, 1997). Christoff ‘s (1996) continuum of ecological modernisation from weak to strong presents weak ecological modernisation as “economistic, technological (narrow), instrumental, technocratic and hegemonic” and strong ecological modernisation as “ecological, institutional (broad), communicative, deliberative, and diversifying” (cited in Oelofse et al, 2006).

Weak ecological modernization adopts an expert led, science-based policy framework (Hajer, 1995). The argument within this approach is that because environmental problems are highly complex, the precise scientific nature of the problem needs to be understood in order to create an authoritative base for policy-making. In this way scientists and experts take on the responsibility for defining and finding the solutions to environmental problems. Positivist science continues to provide a powerful discourse for justifying regulatory responses as it frames environmental problems and therefore the boundaries of political decision-making (Hajer, 1995; Fischer, 2003). It is at this interface of science and policy where power is located. Power is “inherent in the knowledge claims and various practices through which specific scientific claims gain authority” (Hajer, 1995, 139). Eden (1998, 426) notes that there has been much critique of the “‘linear model’ of policy influence which assumes a one-way flow of information – from science to policy and society... which is often implicit in the natural sciences”. She goes on to say that as science is linked to policy so policy issues become “scientized”... and science becomes politicized” (Eden, 1998, 427). A science based policy approach dominates where scientists and experts lead environmental decision-making processes. This conventional framing of science “reifies scientific knowledge as if it were objective and context-free” (Wynne, 1992, 282). Science is thus strategically employed by actors, business or the state, to frame environmental issues and impose particular claims of authority. This approach includes the representation of ‘science for society’ as the “skilled scientific distillation” of environmental problems, such as impacts of air pollution on health, “for non-specialist users such as policy-makers and public audiences” (Wynne, 2005, 70). Within this approach, policy interventions have to be legitimated by scientific evidence (Hajer, 1995; Fischer, 2003) and therefore from the perspective of civil society, oppositional politics needs to be framed within a scientific discourse to be able to present alternative societal options.

Hajer (1995) points to the growing importance of the ‘civil legitimacy’ of scientific research or ‘socially acceptable science’ in democratic environmental governance, where a range of ‘voices’ have rights in participating in policy-making processes. It is

here that we locate the emergence of civic science as a strategic resource for environmental justice movements in South Africa. Environmental movements employ science, even if it only “piecing together the extent of the problem and (organizing) it coherently” to determine the impacts of industrial capitalism on nature and human well-being (Brown, 1997, 140). Environmental movements rely heavily on gathering, analyzing, interpreting and diffusing scientific information about the interaction between development and the environment and often resort to litigation to “struggle over facts and science” (Brown, 1997, 143). Irwin (2001) proposes that there are opposing constructions of what he terms ‘scientific citizenship’. First, there is the conventional ‘public deficit model’ which defines publics “as incapable of respectable reasoning about science” and needing to be supplied with factual knowledge (Wynne, 2005, 70). Second, there is the ‘dialogue model’ which allows the public to play a more active role and assumes they have the ability to engage and learn (Irwin, 2001). The ‘public deficit model’ implicitly assumes that ordinary members of civil society have no knowledge which is appropriate in deliberations about environmental problems. This means that their lay knowledge has no value (Yanow, 2003). Wynne defines lay knowledge as falling within “an adaptive, informal cultural idiom” (Wynne (1997, 287). The environmental governance system in post-apartheid South Africa tends to reproduce the marginalization of social issues and the actors promoting these issues, and the devaluation of local knowledge (Michael, 1992; Christoff, 1996; Scott et al 2001; Laros, 2004).

Within this context dominated by scientific arguments, SDCEA have set out to adopt the discourse of science and engage in a process of conducting and developing what has been termed ‘civic science’, to provide alternative and persuasive formal arguments to support their opposition to the expansion of industrial growth (Eden, 1998; O’Riordan, 1998; Kerr et al, 2007). This has been a challenge for the community organisations in south Durban in areas of low income, high unemployment and lack of resources. In local environmental movements, there exists a fundamental tension between a cumulative history of lay knowledge about pollution and the lack of official acknowledgement of qualitative narratives accompanied by a lack of, and suspicion of, reliable official data (Brown, 1997). Environmental movements have thus employed civic science strategically to place the issue of air pollution on the political agenda. ‘Civic science’ is defined here as the production of knowledge by lay communities which claims to be framed within scientific methodology. Brown (1997, 140-142) in his study of ‘popular epidemiology’ notes that the collation of experiential knowledge, the making of “intuitive connections” and “mapping” of industrial impacts by lay people usually preceeds the stage of undertaking civic science where communities become “partners in scientific enquiry”. This strategy is supported and facilitated by SDCEA’s alliance with the South African environmental NGO, groundWork¹, and international collaborators, such as Global Community Monitor, who have helped fund these initiatives as well as the employment of experts to assist in the knowledge production process. Initially SDCEA employed lay knowledge in their deliberations derived from decades of community experiences living adjacent industry. Lay knowledge is defined here as knowledge which is local, ‘nonscientific’, ‘hard earned’, ‘less formally

¹ groundWork is a non-profit environmental justice service and developmental organization working primarily in South Africa but increasingly in Southern Africa (www.groundwork.org.za)

organized' and related to 'self identity' (Michael, 1992, 323). Eden (1998) characterizes this form of knowledge as incorporating "'extended facts' including beliefs, feelings and anecdotes". These different knowledge resources of lay knowledge and formal scientific knowledge - civic science - are alternately and opportunistically used in activist strategies and campaigns and in state-initiated deliberative processes for purposes of advocacy and placing issues on the political agenda. Together these knowledge resources are termed here as 'hybrid knowledge'.

The aim of this paper is to understand the use of *civic science* as a resource to support oppositional strategies of environmental movements without undermining the validity of lay knowledge.² Section 2 describes the context of south Durban as a pollution 'hotspot' and community activism in south Durban. Section 3 outlines the creation and use of science as a strategic resource in the promotion of the vision of the environmental movement in south Durban. Section 4 provides a summary of the paper and a concluding argument.

2) Industrialization, pollution, and activism in south Durban

The nationally derived state imperative to promote economic growth does not map itself out evenly across the South African space economy. This imperative is embedded in certain locations, identified as key sites of accumulation. The South Durban industrial basin is one such site. This in turn implies that certain highly localized forms of community mobilization might, under certain circumstances, be empowered to contest national economic plans by virtue of their proximity to these sites of accumulation. Their proximity to sites of key national importance enables them to generate highly visible and contentious expressions of the tensions between 'dirty growth' on the one hand, and social justice and delivery on the other. In short, the uneven development of industrialisation and urbanisation in South Africa has meant that civil society actors embedded in localities in South Durban have been pivotal in the emergence of a national movement of environmental justice (Cock 2006).

Durban is one of South Africa's key productive sites and plays a strategic role in the national economy. South Durban has become the second largest industrial zone in the country and provides employment and revenue for the city. It houses one of the largest concentrations of chemical and petro-chemical industries in the country, which are major sources of air pollution and hazardous waste. Two of the countries four oil refineries, ENGEN and SAPREF, are centrally located in the zone. The other sectors of industry found in south Durban include pulp and paper, beverages, textiles, plastics, petroleum and motor vehicle industries, which have a cumulative impact on the environment (Monitor

² This paper draws on collaborative research between the two authors and a larger research team involved in the Leverhulme Trust research project on *New Spaces of Democracy in Post-Apartheid Durban*. Data collection involved 75 semi-structured, open-ended interviews with city officials, councilors, community members, key actors from NGOs and community organizations and from the business sector, undertaken between 2003 and 2006. Purposive and snowballing sampling techniques were used to identify the respondents. Interviews were taped and then transcribed. Other data sources include relevant documentary material in the form of government, business and community reports, newspaper articles and policy documents which provided the empirical data for this study. A thematic and interpretive approach was used to analyse this range of data.

Company, 2000). This industrial core has been strengthened by the construction of the largest container terminal in the southern hemisphere and a number of recent investments in the chemical sector. This expansion has added to the long history of air, water and ground pollution in south Durban (Wiley, et al, 2002).

Toxic emissions from industries, particularly into the air, are a potential threat to the health of communities, workers, and the environment in south Durban. Poor industrial operating practices have led to periodic oil spills and industrial accidents with inadequate emergency strategies for workers and residents (Wylie, et al, 2002). Excessive heavy transport on residential roads, truck accidents, noise pollution and illegal dumping of toxic wastes are also serious problems in the area. Many of these industries operate with older and energy-intensive technologies that produce excessive pollution and hazardous chemical wastes (Wiley et al, 1996). The industrial impacts are more intense in the residential areas of Merebank, Bluff, Wentworth and Clairwood due to the close proximity of residents to industrial activity. The risk falls disproportionately on historically disadvantaged black communities. (See Figure 1)

Durban's local economy has suffered from a very low real growth rate in the 1990s and early 2000s (Monitor Company, 2000). In response to this, Durban has embarked on a re-industrialisation programme, which involves upgrading the older industrial area of south Durban. Work has commenced with the implementation of the South Durban Spatial Development Framework (SDSDF) (eThekweni Municipality, 2005). The proposed upgrading and improved transport technologies are aimed at attracting firms geared towards international trade. Central to this vision for Durban is the plan to upgrade the port to world-class standards (Daily News, 15 May 1997). These local plans form part of the government's national economic strategy to integrate South Africa into the global economy via the GEAR programme (Parnell, et al, 2002; Hart, 2003; Nel, et al, 2003).

Within this context a number of scenarios for development in south Durban have been proposed by a range on national actors. Firstly, the national plan to relocate Durban International Airport to the north of the city frees up land for further industrial development to the south. A further proposal, put forward by the parastatal Portnet, is for the massive redevelopment and expansion of the port. This process has already commenced. These two options, and a proposal that the south Durban industrial zone should be developed as a petro-chemical complex, present the possibility of dramatically increasing industrial impacts on surrounding communities (Peart and von Coller, 1997).

The major obstacle to these proposals is that the communities of south Durban live directly adjacent to the industries and are opposed to residential relocation (SDCEA, 2004d). Their concerns about the existing levels of air pollution and the poor quality of the living environment have been expressed vocally for many years (Scott, 2003a; Chari, 2004). Environmentally racist planning practices commencing in the late 1930s and culminating in the apartheid era created a 'productive zone' surrounding by racially segregated 'racial group areas' to provide a pool of labour for the emerging industrial core of Durban (Scott, 1992). The Indian and so-called 'coloured' areas of Merebank and Westworth/Austerville demarcated in this period lie directly adjacent to industries, and particularly close to the two refineries. These black residential communities in south Durban, like many others in South Africa from the 1970s, engaged in an ongoing civic struggle against the state in order to improve the quality of their neglected living environments and to meet their

reproductive needs. This gave rise to urban social movements that were distinctively community based, such as the Merebank Residents Association (MRA) and the Wentworth Development Forum (WDF). Their reproductive struggles focused on predominantly 'brown issues' which are issues that relate to quality of life in the living environment (e.g. housing, education, open space provision, waste removal, transport), and have been reframed as environmental struggles in south Durban in the post-apartheid era.

This legacy of activist politics among the black member organizations of SDCEA, in the context of unabated industrial development in this area of the city, has been crucial to the emergence in the post-1994 period of environmental justice activism in south Durban (SDCEA, 1998). The communities of south Durban have lived for decades in a degraded environment and have often had to face unresponsive industries and government in their quest for an improved living environment (Sparks, 2004). A central objective of this new form of activism has, therefore, been to articulate the lived experiences of living in polluted urban environments in new arenas of the post-apartheid public sphere, such as the news media and policy processes. In the next section, we examine the creation and use of civic science as a strategic resource in pursuit of this objective by the environmental justice movement in south Durban.

3). Strategic uses of civic science

SDECA has deployed civic science in three ways as part of its broader campaigning strategy. Firstly, to 'frame' environmental problems and their solutions; secondly in oppositional advocacy, and thirdly in deliberative policy forums to support their arguments. In this section of the paper we will examine the different uses of civic science at different moments in the last decade.

3. i) Framing south Durban as a pollution 'hotspot'

The first moment when civic science was employed was during the South Durban Strategic Environmental Assessment (SEA) which was the culmination of a 'greening' process commenced by the local government in Durban in the 1990s (Freund, 2001; Roberts and Diederichs, 2002). Durban was the first local municipality in Africa to adopt Local Agenda 21 (LA21). LA21 is a knowledge intensive form of environmental governance and the first output of the process of integrating the LA21 principles into the development plans for Durban was a '*State of the Environment*' Report' produced in 1996 (Hindson et al, 1996)³. This scientific evaluation identified south Durban as an 'environmental hotspot' because of the long-standing environmental politics in the area. In order to address this problem and provide a framework for all further policy-making in south Durban, the local municipality commissioned a Strategic Environmental Assessment (SEA), which was undertaken between 1996-7 by the CSIR.⁴

³ This was stimulated by South Africa's adoption of the principles and policies of the United Nation's Local Agenda 21 (LA21) Programme (Urquart and Atkinson, 2000).

⁴ The SEA was produced by the Council for Scientific and Industrial Research (CSIR) which undertakes scientific and technology research, development and implementation and employs mainly natural scientists and technicians. The CSIR receives an annual grant from parliament which constitutes 40% of its income. The remainder of the income is generated through research contracts with government departments and the private sector (www.csir.co.za).

The south Durban SEA had eight specialist natural science reports, and the Social Assessment, which was a desktop study (Scott and Ridsdale, 1967). Initial qualitative community narratives contributed to the public participation process were rejected for being too ‘emotional’ and ‘subjective’. Consequently, a ‘scientific’, quantitative study was commissioned to gauge the ‘perceptions’ of people living in south Durban (CSIR, 1998). Faced with this exclusion, communities strategically decided to remain out of the participation process.

The final report of the SEA proposed that the development of a petro-chemical industrial core would be the best future development path for south Durban necessitating possible relocation of residential communities. The report lacked acknowledgement of local community impacts and provided a key moment for communities to mobilize, firstly around the issue of ‘not being heard’ and secondly, around the issue of relocation. When the SEA was submitted to local government in 1999, SDCEA successfully framed the report as a set of recommendations for ‘the forced relocation of black communities to make way for industrial expansion’ and large rallies were held. It was because of SDCEA’s mobilisation around this issue that the eThekweni Municipality never acted on the SEA report.⁵

SDCEA were thus organising at the local level around three connected claims related to citizen’s rights (Douglass and Friedman, 1998). The first claim is the right for citizens to be heard in matters affecting their local interests related to living environment and community, which is entrenched in the South African Constitution. They hereby called for the democratization of decision-making processes and for transparency and openness of all government transactions, and for the accountability of the state to its citizens (Douglass and Friedman, 1998; Barnett and Scott, 2007a). It was a particular claim for their local knowledge of the health impacts of industrial processes to be heard. They were also claiming their difference as historically marginalised and disempowered communities, which have special needs due to their historical location adjacent to industry due to environmentally racist planning. Thirdly, they were claiming as citizens their rights to satisfy their basic needs - the ‘brown issues’- of employment, health, education, a clean and safe environment and access to resources (Douglass and Friedman, 1998). These rights are embodied in SDCEA’s Constitution (SDCEA, 1998). SDCEA increasingly uses a rights based discourse in their opposition strategies as well as claiming their political rights. It is important to differentiate between political rights that confer equality and socio-economic rights, which relate to the delivery of basic needs, especially in developing countries such as South Africa (Seleoane, 2001).

With the experience gained through the SEA process, which was led by scientific experts and used scientific ‘facts’ as the basis for its decisions, SDCEA began to strategize about producing its own civic science in order that it might be ‘heard’:

“Soon after its inception, members realized that the organization’s credibility would lie with the quality of the information gathered on the various industries and on the many accidents and incidents that occur in south Durban” (Reid and D’Sa, 1995).

⁵ Interview with Debra Roberts, Head of Environmental Branch, eThekweni Municipality, 30 July 2003.

Besides highlighting the lack of official acknowledgement of qualitative narratives, the SEA formally exposed a lack of reliable official data describing the problem of air pollution and the secrecy around refinery data. Lay knowledge provided a large body of historically accumulated experiential knowledge pointing clearly to the fact that there were high levels of cancer in south Durban. Yet there was ‘no scientific proof’ of impacts. SDCEA continues to present the local lay knowledge while at the same time realizing the need in certain forums to have their own reliable source of quantitative scientific data.

A second moment in the process through which SDCEA ‘framed’ their argument was the publication of a series of articles in a local newspaper regarding the impact of industry on health in south Durban. Social issues related to marginalized groups are increasingly finding their way into the media in opposition to the historically conventional sources of scientific information (Barnett and Svendsen, 2002; Barnett 2003). SDCEA have perceived this new ‘political opportunity’ and media coverage of social movements has substantially increased since 1994.

From its earliest days, SDCEA had always relied on its accumulated local, experiential knowledge, which remains a powerful resource in challenging the state’s legitimacy imperative (Dryzek, et al, 2003). It was the reporting of this lay knowledge in *The Mercury* that provided SDCEA with credibility and bargaining power and an opportunity to frame the environmental problems in south Durban (Barnett 2003). A local journalist⁶ focusing on health and environmental issues undertook an investigation into the allegation of increased levels of cancer in south Durban. He published his findings in a series titled ‘*The Poison in our Air*’, which consisted of five front-page articles in *The Mercury*, during the week of 11-15th September 2000 (The Mercury, 11-15 September, 2000). The information for these articles was sourced from the community members of south Durban and was in the form of experiential narratives about cancer related illnesses and deaths of specific people. SDCEA through its affiliated community organisations was responsible for providing access to all the people interviewed by the journalist. Each story was accompanied by a photograph and the name of the victim. The lay knowledge of local communities aligned itself well with the frames of journalistic discourse (see Barnett and Svendsen 2002). The storyline that was established through this media strategy to frame the key issue in south Durban was ‘air pollution causes cancer’ and south Durban became metaphorically characterised as ‘Cancer Valley’. Although not claiming that the information was scientific the series was detailed enough to establish SDCEA’s credibility through a systematic presentation of lay knowledge. This had a profound impact on local people. The series was highly controversial and sparked widespread response nationally in other media, and from government. It challenged the state’s legitimacy imperative by engaging in the ‘politics of shame’⁷ and invoked the Minister of the Environment to set up a process two months later in November 2000, the Multi-Point Plan (MPP), as a deliberative forum to deal

⁶ Tony Carnie has established himself as a leading environmental journalist in Durban who has an in-depth knowledge and interest in the environmental issues in south Durban. At a recent awards ceremony for the Vodacom Journalist of the Year competition one of the judges stated that Carnie is “one of the most influential and intelligent journalists in the environmental field... with a string of awards to his name” (Independent Newspapers, 2006).

⁷ ‘The politics of shame’ is the strategic use of knowledge about community injustices by communities to challenge the state’s legitimacy imperative and pressure the state to become more accountable (see Dryzek, et al, 2003; Barnett, 2003).

with the issue of air pollution in south Durban (DEAT, 2007). SDCEA therefore claim that they were responsible for the establishment of this Plan (SDCEA, 2004a; DEAT, 2007). The Multi-Point Plan was a five year multi-stakeholder process established by the Minister of Environmental Affairs and Tourism in response to community activism against the high levels of air pollution in the South Durban Basin. The focus of the MPP process was on air pollution management at the local level and laid the foundations for the Air Quality Management Act (No. 39 of 2004) which came into effect in September 2004 (DEAT, 2007).⁸

4.ii) Civic science and activist opposition

As well as using lay knowledge as a means of ‘framing’ environmental issues, activist opposition is the second arena in which scientific knowledge has been used by SDCEA. There are a number of key moments when this strategy was deployed.

The employment of science by SDCEA is not simply a matter of contesting scientific/legal expertise but also producing and commissioning science of their own as well as devising innovative means of disseminating science to local communities. Since the commencement of the south Durban SEA, SDCEA became increasingly aware of the need to produce their own information and objective scientific knowledge and have access to scientific ‘experts’. To do this they sought international funding, which was obtained from the Danish government agency, DANCED⁹ in 1998. This allowed SDCEA to employ a chemical engineer to assist them with their inputs into the south Durban SEA and assist them in understanding the complexities of the productive processes of an oil refinery (SDCEA, 1998). More importantly, since there was a lack of trust of the scientific data produced by the state and industry, it was necessary to obtain reliable data and information. There was furthermore secrecy regarding the activities of the refineries due to the National Key Points Act of 1980, which was promulgated to protect installations that were vital and vulnerable for the country, such as oil refineries and power stations. The refineries used their status as Key Point industries to maintain secrecy regarding their emissions. They continue to do so although this is increasingly difficult under the new regime of transparency and openness stipulated by NEMA and recent legislation in South Africa to promote public access to information. SDCEA continues to protest about the secrecy around air pollution data collected as part of the statutory required self-monitoring process by industry. This lack of trust lies at the core of the conflict in south Durban between communities, the state and industry.

Since science is the authoritative discourse for industry’s claim that air pollution was at an acceptable level, science could also be used for proving otherwise. Thus, SDCEA began in the late nineties to use science to frame air pollution as a problem. Up until that point, the existing ‘command and control’ environmental management system managed air pollution emissions to comply with a set of ‘quality standards’ via a permit (Hajer, 1995; Royal Commission on Environmental Pollution, 1998; Diab and Motha, 2007). If emissions were below these standards, air pollution was deemed not to be a

⁸ A result of the MPP is the development of a sophisticated air quality monitoring system in the eThekweni Municipality (Durban) which was used to produce objective air quality data to develop the city’s Air Quality Management Plan (DEAT, 2007).

⁹ DANCED was established in 1994 within the Danish Ministry of Environment and Energy to promote environmental sustainability with a focus on community development in developing countries.

problem. When on occasion the emissions rose above these set levels, these are termed ‘exceedences’, for which a warning is issued for a return to compliance and a small fine issued (O’Rourke and Macy, 2003). Such exceedences are explained away as deviations from the norm, rather than part of a larger problem.

The strategic use of science as a tool for activism has involved reaching out to international partners through networks of science and activism (see Barnett and Scott, 2007a). The two examples of international support presented here are, the series of scientific studies funded by DANCED, and the scientific support offered by the ‘Bucket Brigade’ which provided knowledge to refute industry’s claim that air pollution was not a problem.

The first example is the production of scientific knowledge funded by DANCED for advocacy purposes. The DANCED funding, managed through a Danish NGO – Danmarks Naturfredning (DN), was used to undertake two scientific studies. SDCEA undertook a comparative study of a Danish refinery and the two south Durban refineries, namely ENGEN and SAPREF (SDCEA and DN, 2004b; 2004c). The report concluded that south Durban’s refineries were an instance of ‘dirty growth’ due to outdated technology and was rejected by the refineries, which challenged the scientific basis of the study. The funding was also used to set up a GIS information system to collate, analyse and present a range of pollution related data. A series of large maps portraying the spatial distribution of types of air pollution complaints, the location of polluting industries, pollution incidents, population at risk, air pollution mapping and resident’s anecdotal data regarding how they had been impacted by pollution.¹⁰ The maps were presented at the World Summit for Sustainable Development (WSSD) in the NGO session on Corporate Accountability in 2002. SDCEA members have been trained in the use of GIS, and the maps were presented at south Durban schools. The maps produced have proved to be highly successful tools for mobilization of communities, advocacy, and environmental education.

The second example of civic science for activist opposition is the application of the ‘Bucket Brigade’ methodology to south Durban. This is a simple methodology whereby a sample of air is collected in a specialized bucket through a vacuum system. It can be used by local communities in polluted areas to do their own sampling of polluted air. The bucket is then couriered to the United States for testing for pollutants (O’Rourke and Macey 2003). From 2000, SDCEA began to expand its networking with international NGOs and donor agencies. With the assistance of groundWork, a local environmental NGO, SDCEA in 2000 engaged the assistance of the Global Community Monitor (GCM), an international NGO that has established an air testing programme for ‘fence line’ communities called the ‘Bucket Brigade’ as a form of community environmental policing (O’Rourke and Macey, 2003). Air samples were collected around the fence line of the refineries and sent to the Environmental Protection Agency (USA) for analysis.¹¹ The results revealed that the air contained a ‘cocktail of carcinogenic pollutants’ and included the chemical benzene. This served to reinforce the ‘pollution causes cancer’ storyline established through the articles in *The Mercury* in

¹⁰ Interview with Njoya Silas, post graduate student undertaking the GIS project for SDCEA, 20 September 2002

¹¹ Interview with Des D’Sa, Chairperson of SDCEA, 9 August 2003.

September 2002. The community now had credible and reliable scientific evidence that the industries were producing dangerous and toxic chemicals.

Up until this period, air pollution monitoring had only involved the monitoring of Sulphur Dioxide (SO₂) as an indicator of pollution levels (DEAT, 2007; Diab and Motha, 2007). The receipt of the results of the analysis of the ‘buckets’ of air collected by the Bucket Brigade revealed that the air samples contained a dangerous mixture of carcinogenic chemicals. This led to the adoption of the term ‘toxic’ by SDCEA and the people of south Durban when referring to the polluted air and the industrial sources of this pollution. In this way the air pollution problem was reframed and soon thereafter SDCEA developed an education environmental tour of south Durban dubbed the ‘Toxic Tour’ which has proved a very popular advocacy tool.

‘Civic science’ produced by SDCEA is disseminated widely for both advocacy and educational goals through a range of channels. SDCEA has an ongoing programme of raising environmental awareness in local schools in south Durban Basin. The recent publication, endorsed by the Department of Education, called *Applied Meteorology and Climatology in South Durban* (SDCEA & DN, 2004a) is aimed at educators and learners and is considered by SDCEA to be one of its successes (SDCEA, 2004b). Similarly, the dissemination of the technical reports on the comparative studies on oil refineries in Denmark and south Durban have raised levels of awareness about the operation of multinational oil companies operating in developing countries. The installation of Geographic Information System (GIS) in the SDCEA office produces pollution complaints and incidence maps for local schools and is used as an advocacy tool at meetings and in deliberative forums. SDCEA provides its knowledge products in the form of pamphlets, brochures, and newsletters free of charge. The Newsletter, *Community News* is produced quarterly and is distributed locally as well as internationally (SDCEA, 2002/3; 2004a). In addition, SDCEA actively organizes meetings, workshops and seminars, which serve a range of purposes, chiefly awareness raising and gaining the community’s mandate for action. At recent meeting on the 31 May 2008, SDCEA called community organisations, academic and the broader community together to develop a ‘community vision’ and build consensus regarding the “overall transport planning, the future of the airport land and other open land in the area, polluting industries and how to achieve appropriate economic and livelihood development in the area” (SDCEA, 2008).

Knowledge and information have been at the heart of activist engagements when SDCEA has mobilized the communities of south Durban to be able directly to represent their concerns to the state or business. One example of the use of knowledge in activist engagement took place to coincide with the WSSD in Johannesburg in 2002. A mass public hearing was held at the Fairvale School directly opposite ENGEN. Residents were invited to come and share their personal experiences of health problems resulting from industrial impacts with American activists who had challenged SHELL (SDCEA, 2002a).¹² The poster made the following call:

¹² Interview with R. Naidoo, Chairperson of the Merebank Resident’s Association and ‘Leader on the Ground’ for the two events, 12 November, 2002.

“Bring your asthma pumps, crutches etc and join us to speak out against this mass abuse to create a cleaner, healthier environment for us all!!!” (SDCEA, 2002)

The hearing was to collect lay knowledge and evidence to add to SDCEA’s database of local knowledge. The passive hearing was then followed by a candlelit peaceful procession to the gates of ENGEN to deliver the memorandum.¹³

This event provided a challenge to industry and the state and drew on local grassroots support and global partners. The ENGEN hearing was symbolically powerful as it linked the hearing of environmental injustices to the national Truth and Reconciliation (TRC) hearings in South Africa, which logged the violence and human rights abuses under apartheid and were “unique in the annals of history” (South Africa, 2003, 1). In this case, it was a formal public hearing of environmental injustices, a cathartic counter-ritual challenging the contemporary democratic society of South Africa (Scott, 2003). The strategy was successful in gaining media attention and presented SDCEA’s message locally, nationally and globally, promoted international networking, exposed international corporations and local government for inaction, and mobilised support. At the core of this engagement was the transmission of information. These moments illustrate the strategic and opportunistic use of both lay knowledge and scientific empirical data, each providing SDCEA with instrumental power in communicating their vision and challenging the state and industry.

4.iii) Civic science and deliberative policy-making

The third use of science by SDCEA has been in scripted formal environmental policy forums through the process of deliberation. Two examples are provided here, the Environmental Impact Assessment (EIA) processes in south Durban and the Multi-Point Plan.

The first example of the use of science for deliberation is SDCEA’s engagement in EIA processes as an ‘interested and affected party’. Since 1970 when south Durban became consolidated as Durban’s major heavy industrial area, industrial expansion has continued to take place. Since the mid nineties, SDCEA has contributed to “hundreds of EIAs ... to challenge ‘dirty’ expansion programmes” (SDCEA website). SDCEA soon became established as the legitimate representative of the people of south Durban and was inundated by requests to engage in the statutory public participation processes for development applications. Since public participation is a statutory requirement of the EIA process in terms of the Environmental Conservation Act (Act 73 of 1989) and has been reinforced through NEMA in 1998, consultants are forced to consult communities to determine the potential social impacts of proposed developments. A recent study has found that EIAs undertaken in south Durban between 2000 and 2005 reveal weak public participation processes and a lack of adequate consideration of the social issues (Hoosen, 2005). This trend is not specific to south Durban and has been witnessed throughout the country (McDonald, 2002; Laros, 2004; Scott and Oelofse, 2005).

Consultation with SDCEA is sought to ‘rubberstamp’ EIAs and SDCEA has been severely pressured to provide responses and thus suffer from ‘stakeholder burnout’ –

¹³ Interview with D Ramcharrund, SDCEA Steering Committee Member, 21 October 2002.

“Sixty-four EIAs in 18 months in south Durban”.¹⁴ To assist them SDCEA have commissioned engineers and scientists, to assist with input into the complex chemical and engineering issues that are contained in these industrial EIAs.¹⁵ SDCEA claim that their tireless efforts to be included in these decision-making processes has had some success and “has resulted in some companies changing to cleaner fuels and technology” (SDCEA, 2004b). Despite the weak public participation processes, SDCEA, has in many EIAs, demanded additional capacity building workshops and more information, as well as meetings with technical specialists resulting in delays in the EIA processes. They have in this way challenged the industries applying for the EIA approvals and the consultants undertaking the EIAs to improve the quality of their public participation processes and information in the EIAs making them more accountable. SDCEA has called for a moratorium on EIAs in south Durban due to the ongoing ‘industrial creep’ resulting from the current programme of re-industrialization, the lack of attention to the cumulative impact of development in the area and the failure of the SEA process. The SDCEA/Danida 2007/2008 funded programme includes the funding of EIA workshops with community members to build residents’ capacity in understanding the EIA process and in the ability to provide comments and inputs into EIAs (Danida /SDCEA Progress Meeting, 10 January 2007). A handbook has already been produced for this purpose.

Networking with local Universities has been a vital strategy for the production of civic science and students from tertiary institutions have contributed scientific knowledge through action research to assist SDCEA (Edwards, 2005; Abboy, 2006). This process has been productive in providing SDCEA with methodological capacity to defend their methodologies and knowledge production processes. In 2006, a series of research methods workshops were held with representatives of SDCEA for a study commissioned by SDCEA on the public spaces of south Durban that were potentially threatened by industrial expansion via the city’s South Durban Spatial Development Framework. Scientific knowledge was ‘co-produced’ by SDCEA, academics and students from the local university¹⁶ with SDCEA framing the research question, and collaborating in the sampling of respondents, the questionnaire design and the dissemination and collection of questionnaires (Abboy, 2006; Scott, pers.comm., 2007).

A second example of the employment of science in deliberative policy forums is through the much-acclaimed Multi-Point Plan, which was established because of the community protest and mobilization in south Durban culminating in the high profile reports in *The Mercury* in September 2000. Established in November 2000, the MPP aimed to establish an air quality management system for south Durban (South Africa, 2004). In addition to setting up this management system, the MPP undertook two health studies: a Health Risk Assessment and an Epidemiological Study to scientifically determine the impact of air pollution on human health. It was envisaged that it would be a multi-stakeholder forum with representatives from local, provincial and national government as well as civil society, environmental NGOs and business. Siva Chetty, previously a respected leader of the Merebank Residents’ Association and employee of

¹⁴ Interview with Bobby Peek, of groundWork, 10 February 2004.

¹⁵ Some of this assistance has been voluntary, such as the input received from academics from the University of Natal, University of KwaZulu-Natal and the Durban University of Technology. Engineering advice has been funded through the original DANCED grant received at the time of SDCEA’s establishment in 1998 (SDCEA, 1998).

¹⁶ University of KwaZulu-Natal.

the eThekweni Municipality, was appointed as the manager of the MPP with a view to establishing trust between communities and the state and providing the MPP with credibility (DEAT, 2007). In the MPP forum, science was established as the ‘neutral arbiter’ of conflict and the frame for consensus. This was achieved through appointing independent international experts and obtaining external funding for the health studies. Furthermore, the air quality monitoring programme with eleven air pollution monitoring stations was set up to produce ‘credible air quality data’, which were published for all parties to inspect and verify (SDCEA, 2004d).¹⁷

The MPP has been rated as a ‘success’ for SDCEA and groundWork albeit a governance system that is based on a ‘science based policy making’ approach which is characteristic of the weak ecological modernization form of environmental governance. A key product of the MPP has been the promulgation of the Air Quality Management Act (Act 39 of 2004). This Act, according to the Minister of Environmental Affairs and Tourism,

“will establish a scientific basis for identifying our most polluted air, and the sources of the pollution. It will create air quality standards and regulate emissions. Perhaps most significantly it will empower all spheres of Government to act against those responsible for damaging air quality, providing for fines, licensing fees and the entrenchment of the ‘polluter-pays’ principle” (South Africa, 2004).

SDCEA has participated in the five year process of the MPP as a key stakeholder and continues to lobby for transparency and the free access to information. In their 2004 Quarterly report to the MPP, they protested that the National Key Points Act is still being used illegally by the refineries to withhold information necessary ‘for protection of human rights’ (SDCEA, 2004b). SDCEA maintain that this has led to suspicion and a lack of trust and ‘disempowers’ the communities. Thus scientific knowledge continues to be an area of contentious politics (Barnett and Scott, 2007a; 2007b). SDCEA has through their increased scientific knowledge and the recourse to the rich accumulation of lay knowledge, increased the accountability of regulators and industries and changed the face of air quality management in South Africa. SDCEA’s activist protests and presentation of lay knowledge about cancer victims in south Durban stimulated national government to set up the MPP. This has been acknowledged by the Department of Environment Affairs and Tourism (DEAT, 2007).

Key here is connecting ‘science’ with the ordinary dispositions of communities where there is a high level of suspicion about official sources. Through SDCEA’S activities, communities themselves are understanding the ‘science’ of industrial impacts and in doing so are establishing the conditions for ‘placing trust’ through effective communication.

Conclusion

Environmental governance in post-apartheid South Africa is modeled on the assumptions of the ecological modernization paradigm. This is the context for the strategy of developing and deploying civic science pursued by environmental justice movements in south Durban. There is a fundamental tension between the history of lay

¹⁷ Interview with Siva Chetty, Manager of the Multi-Point Plan, 6 February 2004.

knowledge about pollution upon which SDCEA has relied to engage in the ‘politics of shame’, and the lack of official acknowledgement of subjective qualitative narratives. The embedding of ecological modernisation in South African environmental legislation as the framing approach in environmental governance generates a dilemma for SDCEA in their employment of strategies using science and lay knowledge. The authority of science in this approach results in community organisations striving to produce civic science as a response to this dilemma. This tension is coupled with the lack of reliable data regarding the impacts of pollution on human health due to apartheid legislation, which allowed companies to keep their data secret from public scrutiny for ‘security’ reasons. It is not so much an issue of lay knowledge versus expertise/science, but rather that the task of movements has been to develop ways of producing and disseminating scientific knowledge to pressure state and capital, without undermining the validity of their lay knowledge.

Thus a key strategy of SDCEA in their opposition of state sponsored industrial expansion and their claims for the right to clean and healthy living environment, is to translate the validity claims of lay knowledge into forms of knowledge that are effective in institutional contexts. At the same time, SDCEA has lobbied for ‘socially acceptable science’ which they can trust to document the impacts of industrial pollution on human health.

Environmental movements undertake a complex strategy of constructing and deploying lay and scientific knowledge – civic science. Brown (1997) claims that ‘contaminated communities’ do not *require* scientific health studies. What they rather want is the industrial impacts prevented and if the state and the large corporations “admit the problem and take appropriate action, activists would have no need for or interest in (scientific) health studies” (Brown, 1997, 139) nor in undertaking their own civic science. But environmental movements experience much resistance to their claims that there are industrial impacts on health based on experiential narratives, and require therefore more “concrete evidence of causation” (Brown, 1997, 139). They therefore set about gaining support and resources to undertake their own civic science which will produce legitimate knowledge and allow them to leverage some power in environmental management and policy forums. This is the expedient strategy in a context of weak ecological modernization where expert knowledge and science dominate environmental decision-making (Christoff, 1996). This is also in response to historical lack of trust in official and corporate sources of knowledge.

Through the empirical study of SDCEA in south Durban, this paper shows that civic science and lay knowledge, considered together here as a form of hybrid community knowledge are used alternately in different contexts to reframe the problems in south Durban and to put pollution on the agenda as a ‘brown issue’. Secondly, it shows that lay knowledge has been used to engage in the ‘politics of shame’ to broker power by exposing the state’s neglect of community health and well being and reframe environmental problems. Science and lay knowledge are used alternately as tools in activist strategies of opposition to critique and expose industry’s practices of pollution, industrial accidents, emission exceedences and use of ‘dirty fuels’ as well as exposing the health impacts of industrial emissions. And finally, civic science is also used as a persuasive weapon in community deliberation processes and for the mobilization of communities to provide mandates for action. Science and lay knowledge are also

creatively disseminated to a range of publics to raise awareness and provide environmental education.

Deploying this hybrid knowledge, environmental movements furthermore operate opportunistically both 'inside' and 'outside' of the state, in deliberative forums and through activist protests (Dryzek, 1996; Young 2000, 2001). Since science is the authoritative discourse and basis for policy-making in the prevailing approach of ecological modernization, environmental movements have turned to producing their own civic science or commissioning research for their purposes. Knowledge networks both locally and internationally through environmental NGOs, universities and funded programmes, provide a conduit for the expansion of their knowledge base and scientific capabilities. However, this does not counter the use of lay, experiential knowledge of human suffering as a result of industrial impacts, which is employed to challenge the state's legitimacy imperative by invoking principles of social justice. These strategies are also a reaction against the power of science and technology based on increasing evidence of the industrial impacts, hazards and risks which ordinary people are faced with in their daily lives.

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Figure legend:

Figure 1: South Durban showing the proximity of residential and industrial areas