

INTEGRATING QUALITATIVE METHODOLOGIES INTO RISK ASSESSMENT: INSIGHTS FROM SOUTH DURBAN

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ABSTRACT

In the field of risk management, there is growing recognition that traditional tools of analysis may be limited in their ability to arrive at a textured understanding of risk as it is actually experienced by communities. This paper begins with the premise that risk is socially constructed by lay people, as well as by scientists, and that this recognition has important implications for the development of risk management approaches. Technical risk assessments can be complemented by qualitative methodologies that are designed to reveal lay or local knowledge of risk. Such research tools were employed in working with respondents from residential communities in the highly industrialised South Durban Basin in KwaZulu-Natal. Here, as in other urban industrial contexts, risk is constructed by residents through their own experience and histories, their understanding of science, and their response to technical management tools. The qualitative approach adopted in this research provided new insight into residents' responses to chronic and acute risk, drew attention to a widening gap between people's actual experiences and the claims of science and risk management experts and exposed currently hidden, everyday risk narratives that are not directly related to the dominant environmental hazards connected with industry, but which significantly impact people's living environments.

INTRODUCTION

In recent decades, there has been a growing recognition of the limitations of technical risk assessment tools in arriving at a textured understanding of the way people living in a particular environment, experience and consider the risks they face in their everyday lives. Despite the fact that risk assessment is a multidisciplinary field, qualitative methodologies tend to be under-represented in risk assessment practice. Scientists often rely on established methodologies, such as the source-exposure-response approach which includes techniques like exposure assessment, hazard assessment, dose-response estimation and risk characterisation, to assess the probability and magnitude of risks to human health from exposure to environmental hazards.^{1,2} Such methodologies have been used in most work on environmental hazards in the urban context of Durban,^{3,4,5,6,7} and, while they are certainly useful, we argue that they may constrain thinking about risk within certain predictable channels, possibly blinding scholars to other perspectives generated by local people's understanding of, and response to, the risks they face. We believe that this 'lay knowledge' of risk is best elicited through qualitative methodologies that can be used to enhance and deepen the knowledge of risk produced by the application of technical risk assessment tools.

This study draws on qualitative research carried out in communities in or adjacent to the South Durban Industrial Basin. In broadening the debate to include lay knowledge of risk, this research highlights the importance of trying to understand the lived landscape of risk in South Durban. To gain a better understanding of this 'riskscape',⁸ we explored constructions of risk in the community from the perspective of lay knowledge and provide new insights in three areas. Firstly, we show how and why chronic risk is 'normalised' by residents who, for different socio-economic reasons, have not moved away from the polluted environment of South Durban. Secondly, we reveal a growing disillusionment amongst 'ordinary' South Durban residents with the promises of science and its relationship to state responses. Science is regarded by these residents as an inaccessible domain far removed from their everyday lives and they have limited faith in the technical management tools employed by industries and the municipal authority to address the environmental hazards in the area. This situation presents a challenge to scientists who are now required to engage in the politics of environmental governance, rather than merely being responsible for producing knowledge for these debates. Thirdly, we reveal the dominance of one particular narrative about risk – the 'industrial risk' narrative. Conventional scientific assessment methods have played a significant role in constructing and reinforcing this narrative, which has become fixed in the minds of researchers and the media. Lay people living in the area are eager to open up the debate and talk about other notions of risk. Qualitative methodologies, we argue, can reveal hidden or discounted risk narratives that also need to be taken into account in assessing risk and vulnerability.

QUALITATIVE STUDIES OF RISK

The importance of lay knowledge

Scholarship in the field of risk assessment has begun to move beyond what Irwin⁹ termed the 'public deficit model' of scientific citizenship. This model assumes that 'ordinary' people are, in Wynn's words, 'incapable of respectable reasoning about science'¹⁰ and simply require factual information, which is to be supplied by knowledgeable scientific experts. One proffered alternative has been the 'dialogue model',⁹ which assumes that people have some existing knowledge together with the ability to engage with and learn from scientists. This model, while it allows the public a more active role, still tends to marginalise local experiential or lay knowledge in environmental management processes. As a result, understanding of the importance of lay knowledge in risk assessment remains somewhat limited.

Kasperson et al.¹¹ have noted that there are currently few methodologies or bodies of theory capable of 'integrating the technical analysis of risk and the social and cultural response strategies that shape

individual and community experiences of risk'. One which does is the work of risk theorist Ortwin Renn,¹² who has recently argued for greater integration of natural science and social science approaches (i.e. 'realist' and 'constructivist' positions) on risk. Renn argues that the enterprise of risk assessment – and subsequent risk management – must be able to deal with both the 'physical' and 'social' dimensions of risk. In his view, risk practitioners urgently need to find ways to 'expand the set of criteria for assessing, characterising, evaluating and managing risks beyond the largely technological or scientific factors that have dominated earlier models of risk governance'. Renn's new risk governance framework is a step in this direction and is important for several reasons.

Firstly, in order to understand how and why people respond as they do to risk, both chronic and acute, lay knowledge must be taken more seriously. Acute risk results from short-term, intense hazardous events and usually demands a disaster management response, while chronic risk is more pervasive and may become normalised within certain environments. It is important to understand that the degree of risk tolerance displayed and the expectations people have of the national or local state in terms of protecting them from risks, are necessarily shaped by cultural expectations, socio-economic circumstances and historical experience.⁸ Renn¹² expresses the danger in relying only on technical risk assessment tools as, '[T]he price society pays for this methodological rigour is the simplicity of an abstraction from the culture and context of risk-taking behaviour'.

The experience of risk is socially mediated and needs to be taken into account in risk assessment and management. South Africa's history of apartheid and authoritarianism, for example, helps to explain the apparent passivity of some poor Black communities in the face of environmental hazards. On one hand, they are trapped in poverty and based on their past experiences of the state, expectations remain low and people may feel they have little choice but to put up with the conditions.¹³ On the other hand, many poor communities in South Africa (and elsewhere) have strongly resisted environmental pollution and the failure of the state to deal with environmental hazards in their living environment, leading the way in social activism in support of environmental rights.^{14,15,16,17,18} Perhaps ironically, the positive factors emerging from such resistance, such as community cohesion and a sense of history and belonging, can result in communities remaining in polluted environments while fighting for a change in environmental quality in their area.

Secondly, scientific knowledge produced in the risk assessment field is clearly knowledge produced for, and consumed by, the state and society. As a pre-eminent example of science serving the interests of society, risk assessment research is generally applied research that often leads to specific interventions in people's lives. It is thus important that the public have confidence in the promises of science. But science can easily be mystified, regarded as existing in another realm and only comprehensible to 'experts'. The work of scientists can seem remote and frustratingly opaque to ordinary people, who may become sceptical of its claims.^{19,20,21} Furthermore, researchers need to be aware that science is not value-neutral; in the real world, scientific knowledge is strategically employed by various actors (e.g. the state, businesses and non-governmental organisations) in order to frame environmental issues and make particular authoritative claims.^{12,22,23} The process of generating and communicating knowledge about risks and hazards to affected communities, produces an often politically loaded 'distillation' or framing of environmental problems. Repeated exposure to the same messages attached to the same predictable agendas, combined with a lack of success in effecting any real change, can result in communities becoming jaded and losing confidence in the ability of science to solve problems.^{24,25}

There is doubt that scientists actually identify the risks that are of concern to people. By tapping into lay knowledge,²⁶ scientists

should feel more confident that they have at least understood the wider terrain of experienced or lived risk. Even if the concerns expressed by the lay public appear to have little evidence-based connection to the real world, they are 'social facts' and are therefore important. As Renn¹² points out, addressing such concerns may be beneficial – not only in enabling practitioners to take into account previously unrecognised risks that are regarded by the public as important, but more significantly in 'improv[ing] trust in the risk operating systems', as well as providing affected people with a greater sense of 'personal control over the extent of the risk'. It may be challenging for researchers more familiar with the universal principles of positivist science to take lay or local knowledge, in the form of what Eden²⁷ calls "'extended facts" [,] including beliefs, feelings and anecdotes', more seriously. Nevertheless, these 'extended facts' are important and they can be drawn out using qualitative methodologies that take risk assessment (and environmental management in general) on new and innovative paths.²⁸

The context of African cities and the practice of risk assessment in such spaces illustrates these points. In African countries, many of which are not functioning democracies, there is an even greater tendency to sideline the concerns of the lay public, who are typically less able than vocal Westerners to set the research agenda. A recent study by scholars working on urban risk in Africa²⁹ has highlighted the critical importance of the experience of 'everyday risk' in people's lives. In thinking about risk in African cities, these scholars propose a 'hierarchy of disaster', from everyday disasters (the high incidence of death from traffic accidents in a Kenyan city, for example), to small disasters (fires in informal settlements in Cape Town), to large disasters such as urban flood events. These case studies suggest that for those working in the field of risk, it is important that a special effort is made to engage with the everyday and smaller-scale risks that combine to create an experience of African cities as unsafe spaces.

In summary, an uncritical adherence to well-trodden paths in risk assessment means that the totality of people's experiences – what we call here the broader 'riskscape' – may not be fully understood or incorporated into the risk knowledge produced by scientists. The resulting gulf between lived experience and the scientific activity of risk assessment is potentially disastrous for what Kaspersen et al.¹¹ call 'the societal management of risk'. Qualitative research from South Durban is presented in this paper to show how these issues are made manifest in the particular context of one African city. Firstly, a brief background to the history of South Durban is given.

THE HISTORY OF SOUTH DURBAN

The South Durban industrial zone, located south-west of the Durban harbour, emerged in the early 20th century as an urban landscape planned by the local authority in concert with powerful industrial interests. By 1938, it had been agreed that the future of the South Durban Basin was as a productive zone for the city;³⁰ Durban saw its future as an industrial city. In the post-war planning of the city and in the subsequent demarcation of 'group areas' in line with the Group Areas Act promulgated in 1950 by the newly elected apartheid government, a series of residential areas was planned around the productive zone to supply labour for this emerging industrial zone. Within this South Durban area, Merebank was zoned for Indian occupation while the Wentworth/Austerville area was demarcated for occupation by people of mixed race. (Note that in the lived experience of residents, there is no sharp distinction between 'Wentworth' and 'Austerville', although Austerville is often used to refer to the poorer area of Wentworth). African townships had already been set up in the adjacent area of Lamontville, while on the eastern side, the Bluff was zoned for White people.

In his research on the history of environmental regulation in Durban, Sparks^{31,32} traces post-war struggles over the siting of petroleum industries in the city. The American-owned Standard Vacuum (Stanvac) oil company located its refinery at Wentworth

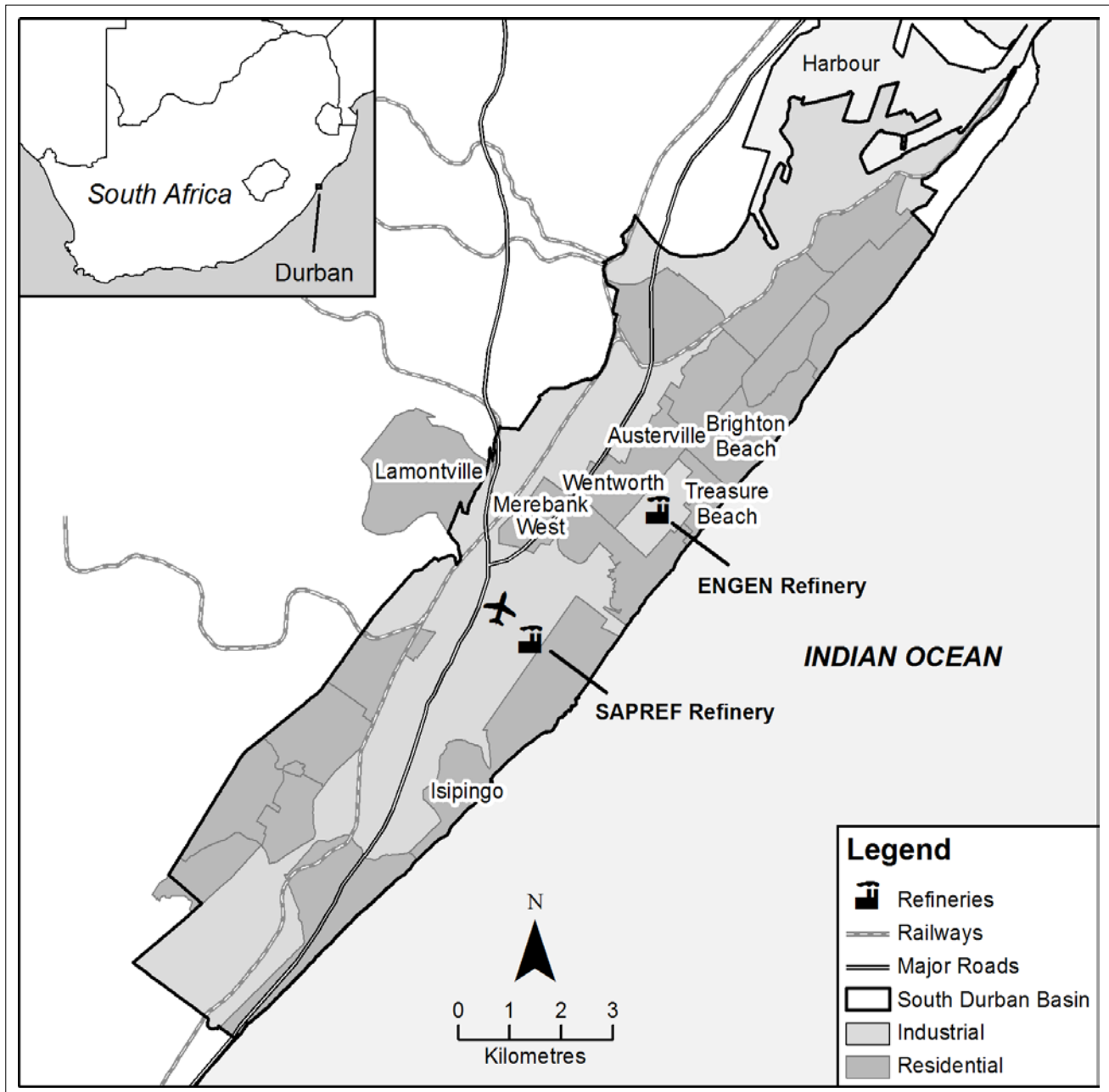


FIGURE 1
Details of the areas where interviewed residents of the South Durban Industrial Basin reside

in the 1950s (Figure 1), giving South Africa its first experience of domestic petroleum refining. In the 1960s, Shell Oil applied to locate a refinery in Durban Bay. Based on the Stanvac experience, the Durban municipality knew that, despite the assurances of engineers, petroleum refineries inevitably would produce significant amounts of pollution. They therefore reacted with caution to the proposal. Sparks³¹ traced the subsequent tussle between competing interests, those of 'the central apartheid state, the local municipal state, international petro-capital and local communities living in the vicinity of the refineries'.

The outcome was that the new Shell Oil refinery was relocated from Durban Bay to Isipingo in the South Durban Basin. It was noted at the time that strict pollution controls needed to be put in place because of the 'large Indian and Coloured Housing Estates [which] are being erected in close proximity to the proposed site' (at Merebank and Wentworth).³¹ However, it would not be cynical to doubt the commitment of Durban's White-dominated city administration to ensuring the enforcement of such controls.

Since the 1960s, in addition to housing two of South Africa's four oil refineries (today owned by ENGEN and SAPREF), the South Durban Industrial Basin has also attracted other sectors of industry including pulp and paper (the Mondi plant), beverages, textiles, plastics, and motor vehicle industries. 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.

The process of industrial expansion in the South Durban Basin generated local resistance. In 1996, air pollution became the key focus of resistance as a diverse group of individuals and community organisations came together to form the South Durban Community Environmental Alliance (SDCEA). SDCEA, an alliance of 14 civic and residents' associations, practises a brand of environmental activism that draws on experiences of anti-apartheid social protests to mobilise the communities in South Durban across race and class lines.^{14,16,33,34,35} The work of SDCEA under its chairperson Desmond D'sa, has attained

international prominence.¹⁶ Communities have also organised around the issue of relocation, rejecting suggestions that the solution would be to move residents out of South Durban and relocate them elsewhere. Residents of South Durban thus live in a context in which they are exposed to chronic environmental hazards (such as pollution) and, at times, acute environmental hazards (such as industrial accidents).

Understandably, conventional risk assessment work in South Durban has focused on documenting and managing the industrial pollution risks posed by this environment. A large body of research on this topic now exists, some of it undertaken by bodies such as the Council for Scientific and Industrial Research (CSIR), a parastatal research organisation.^{3,4,5,6,7,36,37,38,39,40} The industrial risk narrative also dominates the activism of the SDCEA, which has made strategic use of scientific knowledge to try to mobilise local communities against large industrial interests as well as the local state.^{34,35} This research tries to approach the issue from a different angle – one sensitive to the lived experience of residents of South Durban, and one that tries to open up the question of lay knowledge of environmental risk so as to reveal a more complex riskscape.

METHODOLOGICAL APPROACH

Most qualitative research methodologies focus on entering, as far as possible, the lifeworlds of those involved in the research. The philosophical approach taken to knowledge construction in such research is the assumption that 'social reality' does not exist as an exterior object. Rather, the social world is 'seen as a subjectively lived construct' and it is this constructed or lived reality that qualitative methodologies attempt to understand.²³ Instead of attempting to extract 'hard facts' from research participants or interviewees, the aim of qualitative research is to probe how people themselves construct their world and their experiences. Mottier⁴¹ expresses it as follows:

Interpretive perspectives consequently abandon claims to objectivity[,] to emphasize instead the reflexive nature of the research process and the subjective nature of constructions of meaning, both by the research subjects and by the researcher.

This interpretive approach can perhaps be better understood if it is contrasted with the assumptions of positivist social science. In positivist research methodologies, 'the nature of the collected data [is] seen as relatively unproblematic ... the produced data are seen as objective observations of external reality and independent from the researcher'.⁴¹ In positivist research, the researcher sets the research agenda and channels the responses into pre-existing conceptual categories. There is little or no acknowledgement of the mutually constituted nature of knowledge, or of the dominant role of the researcher in shaping the research agenda. Language itself – the way people choose to express themselves – is of little importance in this approach. In contrast, qualitative methodological approaches acknowledge that shared meanings are constructed through language and that language is of primary importance in shaping and transmitting these meanings. People's 'thoughts, feelings and experiences are products of systems of meaning that exist at a social level'⁴¹ and social realities are inevitably framed through language.

We argue that adopting a qualitative and reflexive approach, in the context of research on environmental risk, opens up the subject in ways that extend beyond the reach of standard (positivist) research techniques. Instead of approaching research participants with a structured research tool, 11 in-depth interviews undertaken in South Durban during October and November 2008 were conducted as semi-structured conversations in which the researcher raised general questions around the topic of risk; interviewees were allowed to take the interview in the direction they wished (Table 1). The interviews were taped and later transcribed with the agreement of the interviewees to ensure that close attention could be paid to the

TABLE 1
List of respondents

Respondents	Location in South Durban	Date of interview	Description
Respondent 1	Lamontville	29 October 2008	Female: A 62-year-old African woman who has lived in the area for 60 years with her friends and family. She has lost family members to political violence and to HIV.
Respondent 2	Lamontville	29 October 2008	Female: A woman who has lived in the area for almost 80 years.
Respondent 3	Lamontville	29 October 2008	Male: An 80-year-old man living in an old-age home. He arrived in Lamontville in 1936 as a 7-year-old, travelled extensively and returned to the area 4 years ago.
Respondent 4	Wentworth/Austerville	20 October 2008	Female: A 36-year-old, unemployed, single mother of two boys, the eldest of whom is 14. She came to the area in the 1980s as a teen. Her household then consisted of 10 people and was allocated the same one-room council flat in which she currently resides.
Respondent 5	Wentworth/Austerville	10 November 2008	Male: A 66-year-old artisan who arrived in Wentworth at the age of 17 in 1960 during the period when White people were still being moved out of the area. As a skilled worker who has had relatively stable employment, he is a 'privileged' member of this community. He has lived in this council flat for the last 17 years.
Respondent 6	Merebank	13 November 2008	Female: A 40-year-old woman, married with two children, the eldest of whom is 19. She has owned and lived in her current house for 10 years but has lived in the area her entire life; her mother lives nearby.
Respondent 7	Merebank	12 November 2008	Male: A 58-year-old retired policeman who took an early retirement package in 1999. He is married and has adult children. He has owned and lived in his house for 28 years.
Respondent 8	Treasure Beach (former resident of Wentworth)	29 October 2008	Female: A 50-year-old woman who runs an engineering business with her husband (from home). She has adult children and appears to have at least one grandchild. She was born in Wentworth and has owned and lived in this Treasure Beach house for the past 21 years.
Respondent 9	Treasure Beach (former resident of Wentworth)	17 November 2008	Male: An engineer in his 50s, married with adult children who have left home. He has lived in Wentworth for 40 years; 26 years ago he bought a plot in Treasure Beach from the City Council and built the house he has been living in ever since.
Respondent 10	Brighton Beach	16 November 2008	Female: A woman who moved from Johannesburg to the Bluff in 1974. She bought a house in 1978 and has lived there ever since. She is married and appears to have adult children.
Respondent 11	Brighton Beach	12 November 2008	Male: A retired industrial sales representative, originally from Gauteng, who has owned and lived in the same house in Brighton Beach for 28 years. He runs a Bed & Breakfast from home with his wife. They have adult children in their late 30s, one living in the area and the other overseas.

ways in which participants were creating the meaning of risk in the context of South Durban.

While the research participants are not regarded as in any way constituting a statistically meaningful sample, an attempt was made to ensure that respondents from all the former 'group areas' in South Durban were included (Table 1). South Durban is a place with a high degree of social heterogeneity. Although the communities are spatially proximate, there are also vast socio-economic differences between different neighbourhoods. The research was conducted in a broad transect from Lamontville, Merebank, Wentworth/Austerville, and Treasure Beach to Brighton Beach (Figure 1). The intention was to interview one male and one female respondent living in each of these areas. While civic organisations such as the SDCEA assisted in suggesting possible contacts, it was made clear that respondents needed to be 'ordinary' people, not necessarily those engaged in community activism. The history and nature of environmental activism in South Durban has been dealt with in detail elsewhere^{14,33,34}; our aim was to gain a better understanding of the lived riskscapes of ordinary residents. The other criterion for the selection of respondents was that people should have lived in South Durban for at least 20 years.

RESULTS AND DISCUSSION

In line with the qualitative methodology adopted, the use of substantial extracts from the interview transcripts provides insight into the lifeworlds of the respondents and their personal constructions of risk. It should be noted that the socially mediated risks discussed here range from risks that are not dangerous, but more of an irritation, to those that are indeed potentially life-threatening.

Normalising risk and staying in place

The Swedish scholar Soneryd⁴² used qualitative research techniques to explore what she called the 'soundscape' of people living in close proximity to an airport. Residents, she showed, automatically distinguish between so-called 'keynote' sounds and 'signal' sounds. Keynote sounds are there all the time and become normalised – residents will notice the sound's absence rather than its presence. Signal sounds, on the other hand, are unusual, out of place, and demand attention. Soneryd's concepts have been applied here to the analysis of constructions of risk in South Durban, as they help to reveal what becomes normalised and what is understood as 'immediately dangerous'.

At the time this research was conducted, an airport formed part of the 'soundscape' of South Durban and its presence intruded into many of the interviews, making conversation difficult for some minutes, due to low-flying aircraft. People living near the airport appeared to respond in a similar way to that noted by Soneryd: the airport's keynote sounds became normalised and part of everyday life. The airport was due to move to a new site north of Durban. Respondent 4 was asked how she felt about being 'released' from the airport noise:

Q: How do you feel about being released from the airport noise?

A: *I'll miss the aeroplanes which we gotten so used to but I'd be happy*

Q: Are you joking about the aeroplanes, or...?

A: *No I'm serious. I mean ... this is a sound you hear, like all the time. You grow so accustomed to it. You know what time, which plane is moving which direction. You get to a stage when you've been at home so long and you actually start timing them. You know, ok this one's going to Jo'burg [laughs], this one's going to Cape Town. But if they ever go, I mean if that kind of sound were to disappear, you kind of, you'll miss it. It's things, it's stuff like that you get used to.*

Ongoing noise pollution is woven into the fabric of everyday experience in South Durban and residents have largely become resigned to it, although they do complain about the cumulative stressful impact. One resident, Respondent 7, who lives opposite

a refinery commented on the impact of noise on his sleep patterns:

With the air traffic it's every day. The trucks it's every day. And this pressure releasing it's every day ... That's pressure releasing... there are times they release even more, so it's a louder noise ... But at night. When the trucks come at night. There is no such thing as we getting used to that. And then what makes it worse now, and I have tried speaking to the people here, I think the guys work shifts and the guys coming here at midnight and four in the morning and they are hooting at the gate to be opened. And that is when, you know you have a good sleep and, 'Babap! babap!' and continuous until somebody comes ... It's both these companies that's opposite us, it's a 24-hour operation. And air traffic is 24-hour operation. And the refineries is 24-hour operation. So there's no respite for us.

Noise is, however, also a signal sound as residents live in fear of industrial explosions and accidents, and any sudden noise that differed from the keynote sounds was described as a stressful event.⁴³ Noise therefore plays an important role in the construction of risk and its resulting social impacts in the South Durban Basin.

The soundscape forms part of the broader riskscape experienced through all the senses. In addition to sounds, it is visual cues (such as smokestacks emitting smoke) and smells that constitute the keynotes and signals that frame residents' concepts of risk. Many visual cues and smells become normalised, although residents worry about the short-term and long-term health impacts of these environmental hazards. Most respondents reported smelling the pollution which, in their experience, was a warning that those that suffer from asthma would become ill. Although significant action has been taken by social groups in South Durban against air pollution, residents, reluctantly, are resigned to its ongoing presence. Respondent 7 stated:

God willing if it can happen, these big companies must move away from the residential area. I mean look how close we are to them! We are surrounded by ENGEN on this side, SAPREF on this side. Mondi's at the bottom. So whichever way the wind blows we are going to get something.

Respondent 4 felt that solutions to the problem were limited. She suggested that industry be made to pay compensation for subjecting people to these health risks:

Also jeez, the pollution, that's one thing we have to sort out is the pollution there, like all these factories and a lot of people get sick. And also like, because there's nothing much we can do, we're not going to be able to chuck the - take those people away. Like ENGEN, we can't remove them. So like, if people get sick and stuff they should be able to be compensated for their medical bills 'cause there's a lot of asthma going on around there and other local diseases.

Residents see the smoke emerging from factory chimneys during the day and night and read this as a signal that the air pollution will impact on them. In response to a question about 'the most scary thing' in his environment, Respondent 7 emphasised these strong visual signals:

The most scary thing? If we take the pollution coming from those chimneys ... The ENGEN, the SAPREF and the one here [gestures at the factory across the road]. It's just thick, black smoke... It's like soot you know, it's just like soot.

For residents of South Durban, personal histories are made and lived against a background of what can be thought of as partially normalised risk. However, when a sudden shock or 'signal' event intrudes, with the risk being experienced as acute and life-threatening, fear is heightened for a while as residents seek to incorporate the experience into their ongoing lived experience of place. Such a signal event can be experienced through sound, smell, or visual cues such as smoke and flames from a fire.

A signal event relating to the airport occurred in September 2009, when an aircraft was forced to crash-land in the playing field of a secondary school in Merebank. Fortunately, it was a public holiday and there were no classes that day. According to

the local newspaper, Merebank residents flocked to the crash site, 'cameras and cellphone cameras in hand' to get shots of the damaged aircraft. The area was cordoned off by police. People 'stood in groups and talked about their "close call", with "what-if" scenarios dominating conversations'⁴⁴.

The sudden occurrence of an acute risk event clearly brought a sharpened awareness of the risks posed by the presence of an airport in close proximity to residential areas and adjacent industrial complexes. The plane crashed less than a kilometre from the Mondi Paper Mill and the ENGEN Refinery. Des D'Sa was reported as stating:

We are concerned about risk assessment at the refinery, which does not take into consideration incidents of this nature. Imagine if that plane had gone into the [ENGEN] refinery or Mondi – thousands of people may have been killed. The entire area would have gone up in flames ... The refinery has said in its risk assessment that this kind of thing will never happen and the city has agreed, but this incident proves that it can happen. This accident proves that we have to take steps to guard against this danger.⁴⁴

In the case of industrial accidents, air pollution may go beyond being a nuisance factor and become an acute hazard. In the interview with Respondent 7, he vividly described a crisis event that occurred in his neighbourhood in 2003:

A: *Immediately after, we had – what is it – SO₂, is it? Sulphur dioxide actually came out of the company. What had happened, they said some valve didn't shut down and it came in. And it was terrible ... we were all rushed to hospitals and treated.*

Q: What were the symptoms?

A: *Firstly it was a choking sensation. It's like, you trying to take dust down and you know, like burning in the nostrils and the throat and nauseous feelings ... you just couldn't breathe, all we had to do was get everybody indoors ... I tried to get the Health Department and in the meantime the wife pressed the panic alarm and, thank god she did that because within no time, when they called back, the wife said, 'this is what's the problem' and they were here with oxygen tanks, the works ... We all had to go to hospital. We all went for treatment and then we had to keep going for repetitive treatments ... That was the worse scare that we had here ... You know we actually wanted to pursue it but, I told the wife, I said leave it.*

The question arises as to why people remain in such an environment and why they live with the normalised risk and nuisance, in fear of acute hazardous events occurring. The answer is complex and multi-layered. Moving towards understanding involves engaging with the way people construct meaning in such living environments, a process also influenced by the trade-offs made between environmental and socio-economic factors. According to Soneryd,⁴² citizens perceive and respond to both chronic and acute risk in terms of their broader experiential and synthetic knowledge about the place they live in, together with their expectations with regard to quality of life and their sense of political empowerment. Another factor is the level of confidence they have in the management of the impacts to which they are exposed.

In South Durban, some respondents have clearly traded off the environmental hazards in the area against their desire to maintain social connections, family ties, histories and support systems. In the words of Respondent 5:

A: *I've seen this area grow up around me from three to four houses to becoming a community. So I've seen people come from all walks of life ... all coming and building around me. I've seen this area developing around me, so that's what I really like about it, it's that I've been here from the time it started... Nobody wants to move out. No-one. Neither would I. Even if I won the Lotto.*

Q: Why is that?

A: *The place grows on you. Here I can be myself. I look at events and things and say, you know, come on! You go somewhere else and people don't even know their neighbours! ... Here you know everybody... [Elsewhere] people just don't know one another and*

they're not interested... I want, when I leave here, the people must say, 'Ay, one thing, ay that bally [old person] there, come on, we miss him'.

Other residents stay out of necessity. They say they might consider moving away if they could, but for economic reasons they are unable to relocate. In the impoverished community of Wentworth/Austerville, some residents have managed to purchase their flats as part of the municipal housing policy to ensure access to housing in the area, which, however, ties them even more closely to the area. At the other end of the spectrum, middle-income homeowners in Merebank and Treasure Beach stay because they have over-capitalised on their properties and fear they will not be able to sell for a good price. Respondent 7, a Merebank resident, explained:

It was a council house. Then, I mean, to improve we had to take bond loans... I added a floor and did some changes at the bottom ... I broke the wall and made the kitchen bigger. Well, look, finance-wise ... I won't actually improve now, because if I do happen to put it on the market there's no value. Though the prices of houses are quite high, but because of what's going on in our area it's difficult to get the asking price.

In the case of the South Durban respondents cited above, there is a strong sense that little can be done to change the situation. Respondent 7 and his wife decided to 'leave it' after the incident relating to uncontrolled emissions of sulphur dioxide, instead of pursuing action against the company that had been at fault. Respondent 4 felt 'there's nothing much we can do'. Her argument that compensation should be paid by the companies to the communities for the health costs incurred by air pollution has been part of the ongoing debate between community groups, the state and industry in the area. However, it has always been very difficult to prove conclusively causal relationships between health and industrial pollution in South Durban, using exposure analysis and environmental epidemiology – even though other scientific research and lay knowledge reveals a strong relationship. In addition, the enforcement mechanisms at national and local level are relatively weak.

The further question of whether the respondents feel confident in the management tools employed to protect them, and how they regard the promises of effective scientific management in this context, is the focus of the next section.

'Give us the facts': science and public trust

From the interviews, it appears that a belief in the power of science to alleviate or resolve the environmental problems, and confidence in the efficacy of technical management tools or existing risk assessment practices, plays little or no role in respondents' decisions to stay in South Durban. On the contrary: the qualitative interviews reflected some scepticism about science and scientists and an entrenched mistrust of the 'powers that be' and their efforts to put in place protective or remedial measures.

Several interviewees had started out with the hope that better scientific information and monitoring tools could be used to improve the living environment. They had responded to calls by environmental groups like the SDCEA and also the eThekweni municipality, which is responsible for administering the greater Durban area, to proactively report incidents. They are now disillusioned. One resident, located in the more upmarket neighbourhood of Treasure Beach, said that his efforts to report pollution incidents elicited only a defensive reaction from the nearby ENGEN refinery: 'When he phones them with complaints (e.g. soot and sulphur stains which ruin his washing, yellow spots on cars, stained tiling, unexplained bangs in the night), he is told to provide proof that it is the refinery' (from notes on the interview with Respondent 9).

Several residents felt that both industry and the eThekweni municipality often try to pacify residents by underplaying the chronic risks, while reacting only to sudden acute risk events.

When asked whether she thought the municipality and industry understood the residents' point of view, Respondent 8, a Treasure Beach resident, answered as follows:

A: *Well they understand, but they usually – that's the other thing, they usually have their meetings after a crisis in the area, you know? So there's never [a response], like, unless people are screaming about it, then they respond to those screams so to speak.*

Q: Do you think meetings reduce risks?

A: *Well, they just quiet the people's screams for that time as far as I'm concerned.*

According to Respondent 4, the municipality is ineffective and reporting problems achieves nothing:

You know the municipality always - they say [they] help where they can with the pollution problem and, I think the municipality should focus on the people ... They should deal with these polluters. They should be fined ... They keep saying they got some strategy and, you know, there was meant to be a certain percent of emissions at certain times and blah blah blah and we've got this toll free number where you call in case you get the - you know, when the smell comes up. You'll sit for hours on hold ... I know it's call centres, there's different people, blah blah blah, but they should monitor them ... if they really want people to believe that they're helping them, you know?

Residents feel that they do not get enough information on environmental risks. A Treasure Beach resident, whose house is about 200 m from the ENGEN refinery, spoke about an acute event (a fire) that occurred in November 2007 and which necessitated that residents be evacuated from their houses. He is disappointed with the lack of contact and feedback from the refinery. At one point, he received a pamphlet which stated that ENGEN was going to send out somebody to talk to the residents, but no one arrived; he initially thought the researcher for this project was a representative from ENGEN. He feels there has been no response to residents in the immediate vicinity of the refinery and has little faith in impacts from ENGEN being controlled in the future (notes from interview with Respondent 9).

Hexavalent chromium, or chromium-6, a toxic chemical produced by several industrial processes and known to be carcinogenic, was found in the groundwater in Merebank. The eThekweni municipality and Bayer/LANXESS, the company responsible for the contamination by chromium-6, released statements to the press in November 2004.⁴⁵ They acknowledged that chromium-6 had been discovered six months previously by municipal workers installing water meters. Under pressure from the environmental action group SDCEA, the municipality responded by replacing the water pipes in Merebank and the city health department engaged a scientist to review the problem. The relationship between scientists and the public is mediated through the municipality, which generally commissions the scientific studies and whose responsibility it is to put into effect the management actions that scientists recommend. This relationship undoubtedly contributes to the problem of a declining faith in the ability of science to provide answers to the serious problems residents face.

Respondent 7, a Merebank resident, explained that he had been concerned as to whether the fruit trees in his garden were affected and did not know whether it was safe to eat the fruit. Unusually, Respondent 7 had a direct interaction with a scientist, and was not happy with the outcome: 'There was one professor who came and he took the fruits, I don't know what was the results'. There was a lack of feedback to residents. The respondent was also unhappy with assurances from the municipal authorities that his family had not been poisoned through their drinking water. Perhaps as a kind of insurance policy, he kept all the newspaper cuttings relating to the chromium-6 incident:

I've got all my cuttings, you know, I've got them all, where we had [chromium-6] - when they took out the pipes and it was exposed and we could see it was yellow on the inside. Because it was porous

pipes, asbestos pipes are porous, but they still say, no, the drinking water was safe.

This respondent's interaction with scientists and officials from the municipality, his personal observations, and his reading of media reports on the matter led him to distrust scientists and policy makers. His reaction is indicative of the limited trust that exists between 'ordinary' residents and officials and scientists involved with risk assessment and alleviation.

In June 2007, Bayer/LANXESS announced a R50-million remediation plan to pump and treat the toxic chemical that had polluted the groundwater under dozens of Merebank homes. This remediation is expected to take more than 10 years. Public reaction to the plan was mixed.⁴⁶ Respondent 7 has little or no confidence that the problem has actually been solved and he remains suspicious of industry's intentions:

Where I'm living is approximately 25, 30 metres from the main entrance of the LANXESS factory. Now the LANXESS factory at that time was known as Bayer. Previous to that it was known as Chrome Chemical. So they just went about changing names, and we had no knowledge that this company was actually manufacturing Chrome 6. And I believe that's a deadly chemical ... And we have got it in the ground at the moment, as we speak we have got it in the ground.

When asked whether he was satisfied with the environmental management systems now in place, Respondent 7 expressed strong feelings of frustration, confusion and distrust. He had been made to feel that, as a 'layman', he had nothing to contribute: the world of science was a confusing mystery to him. The information he had been able to access was from newspaper reports and feedback from the workers installing the pipes. He also remained unclear about the actual implications of the chromium-6 problem and felt that residents were being asked to take industry and the municipality at their word that the chromium-6 incident and other environmental hazards were under control:

Because when they went to ENGEN, then they said they gonna put some other safety valves and ... I don't know what terms they used, you know with all this, I don't know if it's the lead that's coming out, or the sulphur that's coming out or ... I think that's way out of my league. I'm the layman. A person that has got the knowledge about what he's working with when it comes to chemicals etcetera; a layman won't know the terms. The only way he will be able to understand is if he [the expert] comes down to the layman's level and explains it to him ... He's got to do that and tell us that. When he says Chrome 6, what does it mean? I don't know. OK, if he tells, chrome is this and this and this, what the effects of Chrome 6 [are], you know, whether it's contamination, inhalation, or whether you – you know, [get it] onto your body, or whether you ingest it. Give us the facts.

If, as Soneryd argues, one of the factors influencing people's responses to living with environmental risk is the confidence they have in the way these problems are being managed, it seems that the technical management tools employed by industry and the municipality do not inspire confidence and play little or no part in the respondents' decisions to stay in South Durban. Part of the reason is ineffective communication, a disconnect between the understanding of experts and that of residents regarding the issues at stake. Research elsewhere has shown that public confidence in science is easily eroded, especially in a context where there is little real engagement with 'ordinary' people.^{18,19,20,21} Reliance on technical management tools, to the exclusion of a more humanistic approach, together with a lack of follow-up may have contributed to this situation in South Durban.

Another reason for disillusionment appears to be the sense among residents that the whole issue of risk assessment and remediation has become caught up in local politics. The environmental civic organisation and other actors, including industry and the local authority, have selectively used science to

drive their own agendas. People are less willing than they were to engage actively with the issues. As Respondent 4 noted, she is not involved at present, although she used to be in the past and will not become involved again 'until they stop their in-house fightings and ... politics'. She is, however, prepared to attend meetings as an observer, 'like at ENGEN, I still get invited, I sit in, listen'. As noted earlier, it is imperative that scientists understand the social context in which the knowledge they produce will be used.

Widening the frame: hidden narratives of risk

Industrial pollution is the dominant and well-established risk narrative of South Durban. However, as this research suggests and as a further study conducted in the area in 2008⁴⁷ confirms, the riskscape is far more complex.

When asked what she would identify as being the 'most scary thing' in her environment, Respondent 1, an elderly woman living in Lamontville, said she would:

[... T]ake a photo of the scary road where the criminals pickpocket people while they are waiting for transport. [...] Another photo would be of the boys who take pensions from old people and use the money to buy drugs. The last photo would be of those youngsters who fight old people or their parents if they need the money for drugs or alcohol.

Respondent 3, an elderly man also residing in Lamontville, said that he would photograph the narrow lanes outside the seniors' home where he lives (which has electric fencing, a security guard and an electric gate). He would photograph the 'boys' who 'prowl around like tigers' stealing from people and stabbing them. These images are rather different from the emblematic South Durban image of a factory chimney emitting pollution.

In addition to the evident loss of faith in science, emerging from the qualitative interviews is the sense that scientifically based management tools and processes may have focused too narrowly on one dominant construction of risk – industrial risk – and that other serious, everyday risks forming a major part of residents' everyday experiences are not recognised. This finding resonates strongly with the findings of critical risk assessment work in other African cities.²⁹ Industrial risks clearly are present and have serious consequences for people living in South Durban, but the qualitative research suggests that these are not the only risks constituting residents' lived riskscape. Alternative or additional narratives of risk, it seems, have been obscured by the dominance of one narrative, that of industrial risk.

This obscuration is a source of frustration for many of the respondents, who would like other issues to be aired and to receive attention. Respondent 5 put it this way:

[...A]ll these other organisations, the Des D'sa's, OK, we fight for pollution everyday. The pollution's been there for the past 50 odd years, you know? Now we've got real issues, ongoing issues that need to be highlighted, that they need to like work on top of. I'm not saying put all those other issues aside but like they need to wake up and really see that this [drug] problem's really, it's really big, I see it everyday. I talk to kids, I see it, I know everything that happens around here.

It is easy to see how technical risk assessment tools might reinforce and reassert the powerful narrative of South Durban residents at risk due to industrial pollution. Representations of South Durban put forward by community environmental groups and the media have reinscribed the industrial risk narrative to the point where it is difficult for outsiders to view the area in any other way. This dominant framing of the question has, however, resulted in other environmental and everyday risks being hidden from view, despite the fact that they exist very strongly in the minds and daily lives of those who live in the area. Risks associated with drugs, crime and an uncontrolled youth emerge strongly from the interviews, but are currently not widely recognised as part of the area's riskscape.

Drugs can be regarded as both a chronic and an acute risk in terms of how their impacts play out. The drug problem in South

Durban generates sensational events that elicit the same shocked response generated by large-scale fires and explosions from industry. Respondent 4, who lives in a poor area of Wentworth/Austerville, was vocal on this point:

I mean all this drug thing – just last week ... we got a 10-year-old that's walking around that just got shot. A friend of mine's son. By a drug dealer, on his leg and another guy got shot on his arm. This guy [was] just like shooting randomly. It was the first incidence we've ever had of people coming around with guns and want to be acting that way in our area. It's gone out of control ... The children... This year it's just spiralled. It's not just 'rock' [cocaine], there's this new 'sugars' drug [a heroin derivative mixed with cocaine] that just like – everybody's like, young people, older people, mothers seen crying over 'rock'. It's scary to see what's happening within the community you know?

Residents from the poor neighbourhood of Woodstock in Wentworth/Austerville feel that the municipality and political representatives do not understand or care about their situation and the serious risks they face, from the presence of drugs in particular. They feel marginalised and ignored. Respondent 5 had the following to say:

A: *The councillor is aware of any project that is going on, like you know, or workshops that is being run or whatever, whatever the government, you know, is planning. But the councillor doesn't filter it down to the people. Then we hear on the by the way that there's something and a few people know about it and they go, and they keep it a secret.*

Q: *Why would they keep it a secret?*

A: *I don't know. It's not like they're keeping it a secret but maybe, you know, they tell their friends, so you're not - Woodstock, who's gonna come and tell people in Woodstock? 'All those riff-raffs.' So we're considered to be like, the scum of Wentworth.*

Q: *So do you think the municipality understands these risks?*

A: *I don't think they are even aware of it.*

Crime is a serious problem in South Africa. It has become pervasive and it impacts on many aspects of people's lives and well-being. Crime was raised by all the South Durban respondents as a critical issue to be addressed. Many residents felt that they did not have the means to tackle the problem because they did not trust the police, and because crime was driven by drug lords and unruly young people who could not be controlled by parents or schools. Parents are afraid to report their own children who are involved in crime and drugs to the police. Respondent 1, a Lamontville resident, was the first and last woman taxi owner in this township. Crime has affected her ability to work. In the past she was able to operate safely on her own, even at night, but now she can no longer do so.

The following statement from Respondent 5, a resident of Wentworth/Austerville, typifies the acute risk posed by violent crime:

When people come shooting here ... our children are right there! And they carry on shooting regardless. And it's very, very scary ... It happens a lot. Nearly every weekend. Touch wood, this weekend it never happened. You see the tree over here. I had to chop the tree down ... because the bullet hit the tree, they were shooting over there and the bullet hit the tree, ricocheted and went to my neighbour and landed on my neighbour's door ... So that's how close ... So there's a man putting his house up for sale because most of the boys stand in the corner there, when they start shooting they're shooting into his yard ... He just bought the house and he says, 'Hey, I can't live here, got to get out! My children!'

Social cohesion within the communities in South Durban is being challenged.⁴⁷ There is a strong sense that in the post-apartheid period, society has begun to fall apart; that social ills have multiplied and a sense of community is being lost. There is a new sense that people are just looking after themselves, rendering the taking of community action more difficult.

This perception is true not only for those living in the poorer parts of South Durban but also for Respondent 8, living a more middle-class lifestyle in Treasure Beach. Ironically, her attempt

to block out the noisy environment of South Durban has cut her off from her neighbours and made her feel even more vulnerable to crime:

You know, this area, this particular area is such that if I died in this house now and none of my family were here, when they came – whenever that would be – they would find me dead in the house, because I could scream, nobody would hear me. And the reason for that is because we have practically tried to keep the sound outside out there as much as possible. So in that way you keep your screams in, if you need to, you know?

It is in fact the 'hidden', everyday risks together with the industrial risk narrative that dominate people's lives in South Durban. This cumulative health and social risk might eventually push some of the residents to the point of relocating, should that be possible. Respondent 4 expressed this meaningfully:

The only reason why I would move out of South Durban? I love Wentworth, it's been a home to a lot of people ... I think just the pollution and the noise, and also for a safer environment for my children. 'Cause it's not just the noise and pollution, it's the drugs, you know? You don't want to grow up kids in a place like that especially when you're a single parent and a mother only and there's no father figure to be stern. It's scary.

CONCLUSION

We have argued that risk needs to be explored continually, and assessed using not only conventional scientific knowledge and methodologies, but also lay knowledge and perspectives from the social sciences. In a context like South Durban, where there is a strong dominant narrative of risk, it is crucial that a more open-ended approach be taken, one that starts from the assumption that risk is socially constructed by lay people, as well as by scientists. Qualitative research amongst South Durban residents presented in this paper has drawn attention to residents' lived responses to chronic and acute risk, to the widening gulf between their own experiences and the claims of science and risk management experts, and to the existence of currently hidden, often everyday, risk narratives that are not related directly to environmental hazards emanating from industry. These findings resonate with the findings of other researchers working on risk in African cities. They also highlight shortcomings in local-level risk governance; failures that, as pointed out by the International Risk Governance Council,⁴⁸ are all too common in this field.

The findings also speak in interesting ways to emerging debates on contemporary risk governance, adding to a growing consensus that, if the deficits in local and international risk governance regimes are to be addressed, more socially nuanced risk assessment methodologies need to be employed in the complex field of risk management. A greater effort needs to be made to integrate perspectives, insights and methodologies from both the social and natural sciences. We support Renn's¹² contention that the inclusion of a social science perspective 'broadens the scope of undesirable effects, includes other ways of expressing possibilities and likelihoods, and expands the horizon of risk outcomes by referring to "socially constructed" or "socially mediated" realities'. In the case of South Durban, such an approach would allow scientists to reconceptualise the South Durban riskscape in a more reflexive way and, it is hoped, open up a more effective dialogue between experts involved in risk assessment and remediation, and the people whose lives their research and recommendations affect.

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