

IMPLICATIONS OF ENVIRONMENTAL

RISK IN A DIVIDED SOCIETY:

The Case of Acid Mine Drainage on the West Rand, South Africa,
as an Example of a Risk Society

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DECLARATION

I declare that this is my own unaided work. All references and borrowed ideas have been duly acknowledged. It is being submitted for the degree of *Masters of Arts, Development Studies, Graduate School of Humanities* at the University of Witwatersrand, Johannesburg, South Africa. None of the present work has been submitted previously, for any degree or examination in any other University.

SIGNATURE

DATE

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ACRONYMS

AMD:	Acid mine drainage
DMR:	Department of Mineral Resources
DWA:	Department of Water Affairs
EIA:	Environmental Impact Assessment
EMP:	Environmental Management Programs
GDARD:	Gauteng Department of Agriculture and Rural Development
MRPDA:	Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002)
NEMA:	National Environmental Management Act, 1998 (Act No 107 of 1998)
NGO:	Non-Governmental Organization
WUC:	Western Utilities Corporation

ABSTRACT

It is argued that in the wake of the increasing number and extent of industrially produced risks, modern societies are transforming into risk societies (Beck, 1992). The implication of risk for modern society is understood to render traditional institutions and instruments incapable of managing what essentially are the consequences of modernization. The acid mine drainage (AMD) currently decanting from an abandoned underground mine shaft on the West Rand of Gauteng is in many ways the epitome of the type of risks that define a risk society. Having engendered intense political debate due to the threat it poses to the environment and society and the uncertainty over how to manage it, the circumstance on the West Rand might be argued as representing a classic example of a risk society. Using an inductive research design, this study aims to examine the truth behind this statement and furthermore, to what degree a unique form of risk society might be emerging. Specifically, the concepts of organized irresponsibly and subpolitics are explored, as is the role of science. The findings suggest that on the one hand risk does have the predicted impact on institutional arrangements. However, due to certain unique factors within the South African context (e.g. weak state capacity and social inequality) it is evident that there is also potential for society to move deeper into a state of risk society. This is in contrast to the idea posited in Beck's theory that many societies facing the circumstances of risk society will, over time and necessarily, adequately respond to the risks by becoming reflexive. Indeed, if this is to be the case however, the strengthening of current civil society engagement at the political level and a greater institutional willingness for change are seen as the essential ingredients for a more reflexive approach to the risk of AMD.

CHAPTER 1 - INTRODUCTION

1.1 Introduction

Many sociological debates have sought to grasp and conceptualize the apparent change which modern society is undergoing. The idea that modern societies (i.e. industrial societies) are undergoing radical change and entering a stage of second modernity is put forward by the theory of reflexive modernization (Beck, 1994, see also Beck, et al, 2003). Here, change is characterized by the transformation of the key institutions (e.g. government, economy, law) and principles (e.g. linear progress) of modern society itself, as oppose to their just their superficial structures. This change is understood to be in reaction to the myriad of industrially produced environmental risks confronting contemporary society (Lee, 2008). Consequently, in the wake of the increasing number and extent of these risks, it is argued that on their way towards this second modernity, modern societies are also transforming into what Beck (1992) has described as risk societies. The theory of risk society is founded on the notion that due to the unique nature of the risks facing society today, the institutions of modern society are unable to cope with what essentially are the *accumulation* of the 'side-effects' of modernization. Specifically, it is argued that the state's ability to provide security for its citizens, science's ability to provide certainty and the ideology of economic progress are being undermined.

Indeed, like those that characterise a risk society, arguably the most significant environmental risk facing South Africa today is to a large extent the very consequence of its modernization. For over a century, exploitative mineral extraction, in the form of gold mining, has been the dominant industry across the Witwatersrand, playing a central role in the industrialization of the country as a whole. Subscribing to the logic of capital accumulation, this early gold-economy gave little consideration to its possible long-term adverse environmental and social impacts (Adler, et al, 2007). In turn, what were once simply 'side-effects', are today becoming recognized as significant environmental risks. The most manifest of these risks being the uncontrolled decant of contaminated mine-water- known as acid mine drainage (AMD) - from an abandoned underground mine void on the West Rand of the Witwatersrand. This AMD has proven to have had a devastating impact on the surrounding surface water systems in the area

and poses a significant threat to the associated environment and human health (Van Tonder and Coetzee, 2008, Adler, et al, 2007). Consequently, by virtue of the example given here, it can be argued that we are increasingly living in a risk society “that has to make decisions concerning its future under conditions of manufactured, self-inflicted insecurity” (Beck, 2009, p.8).

1.2 Contextual Application of the Risk Society Theory

The extensive political debate which the circumstance on the West Rand has engendered and the mounting evidence suggesting that controlling the AMD risk is beyond the capabilities of the current institutions, certainly does hint at the emergence of a risk society. However, to associate the situation that is currently unfolding (and has been since 2002) with that of a risk society would be premature. Specifically, two points are necessary to expand upon before establishing how the theory is applicable and relates to the context of the AMD risk. Firstly, risk society analyses the transformation of modern industrial societies. Although South Africa is an emerging economy and cannot be classified as a developed country, it can still be regarded as a modern society. Essentially, South Africa has all the fundamental institutional components (i.e. government; market economy; democracy) underpinning a modern society. For the purposes of this research then, at the structural level South Africa is understood to be the equivalent of the modern societies around which the theory of risk society is conceptualized. The importance of this point being that it demonstrates how the constructs of the risk society theory are relevant and applicable to the context of this research.

Another important consideration in terms of the risk society theory in the context of South Africa is the fundamental argument that the transformation from modern society to risk society is said to occur via a change in political discourse. The political debate and conflicts of industrial society were characterized by concern over the distribution of wealth (Beck, 1992). However, as “the struggle for one’s daily bread” (Beck, 1992, p.20) loses its urgency and society’s knowledge of its risk producing nature becomes more apparent, the focus of political debate and conflict begins to concern the distribution of risk. Thus, a defining characteristic of the transformation from being a modern society to being a risk society is the fact they become ‘risk-distributing’ societies, as opposed to

'wealth-distributing' societies. Indeed, while the recent Copenhagen Climate Change Conference (2009) is somewhat evident of this phenomenon, the focus of Beck's analysis is exclusively on the "welfare states of the West" (Beck, 1992, p.20). In contrast, this research concerns South Africa as an "emerging economy" (Fig, 2005) where *re*-distribution of wealth is the focus of political debate and conflict. At the same time however, environmental risk is a threatening social and political reality. Thus, the question as to the effect that risk may have on those societies which are still overwhelmed by a concern for the distribution of wealth, but also face increasing environmental risks, remains unaccounted for by the risk society theory. Consequently then, it is clear that further analysis is required in order to understand how the theory of risk society might explain what the risk of AMD means in the context of the West Rand. The aim of this research is therefore to determine the implications of an environmental risk beyond the original scope of the risk society theory.

1.3 Problem Statement

Modern societies have tended to "unfold themselves on the basis of a scientifically defined concept of rationality that emphasizes instrumental control...implying a belief that scientization can eventually perfect the control of nature" (Beck, et al, 2003 p.4-5). However, as modern societies become risk societies, the uncertainty which industrially produced environmental risks engender begins to reveal the fallibility of such assumptions. Most notably, the idea that science alone is able to explain and manage environmental problems is increasingly questioned. It is argued that in the age of risk society, society is forced to recognize the inherent subjectivity of the concept of risk. Environmental risks become problematic for modern society to deal with for the reason that they exist only in terms of the knowledge about them and are thus open to social definition and construction (Beck, 1992). While science is still seen to play an important role, it is criticized for not being able to provide insight into the ambiguous socio-political aspects of risk. Nonetheless, when faced with having to decide upon risk under conditions of uncertainty, society still tends to make decisions on the grounds of such reductive procedures that are accepting of quantitative utilitarian trade-offs and ignore the controversial socio-political problems of risk (Stirling, 2003). This means that what counts as potentially harmful is left up to the experts and the dominant institutional authorities (Beck, 1998). These decision-making processes are especially inappropriate

for the reason that those who decide are often not the ones most affected by the potential threats. In the case of the risk posed by AMD, this approach is even more inappropriate given the extreme social inequalities that characterize the country. As politics is left to decide upon the uncertainties of risk, it is inevitable that the decisions made will reflect dominant institutional interests. In this case those of government and the mining industry. In contrast, the rest of society (particularly those who are most vulnerable to the risk and who are also the most socially marginalized), is left to deal with the consequences of those decisions and uncertainties.

The problematic nature and implications of such decision-making processes are described in detail in this study, highlighting the cornerstone of Beck's theory in that all hitherto known instruments and institutions for tackling risk and threat are in fact incapable of doing so (Matten, 2004). In particular, the inability of economic principles and science to adequately manage the AMD risk is explored. At the same time though, while such analysis reveals similar insights to those proposed by Beck, it can be expected that certain unique insights shall also be gained. A further implication of risk for modern societies is seen to be a dynamic of political change where state bureaucracies are undermined and the battle-line of contemporary politics redrawn (Beck, 1998). In this sense, risks themselves are conceptualized as powerful uncontrollable actors that "delegitimize and destabilize state institutions with responsibilities for pollution control... and public safety" (Beck, 1998, p.17).

Before accepting this notion however, it must be considered that the political economy of South Africa is unique, in that it is engineered towards economic growth in order to address historic inequality by means of redistribution (Turton, 2009; Ndayi, 2009). In particular, the role of the mining industry in relation to society remains conceptualized almost exclusively in economic terms. Consequently, the mining industry's role as a facilitator of wealth-redistribution would seem difficult to unsettle on a broad scale, despite the significance of the threat posed by AMD. Thus, the relative force that risk may have in terms of seriously destabilizing or delegitimizing institutions can be expected to be markedly different to that experienced in the modern societies in which Beck situates his theory. Furthermore, the analysis of the AMD risk through this sociological lens also provides a means of generating new insights as to how risk implicates a society that is heavily divided along socio-economic lines. In this way,

unlike the welfare states of the West, risk cannot be expected to have the same leveling effect that Beck speaks of, whereby everyone is a potential victim. Therefore, while some consistencies have already been alluded to, a very much specific and unique pattern of risk society and trajectory towards a second modernity can be expected to emerge here (Crotty and Crane, 2004; Beck, 2000).

1.4 Research Scope and Direction (i.e. Methodology)

1.4.1 Research Design

The risk society theory is a widely acclaimed (and criticized) contribution to the discipline of sociology. As explained above, its insight is almost exclusively generated from analysis and experience within the context of what might be called the conventional model of developed countries. Unsurprisingly, the majority of Beck's work has been applied and tested within that context (e.g. Benn, 2004; Matten, 2004; Hogenboom, et al, 2000; Dingwall, 1999) in contrast to that of less developed or developing societies (Rinkevicius, 2000; Crotty and Crane, 2004). Therefore, in the case of South Africa which can be classified in a similar context, a unique opportunity exists to contribute to the theoretical insight and extend the theory's relevance. An endeavor which Beck himself encourages, explaining that "to situate the non-Western world firmly within the ambit of a second modernity (and that of a risk society)... allows a pluralization of modernity... (and) opens up space for the conceptualization of divergent trajectories of modernities in different parts of the world" (Beck, 2000, p.3).

As a result, an inductive (theory-building) approach to research design was undertaken using Yin's (2003) case study method. The subject of the case study was the AMD problem which originates on the West Rand area of Gauteng, South Africa. Indeed, because "case studies emphasize the rich, real-world context in which the phenomena occur" (Eisenhart and Graebner, 2007, p.25), environmental problems are fitting topics of investigation for the case study method. The method is also described as one which is "used in many situations to contribute to our knowledge of organizational, social, political, and related phenomena (Yin, 2003, p.1). Since this research is essentially an enquiry into the political and institutional issues surrounding a particular environmental problem, it is an ideal framework from which to portray those issues.

Yin (2003) notes that for case studies, four components are especially important in terms of the research design. These include: the study's question/s; its propositions; its units of analysis; logic for linking the data to the propositions. Having positioned the AMD risk, as the research subject, within the context of the risk society theory, each of these components are determined in relation to the theory itself. They are outlined below.

1.4.1.1 Research Questions

The case study method is deemed most appropriate for 'how' and 'why' questions (Yin, 2003). Essentially, the risk society theory is used to analyse the social, political and institutional consequences of the AMD risk in the context of West Rand. Thus the overarching research questions concerning this case study are as follows:

- How has the risk of Acid Mine Drainage impacted on the socio-political and institutional setting in which the environment is governed on the West Rand of Gauteng?
- How relevant is the risk society theory in conceptualising the nature and consequences of those impacts?

1.4.1.2 Theoretical Propositions

This research specifically employs the risk society theory (Beck, 1992) as an analytical and conceptual tool. As Matten (2004) notes, the theory of risk society can essentially be reduced to providing insight into two issues, 1) the inability of modern societies to cope with 'manufactured risks', and 2) the institutional innovation required in order to better manage those risks. Consequently, two theoretical propositions have been developed in relation to the case of AMD on the West Rand.

The first proposition concerns the question of how the knowledge generated concerning the risk of AMD has affected political and institutional dynamics. The first theoretical proposition thus claims that:

- The current institutional context of South Africa, particularly as it relates to the environment is unable to deal with the threat posed by the environmental risk of AMD, and in fact could be said to be a contributing factor to the production of risk.

The second proposition is based on the idea that institutional innovation is necessary to manage risk. This proposition relates to the question inquiring to what extent, and in what shape, political and institutional change is taking place as AMD and the risk it poses becomes more widely accepted and understood. Proposition two thus claims that:

- Over a period of time (which is variable and context dependent), as the environmental risk gains greater acceptance and understanding from multiple cultural perspectives, certain institutional transformations that encourage a more effective process of managing the risk will occur.

By stating these propositions in advance, attention can be directed to exactly what should be examined within the scope of the study (Yin, 2003). In this way, the research has been framed in such a manner that it is relevant to both the theory and context.

1.4.1.3 Units of Analysis

Determining the 'unit of analysis' refers to the process defining what the case is (Yin, 2003). For this study, the case is that of AMD on the West Rand, whereby the focus is on AMD as an environmental risk. As this research takes the form of a single case study, it must be placed within a contextual framework. This framework, at the broadest, most relevant level, is South Africa and its institutional context. However, as this research involves the governance of the environment and more specifically, the governance of the problem of AMD, there are what Yin (2003) describes as 'embedded

units of analysis' within the case itself. Specifically, the study site is the West Rand area of Gauteng. This is the location of where the AMD threat originates and is host to three mining houses. Although the pollution extends beyond the boundary of the West Rand, it is within this location that the physical risks (human, animal and ecological) and their impacts are considered. Finally, the social components embedded within the framework of this research include relevant stakeholders. For the purpose of this research these are described as the institutional components within the overall governance process. They include: A) government B) the mining industry and C) civil society.

1.4.1.4 Delimiting the Units of Analysis

Having outlined the general definition of the case being studied, certain limits were placed on each unit of analysis in order to clearly define the research scope. This provided an important guideline for the proceeding data collection stage. Firstly, in terms of the study site, only the AMD decant problem on the West Rand was analysed. AMD and related mining pollution problems also exist and have been documented on the Far West Rand, Central Rand and East Rand Mining Basins respectively. Furthermore, only AMD as a source of mining induced environmental pollution was considered. In terms of stakeholders and persons considered as potential interview respondents for this study, a general requirement and limit was that they had to have direct and current involvement in the management process concerning the problem. This meant that mining industry stakeholders were limited to persons representing active mining companies in the area (i.e. Mintails, Rand Uranium and DRD Gold). In general, civil society stakeholders were taken to include anyone directly or indirectly involved with, or affected by the AMD risk but not affiliated to government or the mining industry. However, only certain individuals within this group were deemed appropriate for this study. These individuals included NGO representatives, activists, scientists and researchers. Nearby community members and other affected parties (e.g. farmers) were not included for reasons relating to time constraints on the research and their potential to provide directly relevant information. As for government representatives, this was limited to individuals from DWA, DME and GDARD. Finally, a restriction was placed on the time period relevant for this study. Although historical data was important, the main time period concerning this study was from late-2002 (when decant started) to the present (i.e. 2010).

1.4.1.5 Data Collection

The data required for this research was qualitative data and therefore 'non-probability' samples were used. That is, the samples were deliberately selected because they have particular features that are relevant to the case study and enable a detailed explanation of the central themes surrounding the topic (Ritchie, Lewis and Elam, 2003). The samples constituted of both primary and secondary sources of data. It was mentioned above that case studies rely on multiple sources of data that converge in a triangulating fashion. In the case of this research multiple sources of data are of particular importance due to the complex nature of the problem. As Bryman (2008) notes, multiple sources of data are particularly useful when direct observations and interviews (see below) are used, as one can cross-examine in order to check what they might have misunderstood.

Most significantly, data gathered from interviews formed the main contributing source of evidence for analysing this case study. The interviews conducted were semi-structured and open-ended which allowed for flexibility. This was important due to the diverse backgrounds of the respondents. For example, activists and mining representatives hold very different views and have very different perspectives on the problem of AMD. Therefore, semi-structured interviews allowed for more specific issues to be addressed, whereby different respondents could supply information which was directly relevant to their respective backgrounds (Bryman, 2008). Interviewing for qualitative research purposes is inherently challenging. A specific challenge when using interview data is that it may often be biased (Eisenhardt and Graebner, 2007). Considering the politically charged and sensitive nature of this research, this was a valid concern. In order to reduce the possibility of biased responses, an attempt was made to use highly knowledgeable informants from a diversity of perspectives. To a large extent, this was achieved whereby almost all informants were senior in terms of their respective fields and directly involved with the AMD issue¹. Both primary and secondary sources of data were obtained as detailed below.

¹ It is possible that owing to the highly publicized nature of the AMD problem, gaining entrance to senior personnel in the field was made that much easier.

Primary sources of data included:

1) Interviews with key stakeholders (see appendix):

- Government officials
- Mining company sustainability managers (or similar)
- NGO representatives
- Independent researchers and scientists

2) Documentary data

- Minutes from various forums and public meetings
- Media reports
- EIA reports
- Government documents and publications
- Letters and communications
- Presentations

3) Direct observations

- Attendance at various public participation meetings and forums, specifically concerning mine-related pollution issues regarding the West Rand mining operations

Secondary sources of data were obtained from journal articles and book chapters.

1.4.1.6 Linking Data to Propositions

This stage is essentially the data analysis stage. As the first step of the data analysis stage, data was reduced and sorted according to relevant themes or constructs which inform the propositions. In this case, certain theoretical constructs described in the risk society theory were identified. These same theoretical constructs informed each of the two propositions. The theoretical constructs relevant for the first proposition included:

organised irresponsibility, the changing role of science in risk societies and, subpolitics. Only one construct was relevant for the second proposition and that was *reflexive modernization*. The data collected was then sorted and reduced in relation to the respective theoretical constructs.

The actual data analysis technique used for this research was the ‘explanation building’ analytical technique outlined by Yin (2003). The objective of this technique is to build an explanation based on the case study data obtained. This method is similar to that of the ‘grounded theory method’ (Strauss and Corbin, 1990), which builds theory from data gathered throughout the research process. Because explanations in qualitative research cannot be precise, reflecting on theoretically significant propositions and relating those to the data helps to make the explanation that much more valid (Yin, 2003). Indeed, without an overarching theory, this method loses some of its integrity in terms of its ability to provide a factual account of the case in question. Having established the research question and collected and sorted the data, the final step was to analyse the relationship between the empirical data and the theoretical constructs. The outcomes of this process are reflected on in chapter four, whereby a distinct ‘risk society hypothesis’ was generated and the issues at stake for dealing with the AMD problem are discussed.

1.4.2 Limitations to the study

First and foremost this study was limited by financial and time constraints. In turn, this had the consequence of reducing the number of interview respondents. In particular, this relates to government respondents, who were extremely difficult to get in contact with or schedule interviews with. Furthermore, due to the sensitive and political nature of this research, the manner in which the questions were answered possibly contained a certain degree of bias. More interview respondents may have helped reduce this problem. Yet, at the same time the diversity of respondents proved to be useful in creating a balance between perspectives. Access to information at times was difficult to obtain, as certain research documents were available only via the particular research institutes themselves.

1.5 Structure of the Research

As the first chapter to this research, the above has provided an overview of the theoretical and contextual nature of this research, as well as the research methodology. Chapter two explores in detail the concept of environmental risks and their relevance for contemporary society. Specifically, the risk society theory, as the analytical and conceptual tool for this study, is described. Chapter three provides in more detail the necessary contextual and background information, including a description of the impact of mining on the environment and the political economy of South Africa in relation to gold mining and its history. Chapter four is the core of this research. Specifically, this chapter examines the findings from the fieldwork undertaken in relation to the risk society theory with the objective of generating a theoretical perspective of risk that is directly relevant to the circumstances on the West Rand. Chapter 5 is the conclusion and provides a brief overview of the research, its findings and its implications.

CHAPTER 2 – THEORETICAL CONTEXT

2.1 Introduction

This chapter provides a theoretical perspective of how environmental risks are constructed and dealt with in contemporary society. From a sociological perspective, risk has been defined as “the possibility that human actions or events lead to consequences that harm aspects of things human beings value” (Klinke and Renn, 2002, p.1071). Environmental risk therefore refers to ‘a threat to both the environment and society which is a direct consequence of past and/or present human actions’. On a practical level, the concept of an environmental risk is synonymous with that of an environmental problem (e.g. land degradation, air pollution). However, the former more clearly illustrates the concept as one which is inherently value-laden. Risk has different meanings for different groups and therefore, the term environmental risk is used here on the grounds that it points to both the structural and abstract (social) components of an environmental problem. The theoretical content of this chapter provides the conceptual tools and foundation on which the empirical case study is described.

2.2 Environmental Risk and Modern Society

The modern environmental movement is considered to have begun in the 1960's, largely in reaction to the publication of Rachel Carson's 'Silent Spring' in 1962 (Bell, 2004). In her book she documents the environmentally destructive impact of modern industrial society as a result of the indiscriminate use of chemicals and pesticides. Although later gaining official recognition in the realm of the formal institutions of modern society, environmental and risk critiques such as Silent Spring essentially began as “manifestly cultural innovation movements” (Wynne, 2002, p.460). In other words, the early environmental movement can be understood to have been founded on the perspective that man-made threats to the environment are in fact a moral and ethical dilemma facing humanity.

From these origins, the discourse generated by ecologically enlightened social movements represented what amounted to a direct challenge to the industrial and technological utopianism of the post-war period (Bell, 2004). Today however, the discourse of environmental concern is no longer dominated by those who challenge

modern institutional conventions. What started out as a new social movement has since transformed into a “network of professional mass membership organisations at the national (and international) level” (Rootes, 1999, p.201). The consequence of which can be seen as a sceptical appropriation of environmentalism by the movement’s opponents (Eder, 1996). On the positive side, this dominant cultural appropriation of environmentalism means that the problem of an ecological crisis, and the risks it embodies, is by now almost globally recognised. On the contrary, the negative aspect resides in the increasingly apparent fact that the assumptions contained within the discourse of modernity render it incapable of dealing with environmental problems. The concept of a ‘modern society’ is understood to constitute the “dominant container model of society” (Beck, Bonns and Lau, 2003, p.1). In this respect modern society will be defined here as: a model founded on a realist worldview whereby progress is equated with economic growth and scientific and technological innovation. Furthermore, it can be noted that within this model of society, economic relationships have considerable influence over other institutions (Giddens, 1990). In terms of the environment and environmental risk, the modern discourse is guided by the following assumptions:

- The environment is external and separate to human society
- The environment is an exploitable resource base, existing exclusively for economic progress
- The environment and the risks it poses for human society are controllable
- Scientific knowledge, as morally neutral and objective, is able to provide the means to control those risks

To a large extent, these assumptions remain at the core of how the environment is viewed today. They form part of the dominant public discourse through which environmental concern is raised. By this very nature of modern societies then, the legitimization and decision-making processes involving environmental risks has become the authority of what Wynne (2002, p.460) describes as “the dominant scientific-institutional risk culture”. Through this channel, risk has become public discourse founded on the perceived infallibility of ‘rational risk assessment’ (Bell, 2004). Thus, in the framework of modern society, environmental risks are institutionally legitimated by claims of scientific certainty, accompanied by the belief that full control is possible.

2.3 Institutions and Environmental Risk

The next section presents a completely different perspective on the environment and environmental risk. However, even before looking at risk from a postmodern (late-modern) perspective, what is made most obvious from the above discussion is that institutions must be considered when understanding environmental risks. Institutions “consist of cognitive, normative and regulative structures and activities that provide stability and meaning to social behaviour” (Scott, 1995, p.33, as cited in Nyambe, et al, 2007, p.202). The modern approach to environmental risk is thus representative of the structural institutions of modern society. Importantly, these include government, industry and the economy. Essentially, these are ‘formal institutions’ which represent a particular sector of society. Informal institutions on the other hand, represent the ‘rules of the game’ and denote the values, norms and practices of the relevant formal institutions (Nyambe, et al, 2007). Modern society thus broadly represents society as a formal institution which is founded on those values, norms and assumptions (informal institutions) which give it meaning. For example, in this case, society as external to the environment and able to control it via scientific knowledge, is characteristic of modern society as an institution. As explained in the following, at the centre of the environmental risk discourse in late-modern society is a loss of faith in the idea that these institutions can provide solutions to the multiple environmental risks facing society today.

2.4 Environmental Risk and Late-modernity

A post-modern perspective recognises a shifting landscape within the constructs of modernity. Such a view claims that “the certainty of the modern era, constructed as it was on widely shared and accepted notions of about economic progress has been pulverised, leaving a fragmented, chaotic world which is utterly devoid of meaning” (Hannigan, 2000, p.178). The post-modern perspective is in itself complex and constitutes many different meanings across various contexts. Discussing it in detail is not necessary here. Instead, for the purpose of this section the term is used in its broad context. Thus, if we are moving into a phase of post-modernity, it is taken to mean that modern society is witnessing an historic break from the ways in which it has traditionally defined itself. In particular, this break is seen as a result of the numerous environmental risks which have “rocked the apparently solid, industrial, scientific and technological

foundations upon which modern society is based” (Burchell, 1998, p.1). In turn then, as those foundations are questioned and revealed as fallible, it is argued that a re-structuring and re-conceptualization of modern society itself is taking place. In essence, it is considered that contemporary society is on its way towards a new kind of modernity, characterised by fundamental societal transformations (Beck, Bonns and Lau, 2003; Giddens, 1990).

However, because the shape of this post-modern order is still being negotiated, the term late-modernity more accurately encapsulates the notion. Late-modernity can be defined as a society which remains within the broad framework of modern discourse, but at the same time is open to, and experiencing, changing dynamics in the way that discourse has traditionally been framed. Beck, et al (2003), depict this as a stage in the development of modern society when a fundamental societal transformation within modernity *begins* to emerge. In light of the prominence of the environment and its preservation being arguably the debate of our time, much has been written on the role of man-made environmental problems in relation to the changing dynamics within modern society (e.g. Eder 1996; Giddens, 1990; Beck, 1992). A common agenda within this body of literature are the various provisions of both a critique on ‘the modern’ and a conception of an alternative. Also fundamental to these sociological analyses is a sense of ‘social instability’ prevalent in society today. For example, Beck (2009, p.231) describes this as the “dialectics of modernity” whereby there exists an apparent ambivalence between “more-modernity” and “anti-modernity”.

In the context of environmental risks, this ambivalence within the constructs of modernity has several implications for the construction, assessment and decision-making processes surrounding these risks. As Hogenboom, et al, (2000, p.88) note, “most commentators and policy-makers agree that the process of dealing with risk is much more complicated (today) than is suggested by the conventional model of ‘policy-makers adhering to natural science-based facts’”. Indeed, it is becoming apparent that unquestionably adhering to scientifically-based facts has meant that the underlying question why the risks arose, who caused them and who they affect has been ignored. Consequently then, the notion of late-modernity also implies the growing acceptance of the need for a change in the way risks are handled, particularly from a political standpoint. Important is that in late-modernity there is awareness that no amount of

accumulated knowledge could encompass all circumstances (Giddens, 1990). More specifically, the idea that science, as an institution of knowledge in modern society, is able to explain and manage environmental problems is rejected. In order to more clearly capture these lines of thought, Klinké and Renn (2002) have outlined a number of themes around which debate regarding environmental risk occurs today. Importantly, the philosophical debate between the realist and constructivist perspectives and the handling of uncertainty are two major challenges confronting the institutional assessment and management of environmental risks. Additionally, the role of science in the assessment and decision-making process assumes a new role. These issues are discussed below.

2.4.1 Competing Discourses

Environmental risks increasingly involve not only the scientific and expert community, but a diverse array of informants and stakeholders. In particular, non-scientific knowledge held by the public and civil society has come to be articulated in many debates over environmental governance (Gooch, 2007). Consequently, the number of discourses present represents a real challenge for decision- and policy-making within the political arena of risk management. As the two major discursive approaches to risk, the realist and constructivist approaches are largely considered responsible for the conflicts surrounding environmental risks (Burchell, 1998; Wynne, 2002).

2.4.1.1 Technical Approach to Risk Construction

As the dominant response to environmental risks, the technical approach is based on a positivist or epistemologically realist world view (Szerszynski, Lash and Wynne, 1996). In other words, this approach assumes that objects in the world are waiting to be perceived or defined as risky. As a result, environmental risks are considered to be singular, neutral and objective concepts, whereby a quantifiable assessment of society's impact on nature is possible (Burchell, 1998). Those who hold this view are "convinced that technical estimates of risk constitute true representations of hazards that can and will affect people as predicted by the calculated results, regardless of the beliefs... of the analysts involved" (Klinké and Renn, 2002).

2.4.1.2 Constructivist Approach to Risk Construction

In contrast is the constructivist approach, which until recently did not concern itself with environmental problems and received almost no interest from social researchers (Hannigan, 2000). In line with the concepts of late modernity, this perspective has become increasingly prominent. As a challenge to the technical perspective, it emphasises the idea that nature is inextricably part of society and therefore sees environmental risks as “subjective; shaped and constructed by cultural, social, economic political and psychological factors” (Burchell, 1998, p.8). Environmental risks, it is argued, are not just facts about nature, but are also socially constructed and dependent on successful claims-making (Irwin, 2001). It is thus important to note that this perspective does not deny the reality of environmental problems. Rather, it points out that for a risk to be put on the environmental agenda, it must first be socially constructed (Irwin, 2001).

2.4.2 Construction of Environmental Risk

Hannigan (2000) points out that today the successful construction of an environmental risk requires several conditions (figure 1.1). Considering the fact that the existence of risks arising from man-made environmental damage is a globally accepted notion, the construction of risk can in fact be seen to take place in two stages. At a superficial level, in most cases concluding that a ‘risk’ exists is relatively straight-forward. Today, global and national institutions openly accept the adverse consequences of environmental degradation. However, illustrating the complexity of environmental problems, the multiple actors and stakeholders involved in the process of risk construction transforms what began as an environmental problem into a political and social problem. In other words, as Burchell (1998, p.4) eloquently points out, it is the ontological paradox “that environmental risk is, somehow at the same time, both objectively real and subjectively constructed” that makes dealing with the concept so problematic. In this sense, the problematic nature of environmental risks for late-modern society can be seen to lie more in the process of assessing the degree of risk and what action to take and less in the actual agreement over the existence of the risk. ‘Risk construction’ is therefore defined here as ‘the process involving multiple societal institutions, such as agencies,

social groups within society and individuals, trying to establish consensus on the extent of a risk' (Klinke and Renn, 2002).

1. Scientific authority for and validation of claims
2. Existence of 'popularisers' who can bridge environmentalism and science
3. Media attention in which the problem is 'framed' as novel and important
4. Dramatisation of the problem in symbolic and visual terms
5. Economic incentives for taking positive action
6. Emergence of an institutional sponsor who can ensure both legitimacy and continuity

Figure 2.1: The six conditions required for the construction of an environmental risk (taken from Hannigan, 2000, p. 65)

2.4.3 Domains of Risk Assessment

The outcome of the political process of risk construction is the public meaning given to a particular risk. As the product of the interaction between various actors then, risk construction occurs within two separate, but overlapping domains. The domain occupied by specialised professionals or "chief constructors of risk" (Hannigan, 2000, p.101) is where the most important action takes place. Essentially, risks are legitimised by those chief constructors of risk (scientists, engineers, lawyers, political officials) and the institutions of modern society which they represent (the state, industry, science). Being the bearers of risk, risk construction also occurs in the public domain. NGOs, public participation meetings and to some extent the media operate within this domain in an effort to give risk a more democratic and socially relevant meaning. However, due to the hegemonic role of formal institutions in the construction of risk and the scientific basis of their argument, the voices and concerns of these other stakeholders is often overshadowed (Irwin, 2001). Evidently, it appears that environmental risks continue to be largely framed along these lines. The overarching discursive power of the scientific-

institutional risk culture (the technical approach) seemingly continues to subvert and marginalise the essential human-cultural political dimension of risk (the constructivist approach) (Wynne, 2002). As a result, the concept of risk is very often reduced to a scientific model of probability, which in itself is unaccountably representative of dominant political interests. From a sociological perspective, this fear of the insincere appropriation of environmentalism is one of the central themes concerning critiques of modern society. As Eder (1996, p.203) anxiously puts it:

“The more that environmentalism serves for generating legitimacy, the more it becomes an ideological weapon in political discourse. Environmentalism is becoming a new ideological tradition in addition to the ideological cleavages of advanced modern societies”

In response, the constructivist discourse does illustrate a changing framework, theoretically and practically, for dealing with environmental risks. Implying the need for a more open, inclusive and accessible process for dealing with risk, this perspective becomes evermore relevant in light of particular developments concerning the environment within late-modernity. Specifically, I refer to the notion of certainty and control upon which modern society is founded. While risks arising from man-made environmental harm continue to get assessed from a largely technical-scientific aspect, there is much debate over the concept of certainty and the ability of institutions to control the (adverse) consequences of modernity. The following section discusses the consequence of rising uncertainty for decision-making.

2.4.4 Decision-making, uncertainty and loss of control

Following from the process of risk construction and legitimisation is the need to make decisions and implement solutions. Invariably, pressure to act grows as the socially constructed, yet real, threat begins to reach a (political) point where action or the appearance of it, needs to be taken. The increasing number and extent of disputes concerning industrial legacies illustrate this changing pressure on corporations and government (Benn, Dunphy and Martin, 2009). Naturally, what thus emerges is a political arena characterised by a framework of traditional politics, whereby conventional institutions take the central role of deciding upon appropriate action (Hogenboom, Mol

and Spaargaren, 2000). The central theme prescribed by the conventional institutional perspectives being an “incisive and compelling instrumental approach to decision-making under uncertainty” (Striling, 2003, p.33).

Founded on the unquestioned notion promulgated by the natural sciences of society as external to nature and at the same time able to control it (Szersynski, 1996), decision-making is seemingly systematic. Action sought by institutional decision-makers is legitimated based on the assumption that they are capable of acting in a balanced, logical and technically informed manner (Irwin, 2001). However, today the risks created by modern society are becoming evermore pervasive and uncontrollable. This development in particular has led to an increasing scrutiny of modern institutions and the foundations of the decision-making processes followed. Consequently, as the legitimacy of dominant knowledge systems, such as those produced by science and other ‘experts’ is questioned, their ‘marginal’ counterparts are given greater legitimacy (Burchell, 1998). Instead of progressing towards a solution however, the opposite appears evident as the inevitable conflict and contestation which develops, along with the risks themselves, induces a sense of loss of control. In other words, in spite of increasing efforts towards total control in reaction to environmental problems, we are in fact facing rising levels of uncertainty as we move into a bleak, yet unknowable future (Adam, 1996). The result is that today “the governance of environmental problems has become a matter of significant practical and institutional concern” (Irwin, 2001, p.113). More and more it is becoming seemingly clear that this traditional process of risk management and the norms which underlie and guide it are both flawed and inappropriate.

Ultimately, late-modernity is suggestive of the idea that environmental risks are raising fundamental problems for social institutions (Irwin, 2001). No longer is it possible to understand environmental issues from the point of scientific insight alone. Neither is it possible to expect government policy and legislation to effectively manage current problems or secure a future of certainty. What does become clear though is that the boundaries between the social and the natural are shifting. That is, “terms such as ‘social’ and ‘natural’ do not refer to predetermined entities but rather have a changing discursive and rhetorical role to play” (Irwin, 2001, p.91). Yet this decreasing sense of clear social definition creates further uncertainty as the environment can no longer be

conceived as external to our social world. Traditional institutional mechanisms thought to be able to control the environment also become questionable.

The question is now: where to from here? Today, the risk we face from environmental problems is accepted in almost all spheres of society. Yet, it is now a case of coming to terms with what is fast becoming one of the most dominant issues of contemporary modernity. Following from the fact that the technical approach is losing its legitimacy as an authority for controlling environmental risks, Eder (1996, p.203) asks two fundamental questions as to what the political implications of this recognised uncertainty are: “Does this change the public space as the central political institution of modern societies?” and “Does this lead to more democracy or a new technocracy in the name of environmental protection?”

2.5 Late-modernity as a Risk Society

The main thrust of the late-modern perspective concerns the idea that coming to terms with environmental risks requires a redefining of the operating assumptions and practices of modern society itself. This line of thought is advocated by many social theories responding to a time in which the threat resulting from environmental destruction is a leading political and social debate. Of particular interest is Beck's (1992) theory of 'risk society'. Providing insight into the politically and socially pervasive nature of risks, the concept of a risk society represents a specific development within the framework of late-modern society.

In the late-modern tradition, the theory of risk society (Beck, 1992) argues that modern societies are transforming. Specifically, the claim is that contemporary society is undergoing radical change wherein the principles and institutions of modernity become challenged (Beck, 2000). For Beck, synonymous with the concept of 'modern society' is that of 'industrial society' or 'first modernity'. As outlined in the above, it was during this phase of development that the harmful effects of industry were assumed to be easily identifiable, measurable and controlled (Matten, 2004). The process of assessing and evaluating environmental risks involved the use of conventional methods of scientific calculation (Beck, 2009). Based on the subsequent risk assessments, risk probabilities and norms generated by science and 'the experts', decisions could be systematically

made and the 'relevant' action taken. During this stage of first modernity, it is argued that society was assured by the idea that it was "capable of dealing with its own unforeseeable future through risk assessments" (Beck, 2009, p.26). Essentially, this process is seen to have had two opposing effects. On the one hand, it legitimized the production of industrially produced risks, thus further entrenching the dominant ideology of modernisation as linear progression (Beck, 1994). Risks were accepted as the necessary 'side-effects' of modern progress. On the other hand, it had the effect of intensifying those same risks it sought to control. However, the perceived controllability and certainty regarding the process of modernisation during first modernity meant that the risks being produced remained relatively unseen. Where they did occur, they were regarded as systematic events requiring political regulation. Indeed, as long as those legitimized hazards do not become issues of overt social or political concern, society remains content and unaware of its self-endangering nature.

Inevitably though, as a result of the accumulation of those risks and society's abstraction from the environment, their effects begin to emerge more explicitly (Beck, 1994). Quickly, modern societies begin to find themselves confronted with certain unignorable consequences of their modern lifestyle. Public and private debates become dominated by a growing awareness of industrially produced threats (Beck, 1994). What were once seemingly objective issues of environmental concern now become issues of subjective political concern. This is because, unlike risks attached to fate, those most concerning for society now are ironically the ones that have been created by society itself- they are a product of human hands and minds (Beck, 2009). Furthermore, these 'manufactured risks' are unique in that they are often invisible, existing only in terms of the knowledge about them and are thus open to social definition and construction (Beck, 1992). Essentially, this means that the conventional instruments and institutions of modern societies are unable to cope with the self-imposed consequences of modernization. A specific observation here is that these risks "challenge the bases of the probabilistic calculations of scientific risk management which proceed without reference to the human being affected by them" (Dingwall, 1999, p.478). The result is that the assumption of society as separate to nature and the social sciences as separate to the material sciences breaks open. The relationship between modern society and the risks it faces becomes more apparent: risks are both socially mediated and therefore subjective and at the same time assume an objective component in that

they are manufactured by experts and industry (Beck, 2000). In turn, the institutions of industrial society become both the producers and legitimators of risks they cannot control, rendering certain features of industrial society socially and politically problematic (Beck, et al, 1994). This state of unrest is explained as “a phase of development in modern society in which the social, political, ecological and individual risks created by the momentum of innovation increasingly elude the control and protective institutions of industrial society” (Beck, 1994, p.27). At this point, industrial societies are said to begin to lose their established foundations in the wake of ‘manufactured’ risks, transforming them into risk societies.

A defining feature of this transformation from industrial society to risk society is described by the veritable change in political discourse. During first modernity, political debate and conflict was centred on the distribution of wealth (Beck, 1992). However, as “the struggle for one’s daily bread” (Beck, 1992, p.20) loses its urgency and society’s knowledge of its risk producing nature becomes more apparent, the focus of political debate and conflict begins to concern the distribution of risk. That is, ‘wealth-distributing’ societies become ‘risk-distributing’ societies. Risk society thus “designates a stage of modernity in which the threats produced so far on the path of industrial society begin to predominate” (Beck, 1994, p. 6). For this reason Beck makes the claim that first modern, industrial societies are unable to cope with the risks they systematically produce: the institutions of first modernity were designed for the distribution of ‘goods’, not the distribution of ‘bads’ (Beck, 1994). In a similar fashion, one could say that dealing with industrially produced risks via the mechanisms of first modernity is like trying to fit a round peg into a square hole.

As mentioned above, the risks that give way to the risk society differ from those usually dealt with during first modernity (risks of fate or accidents). They are open to social definition and construction. The result of which means that the risks facing societies today shake the fundamental assumptions of the conventional institutional system and social order (i.e. law, science, economics). This insight finds its evidence in the principal notion that “the risk society has become an insuranceless society in which insurance protection paradoxically diminishes with the size of the threat” (Beck, 2009, p.27). Indeed, the risks of climate change, chemical production and nuclear power transcend the capacity of conventional insurance solutions (Matten, 2004). Yet, these risks

nonetheless pose a constant threat to society at large. Significantly, this means that despite the continuity of industrially produced risk, the capacity of modern institutions to provide protection or compensation via its once effective mechanisms is called into question. The following table highlights the dynamics of the risks of risk society and what they imply for society and the institutions of first modernity.

	First modern society	Risk society
Type of risk	Risks at the work place, accidents	Artificial catastrophes, industrially produced risks
Dependence on individual's decision	Yes (driving, flying etc.)	No (collectively taken decision of modern society, imposed on individual)
Scope of destruction	Limited by space, time, social boundaries	Unlimited 'accidents'
Calculation of threat	Calculable uncertainty (likelihood, level of destruction known, compensation available via insurance)	Very small, yet level of destruction infinite and impossible to calculate
Responsibility	Rules of assignment	Yes and no: organised irresponsibly

Table 2.1: Characteristic features of the risk society (Beck, 1988, p. 121-122, as cited in, and adapted from Matten, 2004)

Evidently the implications of living in a risk society, or rather the implications that environmental risk has on modern societies, are several. Those effects play out on a number of different levels and in a number of different ways. The overriding theme of Beck's theory however can be summed up in that risk societies are defined by the failure or disruption in the workings of previously taken for granted and trusted institutional arrangements. What becomes extremely important in the risk society is the

politics and 'subpolitics' which surround risk definition (Beck, 2000). To a large extent the new political nature of the concept of risk is the definitive characteristic of the risk society. Based on the notion that risks have become a major political force replacing conflicts over wealth distribution, a new power game is said to emerge where the question as to who is to define risk becomes central (Beck, 2000). Given the uncertainty surrounding the industrially produced risks of a risk society, the old power structures of first modern society begin to be undermined. Effectively, what ensues is a struggle within the established 'relations of definition' of modern society (Beck, 2000). In other words, because risks are socially constructed and not simple, obvious scientific facts of reality, their definitions and what they are taken to mean are a result on the dominant norms of society. However, when modern society faces risks which are incalculable, yet created by society itself (and therefore by the dominant powers in society) the old ways of defining and deciding upon risk lose their legitimacy. The institutions of modern society lose their legitimacy. The consequence of risk for modern society then is that there opens up space for reform, reform not only within the institutions of modern society, but also within the principles of those institutions (Beck, et al, 2003).

By expanding on this point, the positive aspect to Beck's seemingly otherwise pessimistic outlook for modern societies is illustrated. Not only is risk considered a socially destabilizing force, but more broadly it is considered a socially transformative force. So, when Beck speaks of modern institutions being undermined in the face of risk, the implication is that they necessarily have to be replaced by new and innovative social arrangements. This idea reveals the risk society theory as a specific development and application of the concept of reflexive modernization (Matten, 2004). The theory of reflexive modernization and reflexivity is discussed in more detail below. For now however, the focus is on the effects of risk for modern society and specifically their implications for certain institutions of modern society. The following looks in detail at three aspects of risk society which highlight the dynamics of environmental risk and the social and political challenges they pose for institutions. Firstly, the concept of 'organised irresponsibility' is discussed. It demonstrates the difficulty faced when trying to assign blame or obtain compensation for industrially produced threats. Secondly, the role of science in assessing risk and the inherent dangers it poses for contemporary society is examined. Finally, the concept of subpolitics is examined, revealing the broader political implications of risks in contemporary society. Together, these concepts

illustrate the 'social and political explosiveness' of the risks faced by society today. Moreover, the extent to which industrially produced risks transcend the traditional mechanism employed by 'risk professionals' and the institutions of modern society itself is revealed.

2.5.1 Organized Irresponsibility

The concept of 'organised irresponsibility' makes note of the fact that by the nature and extent of environmental risks present in contemporary society, no individual or institution can be held specifically accountable (Beck, 1998). During the stage of first modernity, risks on the other hand were covered by insurance. In the case of those risks, such as motor accidents, provisions were more or less easily made for the worst conceivable eventuality (Beck, 2009). However, the risks of today are fundamentally different to those of the past. As demonstrated in table 1.2, they are incalculable in terms of their probability of occurrence and their level or scope of potential damage. Additionally, they are not the result of individual decisions, but rather the consequence of historical actions and therefore imposed on individuals and society as a whole. In turn, this means risks are no longer calculable in terms of the conventional rationale of insurance (Matten, 2004). The insurance principle is thus cancelled- not only in the economic sense, but also in the social, medical and cultural sense (Beck, 2009). In other words, everybody is at risk and nobody is (directly) responsible. Whereas in modern society, the effects of industry were spilling over, they were able to be 'mopped up' (i.e. rhetorically through law, science, economics), in a risk society however they no longer can be effectively mopped up.

Nonetheless, in a risk society, the traditional institutional mechanisms still come into play. Increasing technical-scientific based assessments, norms and controls for risk continue to be put in place (Beck, 2009). However, because those risks are in reality 'institutionally incompatible', they continue to spread and slip through the loopholes of law, science and politics. In other words, most apparent in risk societies is that while there is an expansion in environmental law, there is paradoxically more and more environmental degradation for which no one is specifically held responsible (Beck, 1998). Additionally, that there is no way to conceive of their likelihood- their probability tends towards zero, while their potential damage tends towards infinity- risk becomes

based on subjective (and therefore conflicting) perceptions (Matten, 2004). The socially diverse notion of risk results in political disputes as to what constitutes adequate compensation. Ultimately, the result is that the risk producing industries are able to acknowledge those threats, adhere to imposed regulations and standards, yet at the same time deny responsibility and preclude compensation (Beck, 1998). This social and political contradiction is one which remains hidden so long as the old institutional patterns of rationality hold up (Beck, 2009). Importantly, those patterns of rationality are not only the institutions of modernity, but the underlying power structures of industrial society. Indeed, because those power structures define the institutions of modern society, as long as they remain environmental risk will continue to be produced. So, it is in fact only when the instruments of the industrial system can no longer hide the extent of the risks being produced and society itself becomes questioning of their ability to do so, that we see the condition of 'organised irresponsibility' emerge. In turn, this explicit institutional failure increasingly transforms modern societies into risk societies.

2.5.2 Changing Role of Science

Control and certainty were presupposed notions characteristic of the first modernity. Importantly, within this discourse, science is a key informant, playing a dominant role in terms of underpinning this belief in the ability to attain certainty and control (Beck, 2009). However, considering that certainty over risk can no longer be guaranteed, the role of science must necessarily change. The idea that science can be used as an objective decision-making tool is inappropriate for the risks of risk society. Risk definitions vary due to the different social and political assumptions embedded within the natural scientists models (Hogenboom, et al, 2000). Therefore, in risk society the role of science in dealing with risk becomes revealed as one which is based on how risk is defined:

"In the case of risk conflicts, politicians can no longer rely on scientific experts. This is so...because there are always competing and conflicting claims and viewpoints from a variety of different actors and affected groups who define risks very differently" (Beck, 1998, p. 16).

For Beck, the danger of science for dealing with risk relates to both its use in assessing and managing an already existing risk (i.e. environmental threat such as air pollution) and its use in promoting technological development. The problem encountered in risk societies is that political decisions about risk are always based on uncertainty. Experts can only supply more or less uncertain factual information about probabilities, but never answer the question: which risk is acceptable and which is not (Beck, 1998). The difference between “safety and probable safety, seemingly so close, are worlds apart” (Beck, 2000, p.60). Therefore, science becomes problematic for dealing with risk because it is no longer able to provide objectivity; the possibility and extent of a risk depends on decisions taken. As a result, if politicians just implement scientific advice, they risk getting caught up in the mistakes and uncertainties of scientific knowledge (Beck, 1998). The dilemma encountered in risk societies becomes one of how to use science and how to justify what decisions are taken given the unavoidable uncertainty of the knowledge guiding decisions.

What risk society represents for science is that the monopoly of the expert in diagnosing risk is called into question (Beck, 2000). This is not to question the importance of science for assessing and managing risks. Instead, what is revealed is the inherently social nature of science. Depending on how science is used and implemented, it is able to conceal social change and perpetuate the industrial production of risk, rather than reduce it (Beck, 2000). In other words, because risk definition involves many actors (not least the risk producing institutions), there is always the danger that decisions concerning environmental risk are based on scientific claims that serve powerful interests... those same interests which create the risks in the first place (Hogenboom, et al, 2000). What is thus called for is the opening up of debates regarding risk whereby science is used not as an objective decision-making tool, but as a democratic legitimating force. For risk societies then, the challenge is to shift the role of science from one which previously directed decision-making, to one where politics and morality have to take priority over scientific reasoning (Beck, 1998).

2.5.3 Sub-politics

Environmental risks can be characterised as being surrounded by uncertainty, unable to be controlled by the instruments and institutions of modern society and socially

determined. Yet, in risk societies modern institutions try to remain tied to the 'realist' assumption that human knowledge of nature and, therefore, environmental risk is singular, neutral and objective (Burchell, 1998). Eventually however, the inappropriateness of this approach becomes overtly explicit, giving way to conflict between expert and public opinion. No longer are risks made public discourse by experts alone, but because of the subjective realities which they give rise to, civil society, expert groups, cultures and even nations are having to get involved with each other whether they like it or not (Beck, 1998). The logic behind the advent of sub-politics in the arena of risk society is thus the interface between counter-claims to knowledge and traditional (modern) forms of knowledge in conceptualizing the problem. For example, the disenchantment in the ability of science to make clear cut decisions in risk society, brings to the fore the socially and culturally diverse nature of environmental threats. Industrial society automatically dealt with environmental problems via its conventional politics of the state, parliament and bureaucracy (Hogenboom, et al, 2000). In risk society however, the uncertain nature of the risks now appearing and the inability to manage them is taken to signal the end of such modes of political decision-making. Additionally, because of the socially, culturally and individually unaccountable nature of the dominant institutional risk management strategies, "the political breaks open and erupts beyond the formal responsibilities and hierarchies" (Beck, 1994, p.18).

Consequently (and necessarily), an alternative form of political interaction emerges at what is now the level of 'subpolitics'. This interaction is seen as a process where traditional political actors struggle to maintain their legitimacy, while a number of newly conceived political actors enter debate. They themselves also struggle to gain legitimacy. Here, a dual process is said to take place where certain institutions of industrial society become unpolitical, while those arenas which were previously unpolitical becomes political (Beck, 1994). Environmental subpolitics thus accounts for the way in which significant institutional change and transformation occurs as non-traditional actors become involved, increasingly pressuring and questioning the status quo. The end result being the formation of new ways and means in which political and social interaction takes place in order to cope with risk (i.e. a reflexive second modernity). Importantly, within this new dynamic that unfolds in the arena of environmental politics in risk society, previously marginalized communities (usually worst affected by environmental risks), NGOs and environmental activists are given a

more prominent role (Matten, 2004). Therefore, not only does the concept of subpolitics denote the emergence of new political (and power) arrangements, but also the incorporation of new forms of knowledge. Subpolitics, thus underlines one of the founding notions of risk society in that the common danger of risk “has a levelling effect that whittles away some of the carefully erected boundaries between classes, nations, humans and the rest of nature” (Beck, 1998, p.10).

2.6 From Risk Society to a Reflexive Society

As the concept of subpolitics illustrates, despite Beck’s seemingly negative interpretation of risk for modern society, his understanding is in fact more than simply the demise of humanity. The role of subpolitics is seen to constitute the means by which institutional innovation is generated in order to cope with risk. Risk is thus taken to represent a transformative force for modern society. This brings to light a further development on the risk society theory. Describing society’s recognition of the need for institutional change as a result of uncontrollable risk is the term ‘reflexive modernisation’. The concept of ‘reflexive modernisation’, as a process, is described as society’s “self-confrontation with the effects of risk society that cannot be dealt with and assimilated in the system of industrial society” (Beck, 1994, p.6). Rather than additional legislation, scientific research or financial input, reflexivity suggests deep-rooted change. It is a concept that describes fundamental change within the social relations of society. Accordingly, reflexive modernity is somewhat different to the theory of strict post-modernity. Rather, as a process, it is based on the notion that society is still modern, but this modernity is radicalizing itself as a conscious response to the myriad of risks and unintended side-effects of industry which are only now coming into sight (Lee, 2008).

Returning to the concept of subpolitics, what we see is that change and progress from risk society to a reflexive society is in many ways the product of the new political dynamics the take shape at the level of subpolitics. During the stage of risk society, the institutions and instruments of modern society are rendered incapable of dealing with the increasingly complex nature of industrially produced risks. Over time, the subsequent political dynamics (subpolitics) that take place in reaction to the conditions of risks society begin to initiate a transformation of those failing institutions. Central to

this transformation is the idea that previously non-political actors are gradually becoming inextricably part of the formal political arena. In turn, they are becoming influential in the decision-making process and are thus a vital means for change. To this end, risk societies become reflexive societies via fundamental changes to their otherwise modern institutional systems- changes which are especially driven by new actors and new forms of knowledge. As noted earlier, under conditions of risk society, modern institutional mechanisms remain the predominant means of dealing with risk. Thus, the fundamental institutional changes that are required must necessarily come from beyond the institutions themselves. This means that subpolitics and the important role of previously non-political and extra-institutional actors are key to realizing reflexivity. In this sense, risk society is a theory which on the one hand is descriptive of the effects risk has on modern society. At the same time, it is also prescriptive as to how risk can, and does affect social transformation. As the second main contribution of Beck's work then, reflexive modernization, as initiated by the subpolitical arena, is suggestive of institutional innovation as a pathway out of the failure of modern societies to cope with the self-imposed consequences of risk (Matten, 2004).

2.7 Reflections on Risk Society

The theory of risk society follows in parallel with the description of environmental risks as conceived by postmodern (i.e. late-modern) social theory. As part of the wider body of late-modern social theory, risk society is often pointed out for its close link with certain other theoretical contributions (e.g. Giddens, 1990). The theory's unique contribution however lies in the proposed link between the changes in modern society and the increased presence of risk. Risk society in fact is almost entirely premised on the notion that risk is a fundamental precursor to the changes synonymous with late-modernity. In other words, the 'crisis' that risk is described as inducing coincides (and is inextricably linked) with many of themes common in late-modern theory (e.g. a loss of faith in centralized institutions and the assumptions of 'progress' upon which these are based) (Irwin, 2001). Despite these commonalities though, it goes without saying that many of the ideas and concepts of Beck's work have received criticism. Most significantly these relate to what some perceive as an overly realist approach to risk (Fischer, 1998; Burchell, 1998) and the notion of institutional and governmental failure in dealing with risk (Dingwall, 1999). Nonetheless, it is the unique way that risk is linked

to contemporary society that is thought to be relevant and provoking. As Matten (2004b, p. 372) specifically points out:

“For the context of environmental management the value of Beck’s work lies in providing an interdisciplinary explanatory framework for the new character of environmental problems and the institutional failure of modern societies in tackling risk. As Beck himself concedes in reaction to his critics, the interdisciplinary character of his work requires the application of his ideas in the respective disciplines and rather than questioning his general conceptual approach, the issues brought forward by his critics should be regarded as potential fields of further research.”

In other words, it is that “the concept of risk is accorded major explanatory status” (Irwin, 2001, p.63) rather than its empirically robust nature which provides it with character. Risk is shown to be a concept which is more than a statistical probability- it is problematic for modern society on a large scale. At the same time however, neither can risk be confined to perceptions and social constructions alone (Hannigan, 2000). Thus, at its core, risk society explains a society where we have to make social assessments about the magnitude of risks and at the same time cannot ignore the fact that “scientific evidence (and other modern constructs) can be a helpful source of information in making these decisions” (Hannigan, 1995, p.95). So essentially, it is this ‘midway’ position (between a realist and social constructive perspective) that risk society embodies and the fact that it creates a new avenue of research possibilities which justify it as being a valuable theoretical research asset. Its significance and relevance here specifically relates to the way in which risk, as a catalyst for social and political change, is explored. In this way, the theory is employed not on the basis of its empirical strength, but rather as a means to uncover new ideas and provide unique insight. Furthermore, not only is risk society descriptive of late-modern society, but also prescriptive (Barry, 1994). Through a vision of an ‘ecologically rational’ and reflexive society, driven by those outside the traditional institutional realms, Beck provides the theoretical components for potentially dealing with the uncertainty and risks faced by society today. Thus, an interrogation and conception of the future in terms of the risk analysed in this case study is enabled.

Having now discussed the theory of risk society which forms the analytical foundations of this research, the following sections deal with the concept of governance. Specifically, the concept of environmental governance in relation to risk is discussed. The importance of dealing with this concept lies in the fact that the implications of environmental risk are expected to largely manifest themselves as problems of environmental governance and the corresponding institutions.

2.8 Environmental Governance

The term 'governance' is a broad concept used in varying circumstances and no single definition accounts for its meaning. This definition developed by the United Nations Development Programme (as cited by Hall, 2007) is useful:

"Governance is the exercise of economic, political and administrative authority to manage a country's affairs at all levels... it comprises of the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences."

Put succinctly, governance can also be described as "the relationships between people, the ways they interact with each other in the context of their environment, and the systems of principles, rules and norms that are set up to guide these interactions" (Turton, et al, 2007, p.7). Therefore, governance can also be seen as the means by which certain assumptions and values are upheld in order to achieve specific objectives. In this sense, environmental governance would refer to both the means by which the environment is governed and the assumptions, values and norms underpinning those means. Relevant and common means of environmental governance include the use of command-and-control instruments, economic or market based instruments, voluntary agreements and information-based strategies (Godfrey and Nahman, 2007). In turn, the assumptions, values and norms underpinning those means essentially are driven by global, national and political influences.

Without going into historic detail, both developed and developing countries, have traditionally followed what came to be the dominant approach to environmental governance: the command-and-control approach. This approach involves direct

regulation and relies on the application of regulatory instruments such as standards, authorisation and land-use controls (Godfrey and Nahman, 2007). It can be seen that this approach falls within the framework of modern society in terms of how the environment is conceived and managed. Described in the previous chapter, two important assumptions reflect this. Namely, that the environment is external to society, and the environment and the risks it poses are controllable by institutional means. However, modern societies are also transforming into late-modern societies. While the effect of this in relation to environmental risk is seen to be a growing loss of faith in central institutions and the emergence of, and conflict between, 'new' forms of knowledge, environmental governance has also been influenced. Evidence of this can be seen in a shift away from 'policing' to one of co-operation and the introduction of a number of 'softer' alternative policy approaches (Godfrey and Nahman, 2007). Also described as a 'progressive approach', environmental governance in late-modern societies is an approach which: involves a large and multidisciplinary knowledge base, incorporating the natural, physical, engineering and social sciences within the context of a practical decision-making framework that emphasises process, wider and more democratic participation and deliberation (Pollard, et al, 2004).

However, the question for the governance of the environment in those countries which are harder to define as late-modern, or more precisely, developing countries still remains. Godfrey and Nahman (2007) note that regulatory controls remain the principal means of environmental governance in developing countries. However, to assume therefore that those countries are 'modern' and show no signs of becoming late-modern (or are able to adapt) is too simplistic. For one, it is presumptuous to just assume that environmental governance in a developing country is of a particular standard. More importantly, to generically distinguish between a developed and developing country in terms of its governance principles and institutions would be to ignore the importance of historical and current contextual factors. The next section thus looks at how context influences the governance of the environment and also how this affects how risk is dealt with.

2.9 Governance and Environmental Risk in Context

Importantly, the above discussion regarding environmental risk is explicated in relation to 'modern society' as the generic framework describing developed or industrialised nations. However, as a socially and politically infused concept, environmental risk in less developed or developing countries requires further discussion. Based on the overarching value assigned to economic growth, the environment is invariably devalued as a societal concern for most developing countries. That is to say, economic security and well-being is often given greater interest by institutional bodies over that of the environment. Dealing with worsening environmental conditions is therefore a matter of competing institutional values and norms. For countries in a stage of 'advanced modernity' Beck (1994, p.29) describes them as having reached "a stage of modernity in which the hazards produced in the growth of industrial society become predominant". In this case, risk is a predominating factor over and above the "logic of wealth distribution" (Beck, 1992, p.19). While this idea may be controversial, it does present the logical argument that developed nations, having reached a point of 'satisfactory economic welfare' amongst their citizens, are more permeable, accepting and reactive to environmental risk. Indeed, climate change has become a leading social and (political) issue in most developed countries. In this sense, reflection and reflexivity occur as a result of a society having achieved the objective of economic security and reached an advanced stage of industrial and technological innovation. This is perhaps because more room has been opened up for additional social issues to be dealt with on a political level (Rinkevicius, 2000).

However, we are also living in an increasingly connected and globalised world. This means that today even developing countries placing the environment higher on their political agenda. In some cases this may be voluntary. More generally though it is a case of being forced to do so by virtue of the fact that environmental risk is becoming a discernable reality in developed and developing nations alike (Dalby, 2002). This raises important issues for the developmental trajectory and future progress of developing countries. If both industrialised and developing countries are having to deal with similar problems, the question for the emerging economies is what developmental path to take. Do they continue to embrace the principles and values assigned to continued economic growth and address environmental problems more thoroughly once they have reached

a point where it becomes economically viable? Or are they able to learn and react appropriately? The question of interest here is thus: when economic growth and wealth distribution are the dominant concerns of a society, what happens when an environmental risk is understood to exist? Moreover, how is the system of governance concerning the environment affected?

How the environment is formulated in less developed countries is becoming a growing topic of interest. Expanding on Beck's risk society for example, Rinkevicius (2000) proposes the concept of a double-risk society, investigating the relevance of the risk society theory for Eastern European transition countries. Additionally, it is argued that to some extent, reflexivity in response to environmental risks can take place in those less developed countries. Turton, et al (2007) state that reflexive change in the way environmental resources are governed is being projected, and at times forced, on the less developed countries. Describing these circumstances and change means exploring environmental risk beyond the way in which it is understood in the context of advanced industrial countries. From this one would be able to see that environmental risk necessarily has to set those less developed countries on a different developmental path to that of their developed counterparts.

Reflexivity as 'responsiveness and adaptation' to changing environmental developments is most effective and needs to occur within the institutional setting of the country concerned (Folke, et al, 2002). Societal values and expectations are increasingly helping shape changes in governance and environmental risk management. Nonetheless, final policy-making and implementation are inescapably the authority of the governing institutions. This means that proponents of change, not only in the public but those within the institutions themselves, face several challenges. Most notable is the prevailing values and norms underpinning the direction and content of governance. In other words, while it is the job of the formal institutions to implement policy, the informal institutions, defined as "the customs and practices of such agencies" (Nyambe, Breen and Fincham, 2007, p.201) are not only less tangible, but deeply embedded. For developing countries in particular, focusing on promoting their economic interests is undeniably the most defining value in terms of governance. Although this strongly implies the marginalization of environmental concern, this cannot be taken for granted. As Rinkevicius (2000) explains, just as higher environmental concern among developed

nations does not imply the absence of any conflict over economic concerns, it is also not true that an overshadowing display of material values negates all concern for the environment. Rather, the fact seems to be that “risk awareness is downplayed in developing... societies owing to the complex issues of social, economic and political change” (Rinkevicius, 2000, p. 280).

2.10 Conclusion

This chapter represents the theoretical underpinnings for this research. It has been demonstrated that environmental risks are becoming increasingly problematic for modern societies. Examining risk from a sociological perspective reveals the often ignored social and political challenges modern society is faced with when dealing with industrially produced risks. In particular, Beck’s risk society theory has addressed the incapability of modern societies to cope with the consequences of modernization by revealing the institutional failures (Matten, 2004). Significantly, the contribution of the theory also reveals risk as a force which has the ability to transform institutional arrangements. Subpolitics and the emergence of a reflexive society are unique concepts which have both theoretical and practical relevance. Theoretically, they offer a potentially valuable perspective from which to analyse the changing dynamics in the arena of environmental politics. Practically, the notion that subpolitics offers a way out of the circumstances of risk society is of relevance to the process of environmental governance.

Taking this into account, it is now important to provide a description of the context in which risk occurs. As explained above, the implications of environmental risk for a developing country can be expected to be substantially different to that of a developed country. Beck’s description of environmental risks is based on his admittedly European outlook. The fact that South Africa has elements of both a developing country and a developed one (Godfrey, et al 2007), means that a significantly different type of risk society can be expected to emerge. In turn, the outcome of applying Beck’s theory to the risk of AMD on the West Rand is potentially transformative for the way in which the situation is currently perceived. Thus, having described the social and political character of environmental risks at a generic level, an assessment of that setting is necessary in order to fully understand the implications of the risk itself. Accordingly, the following

chapter provides the background to the current situation in which we find ourselves on the West Rand. From there, it is possible to begin to determine in what way it is reminiscent of a risk society. In making this connection we can then also begin to determine the country's risk trajectory in terms of becoming a reflexive society, as opposed to remaining trapped in the conditions of a risk society.

CHAPTER 3 - BACKGROUND

3.1 Introduction

The fact that the current situation concerning the AMD problem on the West Rand is due to the logic of exploitative capital accumulation demonstrates the truth behind a central theme of risk society. Namely, that it “clarifies a world characterised by the loss of a clear distinction between nature and culture” (Beck, 1998, p.10). In other words, the rise of risk society ushers society into an era where it becomes impossible to remain tied to traditional conceptions of boundaries separating different spheres of life. As a result, it is inescapably necessary to accept the fact that risks are not merely ‘outside’ phenomena, but are generated right inside, and are inextricably part of, the very institutions of modern society which at the same time try to control them (Beck, 1998). For this reason, ignoring the political, historical and socio-economic matrix in which environmental risk is bound up in is both futile and costly. This chapter describes this matrix. Firstly, a brief overview of the environmental impacts of mining are covered, before describing the current situation in terms of the actual and potential biophysical problems resulting from AMD on the West Rand. A proposed solution to the problem has been put forward and is also discussed. This chapter then goes on to briefly describe the current political economy in South Africa and how this relates to the prevailing way in which the environment is governed. Then the chapter focuses directly on the historical aspects of gold mining in South Africa and the West Rand. Finally, it concludes with a discussion exploring the possibilities of change and the potential role of the risk posed by mining in that change.

3.2 Environmental Impact of Mining

Amongst the many environmental impacts associated with mining activities, air pollution and land degradation from mine tailings, sinkhole formation from underground dewatering and water pollution are some of the most notable. This is true not only with regards to mining in South Africa, but for the industry on a global level. This quote from the European Environmental Bureau is particularly demonstrative of the implications of mine related pollution and the risk perception it engenders:

“...problems relating to mining waste may be rated as second only to global warming and stratospheric ozone depletion in terms of ecological risk. The release to the environment of mining waste can result in profound, generally irreversible destruction of ecosystems.”

(EEB, 2000, p.27)

Above all its destructive impacts, contaminated mine water effluent (in the form of AMD) is almost unanimously accepted as the single greatest environmental risk associated with mining activity (Oelofse, 2008). As the focal point of this research, AMD is a general term which refers to the waste water produced as a result of mining. When mineral deposits or the associated spoil generated by mining come into contact with water and oxygen, they become oxidised and contaminate the water source. This contaminated water is characterised by a low pH (high acidity) high salinity levels, elevated mineral and heavy metal concentration and may also contain radionuclides (Oelofse, 2008). This mine effluent, which is both chemically toxic and radioactive (in the case of the West Rand), is generated from mines in several ways: as run-off from mine dumps entering surface water streams and groundwater, seepage from mine dumps into underground water and as overflow from abandoned mines. What makes the problem of AMD unique and particularly problematic is the fact that it is extremely difficult to rectify and has the potential to persist for centuries after mine closure (Oelofse, 2008).

Defined in these terms, mine related pollution has an objective component in that the source of pollution and how it is generated is known. Notably, apart from structural landscape degradation, the effect of mining on nearby water sources is its most threatening impact. When contextualized however, defining the problem, determining its implications and dealing with it results in the creation of a complex array of political, socio-economic, scientific and legal interactions (Adler, et al, 2007). In light of this and given its instrumental cultural connection to modern discourse, it is hardly surprising then that mining, like technology, requires social assessment of some kind (Wynne, 2002).

3.3 Current Situation Regarding Mine Water Pollution on the West Rand

The current debate regarding the decant of toxic mine water from the unused underground mine workings and previously dry springs on the West Rand can be traced back over one hundred years. However, the actual event itself is far more recent and served as the trigger for what amounts to a current attempt at remediation and finding a long-term solution. As early as 1996 the flooding of the gold mines of Krugersdorp and Randfontein (on the West Rand), collectively referred to as the Western Basin Mine Void, was predicted by specialists (Du Toit, 2009, interview; Krige, 2009; Cobbing 2008). That insight was largely ignored by the authorities and the mining houses themselves, with counter-claims also made regarding the direction in which the water would flow. However, in late-August 2002 polluted mine water (AMD) from the flooded underground mine Void indeed began decanting, first from a borehole and then the disused mine shaft as originally predicted (see appendix B). The reason for the sudden alarm over what has transpired into an observable environmental risk relates to the decision made in 1998 to stop pumping relatively 'clean' water from the mine workings (Krige, 2009). Consequently, with the gradual abandonment and closure of mines (which is synonymous with the cessation of pumping) in the area over recent history, the water table began to return to its original level in the Western Basin Mine Void (Van Eeden, Liefferink and Durand, 2009). The side-effect of which is what we see today: water polluted by mine effluent rising to surface levels and issuing from mine shafts and once dry springs alike (Krige, 2009).

While the decant itself remains the underlying problem, the reason for concern is due to 1) the potential for a vast number of water sources to be affected (see appendix B) and 2) the long term nature of the problem. Firstly, the geographical location of the decant points atop a watershed means the escaping water finds its way into several important river systems across South Africa (Swart, et al, 2003). Secondly, unlike 'conventional' environmental problems', the problem of AMD is that it does not cease when mining itself ends. In fact, as noted above, it occurs because, and is made worse when, mining activity ends (Adler, et al, 2007). Along the way communities, industry and ecosystems relying on the natural water sources are all potentially at risk. A further unique aspect of the AMD problem on the West Rand is that it poses a risk to the Cradle of Human Kind World Heritage Site. This aspect has significantly helped to highlight the problem and

add to the acceptance of having to address, or at least look into the problem more thoroughly. As Oelofse, et al (2008, p.7) remark, “it will be a sad day if AMD is allowed to impact negatively on archaeological material preserved over millennia, leaving questions of human origin unanswered.”

3.3.1 Proposed Solution

At the time of writing, the only solution which has elicited any significant response is that proposed by Western Utilities Corporation (WUC). This ‘mine water reclamation project’ is a private sector investment strategy, which seeks to use technological and scientific methods for cleaning the water and selling it for profit:

“Western Utilities Corporation (Pty) Ltd (WUC) proposes to establish a project to collect mine affected water from existing mines in the Witwatersrand mining area (which are currently pumping mine affected water to surface from underground mine voids), treat the water and distribute the reclaimed water to third parties on commercial terms.”
(WUC EIA, 2009, p.1)

In accepting the reality that a large part of the responsibility rests with the mining houses still operating on the West Rand (Mintails, Rand Uranium; DRD Gold), the Western Basin Environmental Corporation (WBEC) was established. As a section 21 (not-for-profit) company, WBEC was formed in order to manage the process of water rehabilitation associated with AMD on the Western Basin (DRD Gold, 2008). After registering as a ‘Water Service Provider’ (WSP) with DWA, WBEC is entitled to remove water from the underground voids, treat it and sell it. In order to reclaim the water, WBEC subsequently entered into an agreement with WUC as the proposed company to be responsible for the reclamation, treatment and selling of the water. As part of the agreement, none of the mining companies involved with WBEC will profit from the WUC operation. In this sense, they are seen as facilitators of the solution and thereby fulfilling their responsibility in terms of a sustainable business code of conduct. To date, the initial feasibility study and scoping assessment has been approved by government. The second phase prior to approval involves the submission of an EIA. This has subsequently been submitted by WUC, but has not as of yet been accepted and is being reviewed by government in terms of its EIA process and feasibility. It is however

the 'monopoly' in terms of available solutions and a central issue relating to the management of the AMD risk.

3.4 Political Economy and Environmental Governance in South Africa

In terms of its developmental status, South Africa has been described institutionally as a "fledgling democracy" (Turton, et al, 2007) and economically as an "emerging economy" (Fig, 2005, p.599). The fact that today, fifteen years after the abolition of apartheid rule, South Africa still needs to overcome the social and ecological damage inflicted during that time, one may even regard it as a transitional economy. The consequent ambivalent nature of the country's developmental needs reflects what is a complex situation. That is, while the majority of South Africa's public policy is necessarily driven by the pursuit for 'wealth redistribution', the country also faces deteriorating environmental conditions (DEAT, 2006). More significant however, is the widely held argument that instead of moving towards a more socio-economically equitable society, in South Africa "one can detect... the evolution of an ascendant hegemonic project" (Marais, 2001, p.233). On the one hand then, South Africa faces what could be likened to Rinkevicius' (2000) 'double-risk society', whereby it is facing challenges in the form of both socio-economic and environmental risks. On the other hand, it is a country overshadowed by a dominant political agenda, characterised by a drive for capital expansion, justified on the grounds of a trickle-down effect, yet also motivated by elite (and corporate) interests (Bezuidenhout, et al, 2007; Marais, 2001).

Ultimately, most evident in this account is the fact that although a democratic government came to power on strict oppositional terms to the principles of the former apartheid regime, the extent to which change has been augmented is limited. Unsurprisingly, the case of realizing better environmental governance in South has suffered too. At first glance however, a review of South Africa's environmental legislation contradicts this rather bleak picture. Having taken many of the best elements from cutting-edge legislation globally, South Africa's environmental legislation has been described as being amongst the best in the world (Hattingh, et al, 2007; Kotze, 2006). During apartheid rule the environment was at best governed as an entity to be selectively conserved for the benefit of a few. After emerging from decades of rule where decision-making excluded all but the central tier of government, the legislation

that accompanied the democratic transition was inspiring. Of particular relevance are the following pieces of environmental legislation:

- National Environmental Management Act (NEMA), (Act 107 of 1998)
- National Water Act (Act 36 of 1998)
- Mineral and Petroleum Resources Development Act, (Act 28 of 2002)

The approach to the governance of the environment as enshrined in legislation follows closely with the 'progressive approach' outlined above. Phrases such as "co-operative environmental governance" (NEMA, 1998, 3), "integrated environmental management" (NEMA, 1998, 5), "ensure that water is allocated equitably and used beneficially in the public interest, while promoting environmental values." (NWA, 1998, 1(3)), "that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised" (RSA, 1998a, s.2.4.a), all follow directly in-line with what seems an enlightened and genuinely forward-thinking approach. Unfortunately, the fact is that the strength of environmental governance in South Africa ends at the rhetorics of legislation. Bond and Stein (2000, p.1) attest to this fact, stating that "notwithstanding rhetoric to the contrary, apartheid-era state support for industrial development and capital accumulation at all costs was not significantly altered through the new (environmental) laws". The result of which is demonstrated in the Department of Environmental Affairs and Tourism Environmental Outlook report (DEAT, 2006) which notes that many aspects of the environment are deteriorating, despite improvements in environmental management.

Certainly, a strong policy favouring economic growth can be seen as a challenge in terms of the realization of a greater level of environmental sustainability. However, the administrative and legal precedence to implement more favourable standards and state capacity to do so is possibly a more fundamental challenge (Turton, 2009; Bezuidenhout, et al, 2007). From this perspective, the most cited problem facing South Africa in terms of working towards more sustainable environmental practices is the fragmentation of environmental governance (Nel and Kotze, 2009; Hattingh, et al, 2007; Kotze, 2006). Fragmentation at both a horizontal (mandates vested in separate, autonomous organs of state) and vertical (mandates shared between national, provincial and local spheres) level is problematic. Consequently, Nel and Kotze (2009,

p.18) highlight the fact that “the legal underpinnings of environmental management and governance...may have a profoundly negative impact on the effectiveness of any environmental governance and management system.” The impact of this fragmentation has several consequences for integrating environmental governance processes. Most significantly these include:

- Disjointed and incremental decision-making processes
- Costly delay in decision making
- Inefficient arrangements between organs of state that control similar activities
- Significant gaps in control arrangements
- Conflicting conditions of authorisation
- Externalisation of governmental inefficiencies to development costs, resulting in negative impacts on development in South Africa and perpetuating the existence of environmental problems

(Adapted from Nel and Kotze, 2009, p.18-19)

In turn, these flaws mean that legislation is largely unable to alter the fact that in South Africa, the environment continues to remain within a strict modernist framework. That is, at an institutional level, the environment is still considered as, (1) external and separate to society and, (2) existing exclusively as a resource base which must necessarily be exploited in order to achieve the objective of economic growth and wealth redistribution. In light of mining as the topical focus of this research, this recent excerpt from a speech given by the Minister of Mineral Resources, Susan Shabangu, highlights this point:

“We seek to further deepen this relationship with Australia so that we can unlock the mineral resources of the continent to address the inherent socioeconomic challenges.”
(From address to Australian Investors given at the Africa Down Under Conference, 3rd September, 2009)

This section has briefly illustrated the current ‘on-the-ground’ situation in terms of the environment and the way it is conceived and managed in South Africa. In particular, it can be noted that a strong neo-liberal policy approach of economic growth is certainly not complementary in terms of the attainment of greater environmental stewardship,

specifically as it relates to the role of government. However, state capacity and other challenges to implementing the legal framework for achieving a stronger regulatory environment can possibly be regarded as having a more profound impact. Considering these challenges for reversing South Africa's declining environmental conditions now, the following section examines how the country's historical development laid the foundation for what we see today. That this research is focused on gold mining as a factor relating to the governance of the environment in South Africa, the remainder of this chapter looks specifically at this aspect.

3.5 The History of Mining in South Africa

3.5.1 Establishing an industrial society

The fact that today the Witwatersrand is a hub of industrial activity and economic stimulus can almost exclusively be attributed to the discovery of gold in the area in the late 1800's (Bond, 2002). This discovery saw the establishment of several mining houses in the area. Rather than just being operators of mines, the established mining houses have been described as "facilitators of mining, bringing together the acquisition of mining rights, operation and management, and... the international finance required for the capital-intensive mining of the ...deep gold deposits on the Witwatersrand" (Hamann and Bezuidenhout, 2007). In these terms, the early industrialization of South Africa, as a product of the discovery of mineral wealth, has a seemingly generic storyline. However, the socio-historical conditions under which this process took place have far reaching implications for the subsequent environmental crisis facing the country today. Expanding on them is thus necessary in order to gain a greater appreciation and understanding of the challenges involved in dealing with such a crisis.

In the context of South Africa, the gold mining industry has been described as the representation of imperial capitalism (Hallowes and Munnik, 2006). It is widely agreed that the emergence of the mining industry was inextricably linked to both early colonial rule and subsequent the apartheid regime and even regarded as the blueprint for the

formation of the regime itself² (Hamann and Bezuidenhout, 2007; TRC, 2003). The mining of gold on the Witwatersrand began as a simple extractive process during British colonial occupation, whereby all profits were claimed by the European superpower (Adler, et al, 2007). The consequent demise of colonial rule as a result of the 1948 Afrikaner National Party victory signalled an obvious change in policy. This change took the form of the mining industry and its profits being treated as national assets for the benefit of South Africa (Turton, 2009). In essence, this meant the merging of entrepreneurial and profit interests of the large mining houses and the state (Adler, et al, 2007). It is thus unsurprising that not only did the government allow the industry a privileged position of power, but its activities were not based on any notions of environmental concern. Instead, “the early gold-economy was simply an extractive industry with little consideration given to possibly adverse long-term effects” (Adler, et al, 2007, p.33). This pattern characterises the relationship between the environment and the mining industry in South Africa between the time gold was initially discovered right up until the late days of apartheid rule.

3.5.2 Mining and the Environment on the West Rand

The Witwatersrand gold deposits are divided amongst three basins, namely the Western, Central and Eastern basins. Collectively they form what is known as the Witwatersrand Supergroup, which extends in an east-west direction over a length of some 45km (Naicker, Cukrowska and McCarthy, 2002). Gold was first discovered in the area in 1886, with West Rand Consolidated established just one year later (Coetzee, et al, 2006). Thus, the Western Basin mining area is home to some of the oldest mining activity in South Africa, all of which were conducted under the same principle of ‘simple extraction’.

The disregard for long-term costs of environmental impacts of mining is relatively consistent with all historical mining operations in South Africa. However, three unique features of the geophysical area of the Witwatersrand compound the local

² Initially, during the first few decades after the discovery of gold, began what was a struggle to profit from the largest gold reserve. This was in the form of the Anglo Boer War between the content farmers of the Boer republic and the wealth seeking British foreigners (Turton, et al, 2006). The establishment of the Union of South Africa in 1910 represented both the victory of British invasion and the emergence of a racially defined industrial class system which would later become institutionalized in the form of apartheid.

environmental impacts of mining. These include: water-bearing dolomite which lies above some of the gold reefs (Coetzee, 2006); the presence of uranium (Cobbing, 2008) and the fact that the reefs lie on the Atlantic Ocean/Indian Ocean watershed (Swart, et al, 2003). Additionally, the impoundment of mine tailings (mine waste dumps) on land was the preferred option of 'disposal' on the Witwatersrand (Oelofse, et al, 2007).

In order to get to the deeper gold-bearing reefs it was necessary to dewater the underground dolomite compartments. The means to do this was only acquired some 40 years after the initial discovery of gold in the area, which then subsequently led to the establishment of additional mines in the 1930's (Coetzee, et al, 2006). With the development of efficient pumps and other dewatering technology gold mining quickly flourished to the point that up until 1998 a further 18 mines (extracting both gold and uranium) were opened (Cobbing, 2008; Coetzee, et al, 2006).

Unfortunately, the combined effects of dewatering, the presence of uranium, exposed mine tailings and the location atop a watershed would come to have a pronounced influence on the environmental impact of mining, both in the area and beyond. Firstly, the act of dewatering had several influences on the surrounding environment, most significantly, the lowering of the water table and compromised ground stability, often resulting in sinkhole formations (Adler, et al, 2007). Secondly, the presence of uranium means that the subsequent AMD decant has a radioactive component (Coetzee, et al, 2006). The exposed mine tailing add to this AMD (at both the surface and groundwater level) through run-off and underground seepage. Finally, that mining operations are spread on and around the watershed means that the now chemically toxic and radioactive AMD decant pollutes not one but two of South Africa's major rivers: the Atlantic draining Orange river and the Indian draining Limpopo river.

Surprisingly, some of the impacts of mining in the area became noticeable as early as 1905, when farmers complained about changes in water quantity and quality (Adler, et al., 2007). However, it was only in the 1950's when environmental issues relating to mining activity became a topic of debate between stakeholders in and around the West Rand (Van Eeden, 2008). For the first time since mining began in the area the effects of certain mining practices were deemed necessary to investigate. On the one hand, the

focus was around the support of geological and geographical research in order to better grasp the richness of the country for mining (Van Eeden, 2008) and on the other, research was based on a cost-benefit analysis of dewatering the underground dolomites (Jordaan, et al., 1960, as cited in Adler, et al., 2007).

However, far from 21st century environmental perspectives, the reasons behind this apparent change in mind-set were primarily economic (Van Eeden, 2008). The significance of the political environment at the time is an extremely important driver behind this one-sided approach. The ruling National Party, which had seized power from British rule in 1948, was beginning to experience a legitimacy crisis in the form of anti-apartheid protest marches. Such opposition began to arise strongly due to the country's immanent emancipation from British colonial rule in 1961 and consequently this transitional period resulted in certain political instability. In order to re-establish its hegemonic rule, the apartheid government not only banned various black liberation movements, but installed a policy of rapid growth characterised by a strong collaboration between state and industry (Turton, 2009).

Unsurprisingly, the entrenched and self-serving principle of 'simple extraction' was deemed most appropriate. The scientifically self-validating claim that the benefits from mineral extraction, despite its environmental impacts, which it must be noted were known at the time, meant that mining was favoured over the interests of surrounding farmers (Adler, et al 2007). Interestingly, this is reflective of the strong modernist principles which are said to have dominated society at the time. In particular, we see evidence supporting the idea that society was dominated by a faith in economic progress and the complementary role of science, whereby a reductive quantitative approach was deemed sufficient in capturing the full reality of the situation (Stirling, 2003). In this case, the flaw in the approach is exemplified by the fact that farmers suffered extensive losses in production. This is specifically because the dewatering meant the drying up of otherwise productive natural springs and surrounding water sources which were essential for all forms of agriculture. What is thus clear here is the overarching power of the combined interests of the state and the mining industry which was put into practice.

Nonetheless, from an institutional perspective, there were various attempts by the government to legitimate their position by introducing certain Acts and laws relating to the use of the environment. Of particular relevance is the Water Act (no. 56 of 1956) “which replaced all previous water-related acts of parliament (and)... made provision for direct state control over areas in which water was abstracted, supplied or distributed” (Tempelhoff, 2006, p.451). This meant government was wholly responsible for the distribution of water to those who were legally entitled and how this water was used. In special reference to mining and water use, it was stipulated in the Act that all mines were required to have a permit to discharge pumped underground water beyond their boundaries (Van Eeden, 2006).

During this time legislation pertaining to the environment itself remained ‘archaic’ or completely absent. In which case, it could be argued, that the true meaning behind the reference to mining activity in the Water Act was substantially different to what it seemingly implies when read today. Furthermore, that such regulations were not strictly enforced did not help either. Highlighted here is the fact that the government’s policy trajectory of the time was geared towards rapid economic growth, with water simply being used a strategic resource (Turton, 2009). Despite a growing global shift in environmental awareness later in the 1970s, largely institutionalised by the United Nations Stockholm conference on environmental protection, government’s perspective on the environmental situation on the West Rand did not change significantly (Van Eeden, 2008). Thus, government essentially left the mining industry to self-regulate, while continuing to support and benefit from the increasingly unsustainable, yet highly lucrative extractive processes (Adler, et al., 2007).

3.5.3 Democracy and the Emergence of the Environment as a Subject of Politics

In terms of the migrant labour system alone, which placed black communities in inhospitable areas in proximity to the mines, the mining industry was an integral part of the apartheid regime (Hamann, 2004). As the anti-apartheid movement gained momentum in the 1970s, issues such as this became increasingly recognised and were incorporated in the struggle under the banner of the ‘environmental justice movement’. Its precise contribution to the apartheid struggle was in bringing issues of inequality in spatial location and social marginalization to the heart of the debate (Ruiters, 2002).

On the other hand, the environment itself and the effect that years of externalising costs, in the form of pollution, had on society and the environment remained completely ignored. Where the concept environmental responsibility did exist, it remained tied to nature conservation and devoid of social content (Bezuidenhout, Fig, Hamman and Omar, 2007). However, as the apartheid regime reached its overdue demise, the costs of industrialisation in particular became increasingly noted (Hallowes and Munnik, 2006). Consequently, from the mid-1990s the definition of the environment was broadened to include the direct ecological impacts of industry and the working and living space of black South Africans (McDonald, 2002). Additionally, the advent of democracy in 1994 signalled a weakening between the mining industry and government and hope for a rights oriented approach to past environmental mismanagement. In order to administer the progressive National Water and Environmental Management Acts (discussed above), three National Ministries were each tasked in some way to address the environmental sustainability challenge (Van Eeden, 2008). These included the Department of Environment and Tourism (DEAT), the Department of Water Affairs and Forestry (DWAF) and the Department of Mineral and Energy (DME)³.

The extended environmental discourse that followed apartheid was largely attributable to the space that the political reform process opened up for progressive civil society organisations and policy entrepreneurs (Turton, 2009). Most significantly, the enlightened sense of combined social and ecological awareness that was engendered during this period saw a new wave of NGOs and civil society organisations challenging industrial environmental malpractices in significant ways (Bezuidenhout, et al., 2007). In the early stage of reform (1994-97) the crafting of environmental legislation (NEMA) and similar policy-making processes were characterised by government consultation with NGOs and transparent multi-sectoral input (Bezuidenhout, et al., 2007). Additionally, during this time South Africa's capital markets were also gradually being re-integrated into the international economy, which meant the mining houses experienced increasing pressure to adapt to international standards (Hamman, 2004). This pressure from abroad, in terms of environmental responsibility pertaining to the mining industry, was largely driven by two factors. Firstly, the fact that most large mining companies were

³ As a need for greater and more efficient environmental regulation, two government-related sub-bodies were formed to ensure a stricter regulatory environment, namely the Enforcement Directorate (also known as the Green Scorpions) and the National Nuclear Regulator (NNR) (Van Eeden, 2008). Their effectiveness, like that of the state departments is also questionable.

listed on the main stock exchanges had significant implications for local operating policies relating to corporate social and environmental responsibility (Hamann, 2005). This in turn was driven by the firm embedding of the sustainable development narrative in both the public and private sector which was occurring mainly in the developed world, but also filtering down to the developing world (Esty, 2008).

Thus, for the mining industry the combined local and international pressures meant that aligning itself with more progressive and holistic codes of business practice was an unavoidable task. Due to its symbolic and rhetorical power the sustainable development narrative was the mechanism most widely employed (Hamman and Bezuidenhout, 2007). Specifically, this was done in the form of sustainability reporting, characterised by both environmental and social disclosure and has been evolving over the past two decades (Dunbavan, 2005). The incorporation of sustainable development into business practice is seen to include, as a primary ethical responsibility, “research and development leading towards better methods to harness our natural resources with minimal impacts on the environment” (Rajaram, Dutta and Parameswaran, 2005).

Further demonstrative of the rhetorical power of the sustainable development discourse and of a greater appreciation of the social and environmental components linked to development in general, is the fact that at the institutional level the concept was also given formal status within the 1996 constitution (Bezuidenhout, et al., 2007). Consequently, both the Environmental Management Act (107 of 1998) and National Water Act (36 of 1998) gave “a degree of legislative effect to the concept of ‘sustainable development’ in keeping with the discourse of ecological modernisation” (Bond and Stein, 2000, p.1).

3.5.4 *Limits Environmental Concern*

The early years of post-apartheid reform and decision-making were evidently progressive, inclusive and somewhat balanced. Although the environment in the ecological sense remained in the background, there was still space for optimism due to the progressive civil society and sustainable development influences on policy-making. The idealist-type institution of democracy that emerged in the early stages, “framed by a liberal and ‘rights rich’ constitution... (and) greater political freedom” (Hallowes and

Munnik, 2006, p.112), certainly boosted such optimism for a more serious environmental approach.

However, with the influence of capital and industry, the 'liberal and rights rich' narrative was transformed to one that was more suitable to their desires. From 1996 there was a discernible shift in discourse, marked by a greater commitment to neo-liberalism and the private sector (Bezuidenhout, et al, 2007). This was made apparent via the introduction of GEAR, which replaced the original RDP approach. Notably, "GEAR foresaw more privatization, deregulation and trade liberalization... was formulated under World Bank influence and implemented without any public debate" (Fig, 2005, p.600). At the same time however, state involvement and influence did place obligations and expectation on industry. This came primarily in the form of the Mines Health and Safety Act (Act 29 of 1996), promoting greater safety measures and the more significant MRPDA (Act 28 of 2002). The latter was aimed at promoting a new mining dispensation whereby State sovereignty over mineral resources was proclaimed and all companies were required to renew their licences (Hamann, 2004).

The positive aspect of such post-apartheid developments meant that the mining companies were no longer a law unto themselves. Rather, they became integrated into the overall development strategy of the country. This is specifically reflected in the resulting broad-based socio-economic empowerment charter for the South African mining industry (Hamann, 2004). Unfortunately, as for the promotion of improved environmental practices, this was left in the hands of a new and therefore legally and administratively weak Department of Environmental Affairs. Furthermore, sustainable development rhetoric and self-regulation of industry offered little hope of seeing transformations in environmental management practices to the same extent that there were positive socio-economic transformations. In some respects it could be argued that what was previously a weak state environmental regulatory system was substituted for a discourse (sustainable development) that "in official and business circles, seems indistinguishable from classic modernisation narratives, with the added business imperative of good neighbourliness" (Bezuidenhout, et al., 2007, p.42). Thus it seems that having been driven by a strong political culture that never had a core ethic of human or environmental rights (Lieberink, 2008), the mining industry has never had any business reason to change its tact.

Under these conditions, the terms 'corporate environmental responsibility' or 'sustainability' undoubtedly lost a great deal of the initial inspiration they engendered for change. Such rhetoric consequently has become the feature of much criticism, often regarded as an attempt to create more positive corporate images while ignoring the fundamental questions of environmental compliance, legacy and ethical responsibility (Bezuidenhout, et al, 2007; Fig, 2005). Thus, it is evident that the internalisation of better environmental management practices, despite being sorely needed to overcome the damage of the past (Bezuidenhout, et al, 2007), cannot be independently relied upon by companies themselves (Hamann, 2004). What becomes clear here is that during the unstable early post-apartheid years, there were indeed attempts (both sincere and not) to move towards incorporating environmental issues into broader governance frameworks. However, overshadowing all such efforts was the persistent desire for capital generation via exploitative resource extraction. Consequently, in remaining consistent to the patterns of the past, up to today, the various government bodies (i.e. DEAT; DWA) have still not managed to show any signs of progress towards changing institutional continuity or addressing past injustices. Rather, they often come up against a more politically supported discourse coming from the DME.

Not to completely discredit steps taken towards environmental reform, over the last ten years combined government and industry efforts have included implementing more effective environmental management plans (EMP's), ensuring the availability of rehabilitation funds, reworking licensing agreements and initiating forums for stakeholder participation (Van Eeden, 2008). Still, with the aim of addressing the West Rand's mining issues, all of these initiatives have been relatively ineffective at engendering fundamental change. Instead, a more striking feature of the dynamics of the processes aimed at addressing the environmental problems facing the West Rand is the conflict and mistrust between stakeholders. This can largely be understood to be as a result of the financially-related secrecy through which the area was co-managed by the state and industry, misleading the public "about the nature of the environmental and other pollution to which they were and still are victims" (Van Eeden, 2006, p.428).

3.5.5 Rudiments of Change

South Africa faces many challenges in terms of achieving a greater degree of environmental sustainability and social equality. This is particularly true for the mining industry. However, despite the bleak outlook painted above, there are signs of positive change. The underlying elements and possibilities for such change, particularly as it relates to environmental governance, stem from what is in fact already in writing. Within the Constitution of South Africa, chapter 2 of the Bill of Rights explicitly highlights the following in relation to the environment and water:

24. Everyone has the right-

- a) to an environment that is not harmful to their health or well-being*
- b) to have the environment protect, for the benefit of present and future generations, through reasonable legislative and other measures that-*
 - i) prevent pollution and ecological degradation*
 - ii) promote conservation; and*
 - iii) secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development*

27. Everyone has the right to have access to-

- a) ...*
- b) Sufficient food and water*
- c) ...*

(2) The state must take reasonable legislative and other measures within its available resources, to achieve the progressive realisation of each of these rights.

Unfortunately, to date these statements have not been fully, or even partially, realised. To a large extent the same discursive continuity that was apparent during the early days of mineral extraction still exists today. Indeed, as Rinkevicius (2000) notes, the hierarchy of a society's values and priorities is not susceptible to rapid changes. So,

while democracy may have allowed for fundamental changes in terms of racial equality, such progressive thought has not had the desired affect on how the environment is managed. This remains true even in the face of growing environmental pollution, degradation and health risks. On the one hand, this could be said to be unsurprising. In-line with Beck's (1992) perspective as to how society evolves into a risk society, it seems plausible that a policy of 'wealth (re)distribution' will continue to overshadow any concern for the environment, so long as economic development is conceived of as the country's overarching 'problem' (or rather as the optimal development strategy). However, on the other hand, this is also an overly realist view, one which even implies that South Africa shows no signs of progressing into late-modernity. In other words, to take that view is to say that all spheres of South African society remain tied to the notion that the environment is separate to society and its destruction has nothing to do with issues of socio-economic inequality or development.

Yes, it is true that South Africa remains dominated by a political agenda of wealth distribution (and accumulation) and development based on economic growth. However, as the country's socio-economic woes and growing environmental risks are increasingly attributed to this approach, what we are beginning to see is a mounting tension (Ndayi, 2009; Turton, 2009). From what was explained in the previous chapter, late-modern societies are more open to the idea that the environment is not external to society but inextricably part of it. It is thought that in those societies experiencing 'changing structures of modernity', environmental debates are now at least as significant as matters of social and material inequality (Irwin, 2001). Can the same be said about South Africa? Certainly there is emerging evidence of this as not only is concern for the environment per se entering the political agenda, but poor environmental conditions are becoming understood as inseparable to those of socio-economic inequality. The prime example is that of mining. Following democracy, the route to solving inequality was narrow, consisting of the legal requirement outlined in the BEE approach which allowed for the accommodation of blacks into the corporate ranks (Fig, 2005). As the environment continues to be put under threat though, it is becoming clear that addressing inequality is also a matter of addressing environmental problems and taking a more holistic approach to development (Kotze, 2006; Fig, 2005). The key driving force behind this emerging discourse comes not from the polity, but rather the grass-roots level. NGOs and civil society are the chief advocates forcing environmental issues into

the socio-economic development debate. Here we can begin to imagine a rising social undercurrent, with the aim of seeing the institutionalisation of more a progressive developmental discourse.

The truth behind the fact that today there is growing unrest and reactivity relating to the current institutional structures is also evident in the numerous examples of failed state activities, such as the power crisis and poor service delivery. These serve as a demonstration of the overall performance crisis that the public sector entered, especially but not only at the local and regional level (Habib, 2009). Here we see some truth in what Simon (2003, p.22) describes as “the potential for conflict between the provisions of the progressive National Water Act and NEMA and the Bill of Rights...and the increasingly neoliberal thrust of national policy”. More appropriately and evident however, within the mining sector, this ‘unrest’ has been theorised by Turton (2009) as a tension between two competing policy perspectives (figure 3.1). On the one hand, there continues to exist what has been the traditional policy perspective of ‘simple extraction’ (i.e. externalisation of costs to the environment and society). On the other, there is also an emerging a policy perspective of constitutional protection and changing governance architecture. This is based on a growing dissatisfaction with current transformation efforts and a desire within civil society for a development strategy that does indeed address historic inequality by means of redistribution (Turton, 2009). In this way, we can say that state capacity and legal and administrative challenges are to a large degree the catalyst behind such tension and not exclusively the neo-liberal economic policy.

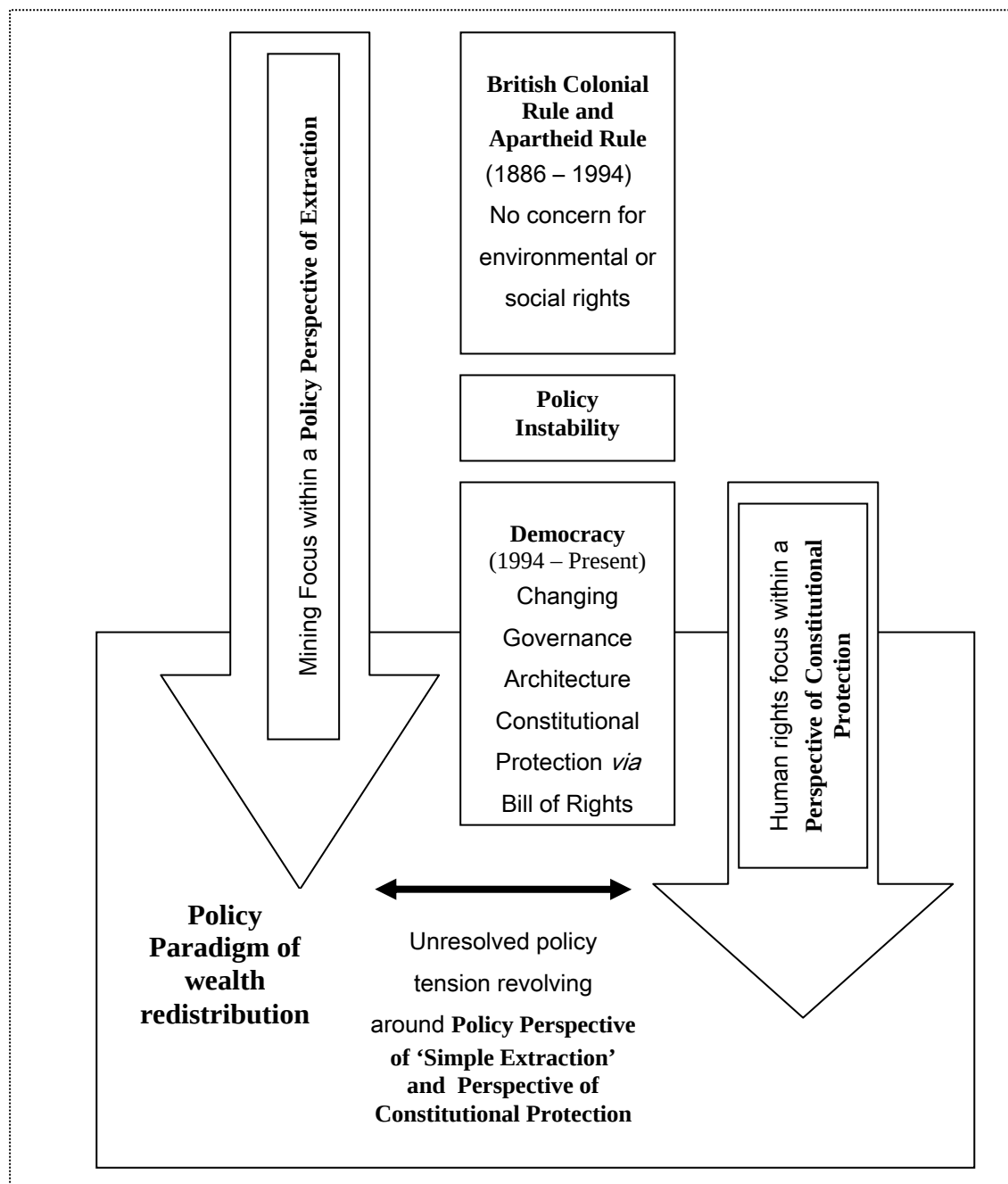


Figure 3.1 Schematic representation of the evolution of mining policy from beginning of mineral extraction (1886) to present (2009). (Adapted from Turton, 2009)

3.6 Conclusion

From the above, it is evident that an emerging tension is developing between two divergent political perspectives relating to the mining industry. Specifically, this tension

is seen to be characterized on the one hand by a continued 'simple extractive' approach, geared exclusively towards economic growth. On the other hand, there is the less entrenched, yet relevant perspective calling for greater environmental sustainability and the realisation of Constitutional rights. Forming part of the argument concerning this research then is that the AMD risk is increasingly becoming a driving force behind this tension. As a socially pervasive and 'non-discriminating' force (Beck, 1992), risk is a common issue for both sides of the debate (albeit in different ways). It then becomes a question of establishing consensus on the risk itself and finding a (democratic) solution. This is where the major challenge seems to lie, because unlike the early gold-mining economy, there is now also government and industry acknowledgment of the problem and not exclusively claims from civil society. The issue now is how to effectively combine all necessary interests (environmental, economic and social). From the perspective of this research, how the risk of AMD and its management is influenced by, and influences, the context in which it arises is pertinent to the understanding and explaining the risk as more than just an objective problem facing society. More specifically, it is argued here that the competing policy perspective for rights-based change can to some extent be characterised by the increasing prevalence of environmental risks.

The environmental and water threat posed by AMD on the West Rand of Gauteng is thus analysed from the perspective that it forms part of the larger development debate taking place in South Africa today. Emphasis is placed on the possibility of a changing role for the 'stakeholder dimension' to help encourage a more balance approach to development. Having provided both a theoretical grounding in the concept of risk (chapter 2) and the socio-historical and political background to the AMD risk itself, the next section analyses how the two relate. In particular, Beck's risk society theory is employed as a means of generating insight into the issues at stake concerning the management of the risk. Placing the findings from field research undertaken within the theoretical constructs of the risk society theory, it is hoped that novel and valuable insights will be gained into a problem that has the potential to cripple South Africa.

CHAPTER 4 – DISCUSSION

4.1 Introduction

The idea that acid mine drainage currently decanting from the West Rand mining basin poses a threat to both the environment and humans is undisputed. Yet, at the same time it is still an issue that has, and continues to, engender contestation among stakeholders. Described as an “emotional” and “sensitive” issue, the environmental risk of AMD is to a large extent the epitome of those risks which are characteristically prevalent in a ‘risk society’. As a result, the social and political dynamics that have been set in motion are demonstrative of a risk society itself- a society unable to (physically and institutionally) manage and control the negative ‘side-effects’ of its process of modernisation. In an emergent sense, we are thus witnessing in South Africa a society necessarily having to shift away from any preconceptions of certainty and control. Describing the social and political dynamics that AMD has affected and examining the challenges that the conditions of the ‘risk society’ pose for dealing with the problem and finding an effective solution are the focus of this discussion. Part one describes the construction of AMD as a risk and the socially destabilising effects in relation to the risk society thesis. Analysing the risk of AMD in the context of South Africa using the framework of the risk society thesis presents a highly unique and compelling perspective of what the issue actually means for the country at large. Applying what has become a timely and distinguished social theory in this unexplored context therefore presents the opportunity to enrich the theoretical insight. Importantly, risk society is the examination of the transition from industrial society to reflexive modernization (Beck, 1992). Having existed for over seven years, one can therefore expect certain reactive and pro-active developments to have taken place in an attempt to solve and mitigate the risk. Therefore this chapter also discusses those developments in terms of the process of governance and decision-making and the challenges faced. Explaining what they represent for how the situation is currently being dealt with and for what the future may hold for both the governance of AMD on the Witwatersrand and the institution of environmental governance in South Africa more broadly is the focus of the second part.

4.2 The Social Construction of AMD as a Risk

The question concerning this section is to what extent the risk posed by AMD on the West Rand has led to a situation reminiscent of Beck's risk society. The key themes from risk society that inform this analysis are: organized irresponsibility, the challenges for science in dealing with risk and the emergence of subpolitics. An overarching theme in risk society and arguably its main objective is to bring to the fore the social significance of risk concerns. Thus, for the first part of this discussion it is necessary to analyse how the risk of AMD has been socially constructed. I am in agreement with the view that "environmental issues... only become socially relevant when acknowledged by human beings" (Hogenboom, et al, 2000, p.93). Therefore, it is important to define the various social actors and groups which have transformed the risk into one which is socially relevant and thus given public meaning to it. Table 1 (below) corresponds with those actors and groups who are involved in the problem on the West Rand with what Hannigan (2000) lists as 'the six conditions required for the construction of an environmental risk'. Essentially, these actors and stakeholders and their interaction are what give social meaning to the risk posed by AMD. Emerging from this collection of divergent views is an ongoing political debate, overwhelmed by conflict relating to both the significance of the risk and to finding a solution. These views are characterised by those actors who give scientific meaning to the problem (WRC; CGS; CSIR), social meaning (Mariette Liefferink and FSE), economic meaning (WUC) and political meaning (DWA).

Condition	Represented by
1. Scientific authority for and validation of claims	Water Research Commission (WRC), Council for Geosciences (CGS), Council for Scientific and Industrial Research (CSIR)
2. Existence of 'popularisers' who can bridge environmentalism and science	Mariette Liefferink
3. Media attention in which the problem is 'framed' as novel	Numerous media reports on the problem have featured in newspapers

and important	(the Star, the Beeld, the Sunday Times, Mail and Guardian), magazines (Financial Mail, Mining Weekly), radio (702), television (50/50, eTV news, Carte Blanche)
4. Dramatisation of the problem in symbolic and visual terms	Often cited dramatically as a threat to South Africa's water supply and resources in the media (e.g. "A rising acid tide in South Africa" Mail and Guardian, 2005; "Where poison water seeps from the earth" – Saturday Star, 2010)
5. Economic and political incentives for taking positive action	WUC as the primary private sector investor seeking to implement a profit-generating solution. As the custodian of SA's water resources, the DWA has a political incentive (and responsibility) to take action.
6. Emergence of an institutional sponsor who can ensure both legitimacy and continuity	Federation for a Sustainable Environment (FSE) as the main NGO involved.

Table 4.1: List of stakeholders directly and indirectly involved in the social construction of the AMD problem of the West Rand.

Immediately evident here is the idea that when a risk becomes public discourse, as AMD has particularly since 2002, an exclusively natural-science based approach is not adequate. Such a singular outlook denies the important and legitimate dimensions of the problem which are grounded in social relations other parameters (e.g. political and institutional ideologies) (Hogenboom, et al, 2000). However, this is not to reject the important role that science has, and continues to play in addressing the problem. Rather, what needs to be emphasised is the importance of extra-institutional (i.e. non-scientific, non-governmental and non-economic) actors for bringing the true nature of

the problem to the forefront of debate. In this case, the involvement of an NGO and ‘popularisers’ such as Mariette Liefferink have proven to play the vital role of bringing the AMD problem out of an otherwise exclusively scientific framing. For a country like South Africa this is an extreme necessity, where the water pollution poses the greatest threat to numerous communities living nearby or downstream from the point of decant. These communities (many of which rely on the affected rivers and streams as their sole source of water) are some of the poorest and most vulnerable in society. Devoid of the efforts from Mariette and the NGO, it can be presumed that their interests would have either been significantly downplayed in the current risk agenda, or even altogether forgotten. Furthermore, characteristic of many stakeholders involved in environmental issues on a moral and ethical front, is that they often act as ‘whistleblowers’. In turn, and by virtue of their role as ‘promoters’ of the negative aspects of industrially-produced environmental problems, a dynamic relationship invariably develops between whistleblowers and the media. This results in the problem being brought to the public as a social risk. Indeed, the real meaning (i.e. socially relevant) of the AMD threat has been brought to the attention of the public since 2003, whereby numerous media publications have given extensive attention to the social character of the problem after having followed Mariette’s exploits. When asked about her role in the problem, it was almost unanimously agreed upon by the interviewees that she was both an important and significant part of the political debate. With regards to her role as someone helping to broaden the scope of the risk agenda and reveal the problem as being more than an isolated environmental threat, one respondent even stated that:

“...in the case of the West Rand, it has come down to Mariette Liefferink, one person, it’s a one man band”

(Dr Anthony Turton, scientist, private)

It is thus fair to say that without her involvement and NGO support, the important social dimensions of the problem would not feature as prominently in the media, nor would AMD be the political nerve it is today. The role of non-traditional actors and the implications for the political dimensions of the AMD issue are discussed in more detail later. For now the point here is to highlight the fact that the AMD risk is by no means one which can be defined in scientific terms alone. Instead, it needs to be examined as one which is impossible to separate from society. From the above, one can begin to see

the truth behind this notion. Following any discussion regarding AMD it is almost impossible to avoid noticing how the issue of the 'socio-structural' (Irwin, 2001) state of South Africa also begins to emerge. More specifically, when debating the problem of AMD we see that it begins to reveal, and forms part of, a number of the country's larger social problems. For example, the water crisis, socio-economic under-development and the marginalizing of the poor. Thus, what is made apparent is that an environmental risk is in fact merely part of the broader social context in which it is situated. A particular defining theme of many late-modern social theories (including that of risk society) is that the relationship between society and the environment becomes challenged. Where modern society is founded on the assumption that the environment is external to society, risk in late-modern society has the effect a destabilising such views. Indeed, we can see here that it is inescapable to think of mine-water pollution only in relation to the environment. Instead, because AMD is understood as a *risk*, when we talk about AMD we talk of society too... sometimes implicitly and other times explicitly.

Ultimately, what is now clear is the fact that AMD is more than just a problem for the environment and more than just a problem about which science can reveal all. As a problem which also as yet has no clear solution, it has in reality become a fundamental institutional and political challenge. Thus, when viewed from the perspective of late-modern social theory, what we see is that the risk of AMD is in fact a far more complex and challenging issue for society to deal with than may otherwise have been thought. For a country such as South Africa this is even more so given its socially ambivalent nature. Focusing directly on the theory of risk society now, the following sections elaborate on these points. Specifically, the aim is to reveal what the risk of AMD really means in the context of South Africa and in what way it is transforming the relationship of "society to the hazards and problems produced by it" (Beck, 1996, p.29).

4.3 South Africa as a Risk Society?

Risk society is defined as the stage of development in modern societies when the consequences of the technological innovation and industrial expansion which defined those societies begin to emerge more explicitly. That is, they begin to become understood as risks which threaten the very existence of society. This advent transforms what were previously defined as modern societies into risk societies.

Following the line of thought that modern societies are becoming late-modern societies, here risk is seen to embody the principal mechanism forcing this transformation. Characteristic of the risk society is that they are witness to endless debates amongst both the public and private sphere concerning how to manage those manufactured threats. Key to Beck's description of how modern societies become risk societies lies in what is described as a shift away from the "conflicts of a 'wealth-distributing' society" (Beck, 1992, p.20) and a move towards a society where the conflicts (politics) of a 'risk-distributing society' dominate. The risks faced by society begin to have a huge bearing on the way society defines itself. In the context of South Africa this idea presents a very interesting point of departure, for it is a country described as an 'emerging economy' and one where wealth *re*-distribution informs its political economy. So the question to ask is when risks such as AMD begin to inform political debate at the highest level, does that same theoretical insight stand? Furthermore, risk societies are defined as those in which "awareness of large-scale hazards, risks and manufactured uncertainties sets off a dynamic of cultural and political change that undermines state bureaucracies, challenges the dominance of science and redraws the boundaries and battle-lines of contemporary politics" (Beck, 1998, p. 12). However, considering the political discourse and historical backdrop that the issue of AMD is set against, deeper analysis is required in order to accurately gauge what the conditions of risk society mean for dealing with the problem and more broadly the political system in South Africa. With reference to the theory of risk society, two questions are thus necessary to frame this analysis:

- a. What are the implications for the management of AMD in this context?
- b. In what way are certain social and institutional dynamics transforming in response to a risk which poses a threat to large part of the country's water resources?

Firstly, the problem of AMD is no doubt a parallel risk to those which inform a risk society. It follows quite uncannily with the description of the risks that Beck sees as demonstrative of late-modern (risk) societies. Specifically, risks in risk societies are

unlike risks in first modern societies⁴ which were essentially: visible; material in their consequences; insurable; limited in their scope of destruction; blame could be assigned and dependent on individual decisions. In contrast, the risk of AMD is the converse of these. It is invisible at its source; the consequences remain material only insofar as the immediate natural environment is concerned (health effects remain impossible to obtain consensus on); it is uninsurable; its scope of damage is indefinable, as its time-period; responsibility lies not only with the mines, but their predecessors and government and its predecessors, and finally, one cannot choose to avoid the risk of water pollution (particularly if it is in one's only source of drinking water).

Despite this convenient fit however, a whole new situation develops when a risk of this dimension occurs within a society that remains divided along socio-economic contours and where a political ideology of economic growth and re-distribution are central. Beck himself acknowledges that contemporary societies indeed differ with regard to the overlaps of conflicts between the distribution of wealth and risk. For South Africa, the 'potentially devastating threat of AMD', which is by now the well established public discourse, can thus be seen to help transform the country into what has previously been defined as a 'double-risk' society (Rinkevicius, 2000). Where the more 'conventional' modern societies reach a point where they reflect on their circumstances of risk, South Africa instead faces the difficult task of having to reflect on both its circumstances of socio-economic risk and environmental risk simultaneously. Undeniably, this 'double-risk' character renders the political debate more complex. In particular, due to the conflict between the agendas of risk and economic growth, decision-making is that much more drawn out and finding a solution that much more difficult. It is thus unsurprising that a unique typology of risk society should emerge. Thus, the role of the following sub-sections is to now examine what exactly the social and political implications are in the case of the West Rand.

⁴ Beck does not deny the existence of such risks in industrial society. Rather the point is that due to their accumulation, late-modern societies are forced to become more aware of such risks. Accordingly, it is understood that one of the consequences of the modern approach to dealing with environmental risks in industrial society is that it had the effect of marginalizing those risks which were less visible and material. Again, this highlights the central notion that modern societies transform into late-modern (risk) societies as a result of those previously ignored consequences of industrial and economic growth.

4.3.1 Organized Irresponsibility

The concept of 'organized irresponsibility' illustrates just how dealing with AMD transcends conventional institutional mechanism for obtaining compensation and assigning responsibility. The concept of 'organized irresponsibility' is explained by Beck (1998) as the idea that in risk societies there exists paradoxically continued environmental degradation and expanding environmental law and regulation. Yet at the same time, no individual or institution seems to be held accountable for anything. In the case of AMD, legal enforcement of environmental management standards and more specifically water quality standards cannot be placed on the mines alone. This is because AMD is a problem which is the culmination of over one hundred years of underground mining. Therefore, those companies which created the underground shafts (which are responsible for the decant) cannot be held accountable for the obvious reason that they are no longer in existence⁵. Adding further complexity to the situation is the fact that all the current mining operations on the West Rand do not even mine underground. Yet, there still needs to be some accountability, particularly financially if the risk is to be managed.

This raises one of the central arguments around which the current political debate is evolving: how to assign responsibility. In this way, the problem of AMD as an historical problem relating to past irresponsibility from both industry and government transcends the ability of any type of environmental management strategy. Rectifying that is thus one of the major struggles and essentially the foundation upon which the conflict of today is built on:

"...it's always challenging to quantify this stuff. Do you quantify it by mining rights, property rights, surface rights, as per who was responsible 20 or 30 years ago? It's not that easy."

(Marius Keet, Regional Director, DWA)

Currently, apportionment of liability has been 'calculated' in terms of the percentage of water that must be treated per relevant mining company relating to their total area

⁵ Since gold mining began in 1887, over 20 different mining companies have mined on the land from where the decant currently occurs.

footprint. Where no current mining operation is in existence, government has assumed responsibility. The percentages are as follows:

- Rand Uranium: 46%
- DRD Gold: 44%
- Mintails: 0.8%
- Government: 9.2%

In the context of South Africa, the enforcement and process of assigning liability is also inextricably linked with the prevailing political environment. Where the (re)distribution of wealth (i.e. 'goods') is the focus of the political discourse, having to now bargain for the distribution of liability (i.e. distribution of 'bads') seemingly works against the current institutional arrangements. This demonstrates the changing pressures experienced by both the mining industry and government. Specifically, the public nature of the problem means that now industry interests and government policy can no longer operate under the assumption that their roles are to simply extend economic benefits to society. Instead, they are now forced to balance between contributing towards economic growth while equally managing the social and environmental risks generated by that very process.

Risk society argues that during the stage of industrial society, environmental risks generated by industry were easily accepted as the necessary 'side-effects' for progress. By implication, the economic contribution would be assumed to neutralize and in fact override those risks. However, the advent of the AMD catastrophe has demonstrated the flaw in this logic- on top of posing a risk to society and the environment, AMD is now also considered a risk to the mining companies themselves:

"At the moment we are doing what we can from a financial constraint. This mine does not make a profit, yet we are spending on cleaning of water because of our responsible citizen nature of managing the business. Should we stop pumping and close the mine, it becomes a government problem... If the gold price drops this mine will close and

overflowing will happen. Financial viability of the company is very important in the short term and therefore we can't guarantee (economic or environmental) sustainability."

(Louis Kruger, Sustainability manager, Mintails)

What we see illustrated here is the irony inherent in the debate regarding the distribution of responsibility. That is, that the risk AMD poses to society has been generated by the very same process which tries to alleviate socio-economic ills. Necessarily, the question society has to now ask itself is how might it be possible to realize a balance between environmental exploitation and environmental sustainability? While this is certainly not a new question, it does highlight a key theme of risk society. What we see is that it is becoming more and more apparent that balancing this equation is an impossible task given the current institutional (and ideological) apparatus at hand. Indeed, the AMD risk reveals the fact that the risks of risk society cause special problems for politics and decision-making because the truth is that "we no longer have the means of redressing the imbalances caused by risk" (Irwin, 2001, p.58). Subsequently, it can be inferred that a major implication of the AMD threat is that it reveals the fact that the current institutional logic of economic distribution and economic growth cannot, and should not, be expected to be capable of tackling the risk. Legal enforcement of responsibility relating to this unprecedented risk using the same framework for which wealth distribution is assigned is wholly inappropriate and a primary reason behind the political conflict.

In addition though, it must also be explained that certain arrangements do exist in the mining industry and legislation with the aim of avoiding or mitigating such unforeseen problems. This comes in the form of a mandate requiring the mining company to set up what is called a rehabilitation trust fund. By law mining companies are obliged to put away money in order to be used at a later stage (usually following closure) for environmental rehabilitation. The MPRDA states that "an applicant for a prospecting right, mining right or mining permit must ...before the minister approves the environmental management plan...make the prescribed financial provision for the rehabilitation or management of negative environmental impacts" (MPRDA, Act 28 of 2002, section 41(1)). Indeed then, there are certain insurance-like mechanisms in place for dealing with future environmental issues. The unfortunate side is that "since most underground mining on the West Rand Goldfield ceased before the promulgation of

legislation requiring proper financial provision for closure it is unlikely that adequate funding is available for proper closure of the mines⁶.” (van Tonder and Coetzee, 2008). Considering this fact, it is difficult to argue against the efficacy of these types of modern institutional means for managing the environmental impacts. One cannot undermine this provision since it has not been implemented. Perhaps then, the context of the risk should be seen to play a large role in undermining the integrity of modern environmental management tools instead. This is an easier argument to make and one which would be compatible with many assumptions regarding the poor enforcement of regulations in South Africa. Here the status of South Africa as a developing country could be blamed for the unmanageable nature of the AMD risk. The risk society theory claims that risks such as that of AMD are unable to be negated by mechanism of modern institutions. In reply, one can instead say that the contextual nature of the risk and the poor implementation and enforcement of environmental regulations on industry are to blame. Certainly, the view that capacity constraints for government do not allow them to forcefully and adequately ensure such measures are taken also resonates strongly with this argument.

Nonetheless, a further argument in response to this is able to demonstrate that indeed the conventional instruments (rehabilitation funds, environmental management plans etc.), even if available or properly implemented, would have proven ineffectual. That is because in the case of AMD, while past financial input and proactive (as oppose to now reactive) measures certainly would have reduced the severity of the problem, it almost defies monetary value⁷. This is not to mention the socially irrelevant nature of such instruments either. Additionally, as the underground tunnels are the cause of the problem, no amount of environmental regulation would have sufficed. In other words, underground mining is almost synonymous with AMD- to mine gold one must dig underground. So, unlike other certain other environmental impacts of industry that may be more or less fully resolvable or avoidable, AMD is a problem to which no short-term remedy is available. Nor is it one which can be avoided. Therefore, what transpires is a problem that has to be managed almost indefinitely. Financial provisions would only

⁶ Proper funding for closure of the mines would include financial provisions for dealing with AMD, as this is one of the key environmental issues.

⁷ It has been estimated that the cost to treat the AMD in the West Rand basin amounts to approximately R 28 800 000 per year (Lieberink, 2009). In no way would remediation funds have been able to cover this cost for any significant length of time.

contribute on a small (short-term) scale by temporarily covering pumping costs. Following the depletion of those funds, the political conflict and actual environmental problem currently being experienced would have simply occurred in the (near) future. The point is it still would have occurred. Also, in this case where industry has failed, the argument that government should therefore take matters into their own hands holds little promise:

“Government can’t just go out there and embrace this stuff and say we are going to do something about it, because what do you do? No one actually knows what to do about it.”

(Dr Anthony Turton, scientist, private)

Again then, this paints the picture that South Africa indeed is in a situation of a risk society. The concept of organised irresponsibility helps demonstrate the nature of the problem as one which transcends any assumptions regarding the capabilities of the institutions of modern society. Specifically, it as illustrated the implications of a manufactured risk for the way in which modern institutions have sought to provide security. The following section now goes on to examine the implications for the institution of science.

4.3.2 The Changing Role of Science

An important implication of a risk society is that certainty can no longer be guaranteed. In the era of industrial society, it was taken for granted that the authority of science could guarantee certainty over the extent and meaning of environmental risk. Today, the contestation evident amongst scientific claims relating to the degree of water pollution in the West Rand and the explicit uncertainty expressed by scientists challenges these assumptions. In contrast, when the problem first arose, many scientific based-decisions were made in confidence of certainty. These have however since proven costly and inaccurate. Firstly, early remediation measures for dealing with AMD decant involved the pumping of the contaminated water into holding pond and dams (Cobbing, 2008). This was seen as a suitable short term measure. It later turned out to in fact be a short-sighted measure, in that many of the dams were found to be situated on dolomite, meaning that a portion of the AMD water simply flowed back into the local groundwater

system. Another scientific error has since proved to be what is called the Environmental Critical Level (ECL). This term refers to the maximum level at which accumulated water in the mine void can reach before overflowing into the surface environment (van Tonder and Coetzee, 2008). It was initially assumed that if water was kept below this level via pumping, the contaminated water could be contained in the underground compartment in which it lay. Subsequent studies however, have indicated that even if water is kept below this level and not rise to the surface, it may still be able to penetrate the compartment's rocky walls which are now thought to possibly be non-porous (Cobbong 2008; van Tonder and Coetzee, 2008; Zorab, 2009). If this is the case, underground water sources in adjacent compartments will also have been contaminated by underground AMD which are otherwise unaffected by mining⁸.

The key concern of scientific uncertainty is that it not only elicits further political conflict, but depending on where those claims come from it can have a significant effect on how the problem ends up being dealt with. The main fear is that uncertainty regarding the details of the risk could lead to complacency and inaction. To this end, the above illustrates that even if action is taken, the mistakes and uncertainty of science can prove costly, often adding to the risk. Additionally, there is also the threat that the solution or action decided upon is done so on the basis that it serves certain individual or group interests rather than the society at large. Again, dealing with the AMD problem is thus not only scientifically problematic, but politically problematic too. The next section specifically examines the role that science is playing in terms of finding a solution to AMD and the institutional challenges being encountered.

4.3.2.1 Science as the 'Only' Solution

Not only is scientific uncertainty a problem, but as there is also the danger regarding the normative assumptions of those scientific claims. The consequence of which has led to the AMD risk being treated by certain sectors as one where science is singularly assumed to constitute the vehicle through which a solution shall be found. Those who hold this position specifically believe the solution lies in WUC- the proposed water

⁸ One of the key concerns regarding contaminated underground water is that nearby springs will begin to produce polluted water. Furthermore, downstream the Cradle of Human Kind World Heritage Site would be receiving water which may threaten certain historically and archaeologically significant structures.

reclamation and treatment company. The fact that the project is in collaboration (albeit indirectly) with the mines raises several issues as to the objectivity of the project and therefore, science and technology. The main fear is that for a society faced with risk, science is used for the benefit of the mines, whereby they are able to forfeit any direct responsibility. What we see is that all possible solutions have come down on one level to science, and on another, to this single proposition. Relying on science alone for a solution and “putting all our eggs in one basket” as one respondent called it, poses other problems:

1. Despite the perceived credibility of the project, concerns have been raised as to the quality of the treated water which will be sold for human consumption.
2. What about the already contaminated water sources, degraded environment and possibly adversely affected communities?

In response to the first issue, to be sure, although “the water will conform to the South African Bureau of Standards and quality checked by Rand Water” (Jaco Schoeman (WUC, managing director), quote from Rosebank Gazette, 2009), there is doubt over the ability of the technology to provide completely contaminant free drinking water:

“No process removes 100% of the impurities in AMD 100% of the time”

(Dr Anthony Turton, quote from Prinsloo, 2009)

Interestingly, WUC themselves admit this same fact:

“WUC’s treatment technology does not, by their own admission, remove 100% of the impurities from the AMD 100% of the time”

(Noseweek, 2009)

With this the case and considering that at the same time the water shall be treated to SABS standards, what comes in to question is the classical argument of ‘who is to determine the standards and what constitutes a risk?’ This is essentially then an issue of power. For if the project is accepted it will mean that science is not in fact acting as an objective tool in addressing the risk. Instead, by virtue of an institutional response based on the ‘out-dated’ assumptions of scientific certainty (which all water quality

standards necessarily rely on), it will mean that science has been used to serve the interests of some, while putting others in a different position of risk. On the one hand, mining interests are served as they no longer have to claim responsibility for the problem. This essentially allows them to dodge the polluter-pays-principle, thus also revealing the ineffectiveness of modern environmental law in an age of risk. Also, WUC's interests are served via the presupposed and institutionalized assumptions of science. In other words, by assuming an instrumental approach to decision making, the ethical considerations of the decision are ignored (Stirling, 2003) whereby they are able to profit from what is a selectively favourable solution. On the other hand, society at large is unwillingly put in a new position of risk in that their tap water may now contain trace elements of AMD. Indeed, this quote provides a perfect illustration of what has been outlined above and how science in the era of risk society is an inappropriate tool on its own:

“WUC is a classic example of an optimal solution at the level of the mining sector. It optimises the solution for the mines, but it is a sub-optimal solution for others (i.e. society at large).”

(Dr Anthony Turton, scientist, private)

Ultimately, the danger here is that by giving into the idea that science is the only way out of the situation, it will result in society's retreat from a risk society, rather than the advancement towards reflexive modernisation. In other words, if the WUC project is government endorsed, the circumstances of the risk society generated by AMD would have strengthened, rather than weakened the foundations of modernist assumptions. We would thus be witnessing the continuity of those same principles that brought us to this point of risk: “dangers are being produced by industries (mining), externalized by economics (WUC), individualised by the legal system (right to sell treated water), legitimized by the sciences (SABS approved) and made to appear harmless by politics (not 100% clean, yet meets the imposed quality standards)” (Beck, 1998, p. 14). However, the conundrum is that a solution is needed extremely urgently. So, on the one hand science cannot be completely sidelined, but nor can it be used as the exclusive tool for guiding the direction of the debate. For risk societies this is one of the main institutional complexities- unquestionably relying on science and the experts, is now out of the question. Yet, who is to be relied upon and how does society reposition science

within an objective and democratic framework? This then is the challenge that the AMD risk poses for the institution of science and science-based decision-making.

Indeed, science is vital for working towards a solution, but cannot be assumed to be the be-all-and-end-all. For if this is the case, it shows South Africa remaining within a narrow modernist framework. The consequence being that the solution will be suboptimal. In this example we see the exact opposite of what defines a 'good governance approach' (if the proposed WUC project is to be approved by government). Instead of a multi-disciplinary approach, what we will have is one that is dominated by science, and therefore dominated by certain interest groups. This brings us on to the next question concerning the already contaminated environment and communities that have been exposed to the risk for so long. While the technological solution may resolve the problem in the future, what about the already incurred 'costs'?

Beck claims that risk has the effect of levelling between classes and groups of society (Beck, 1998). This proposition however overlooks the massive socio-economic divides in developing countries. It is clear that the general response so far has been to solve the physical problem of AMD rather than integrate it into addressing other problems simultaneously. Essentially, AMD results from mine closure, which also implies job losses for the nearby communities, thereby compounding the socio-economic impacts of the risk (Oelofse, et al, 2008). Thus, a possible solution may be through job creation at the local community level. In this way, workers who face redundancy could be re-employed on the basis of administering and managing the problem at site, thereby 'killing two birds with one stone'. However, such examples of an alternative solution are scarcely mentioned. Instead, it seems an unsustainable neo-corporatist approach continues to be favoured, arguably due to the potential benefits offered to those in power. In this way, it may be proposed that when developing countries face conditions of risk society, they may not as easily make the transition towards reflexive modernisation. Instead, they choose to remain tied to the assumption of linear economic progression, as oppose to appreciating the qualitative aspects of progress. Also, the fact that South Africa is still a young democracy means that risks such as these are often regard as threats to government legitimacy, rather than opportunities. A fear which is justifiable, given the fact that the ANC is facing mounting critique for its poor record relating to social and environmental justice (Simon, 2003).

Indeed, the economically and politically destabilising effect of AMD has struck fear into a number of South Africa's already sensitive spheres of government. The possibility is therefore that the risk of AMD may be dealt with as problem which threatens the legitimacy of the polity, rather than one which threatens society at large. Indicative of this is that government's initial response to the problem has been seen to be one of avoidance:

"Since 2002... we argued that look, you have to get all these other people involved, but the state said no its got nothing to do with them, you the polluter...in 2005 they only issued a directive, so for three years it took them to think about it and then they said you three guys (three mining companies on the West Rand) get together and sort it out"

(Rex Zorab, Sustainability manager, Rand Uranium)

So, what we see here is a response where government has tried to hand the risk off to the nearest available party (the mining industry) in order to avoid further risk to their legitimacy, as they are well aware of the difficulties inherent in trying to manage the problem. The danger is that in contrast to risk having a levelling effect, it may in fact create more division. Firstly, if a purely scientific and technological response is followed, it would allow the mining industry to separate themselves further from the communities and environment already impacted. They will no longer be forced to get involved at the 'lower end' as the political incentive to do so is undermined. Furthermore, should the WUC project go ahead, an elite interest will be benefiting financially from the risk while at the same time the conditions facing those already poor communities at location will remain largely unchanged. The pollution already in the environment will not simply disappear. There is thus the possibility that when a risk is handled from a narrow modernist framework, the inherent institutional power structures can in fact exacerbate certain social divisions. That is to say, while some are able to effectively distance themselves from the risk, other have no choice and end up facing exponential risk as the problem continues to go unresolved.

Ultimately, what is most clear is that under these conditions of risk society, science is not the embodiment of objectivity. As Beck (1998) claims, the authority of science for perceiving risk breaks down and its function is thrown into question. However, in a

political environment still dominated by economic pursuits⁹, it should not be assumed outright that this means that science necessarily avails itself to more a democratic decision-making process. As the above suggests, there is also the acute chance that, in contexts where risk society is less explored, science may be cunningly used to re-instate the legitimacy of those previous modes of enterprise that created the risk in the first place. Moreover, there also exists the fear that the pressing nature of the AMD threat could mean that science is turned to out of desperation, rather than exclusively as a means of serving interests. In this case, South Africa is unwillingly and unintentionally put on a path towards the possibility of a greater or new risk.

To be sure, this critical analysis of science and its role in the politics of risk is mere speculation. The WUC project is still be negotiated and there is evidence both supporting the prospect of its approval and evidence suggesting otherwise. The point though is that this ambivalence resonates strong with the overall idea of risk society- the difficulty for modern institutions to makes decisions relating to risk. Specifically, that there is disagreement between industry and government on the project hints at the prospect of reflexive modernisation. Additionally, the involvement of civil society has shown to be an important force in revealing the rhetorical ruse used by certain parties in the scientific debate. However, the difficulties in knowing the problem and the policy difficulties posed by science in terms of a solution suggest there exists the equal danger of a shrinkage in democracy and creativity when it comes to addressing the problem. This is summed up by the fact that on the one hand the modern, scientific approach to risk is failing and on the other there seem to be no other solutions to an immanent disaster. The fear is that the decision-making institutions will succumb to science in its modern framework, thereby ignoring its social character. The reason for the inappropriateness of this approach is the fact that conditions of risk society demand more flexible structures and cautious decision-making (Benn, 2004). The current approach instead shows an over reliance on a centralized state-driven decision-making process as it pertains to science. In which case the polity risk getting caught in the mistakes, modes and uncertainties of scientific knowledge all over again (Beck, 1998).

⁹ ...as oppose to those in traditional risk societies where economic pursuit is still a dominant agenda but less so for the purpose of addressing socio-economic inequalities.

Up to this point the concept of organised irresponsibility and the changing role of science have been discussed in isolation. As conditions of a risk society, both are important issues facing South Africa as it attempts to deal with the AMD threat. Essentially, both concepts have demonstrated the inability of modern institutions to cope with the risk crisis engendered by AMD: legal enforcement of environmental standards and regulation has failed to reduce the threat; economics has proved a hopeless solution via the apportionment of liability; government has shown to be incapable (and unwilling) to protect its citizens from environmentally related risks or to control those who produce the risks; and science has proven sceptical at best in its ability to provide a clear-cut solution. While this is demonstrative of Beck's prophecy, evidence also suggests other implications of risk in the context of the West Rand. Most notably that a strong modernist approach to risk and environmental management can remain robust, despite obvious failings and inadequacies. However, as yet the larger political and social dynamics that this state of uncertainty and uncontrollability has engendered has not been covered. Talking of these institutional failures separately paints only half the picture. In reality, they are all simultaneously entangled within the melting pot that is environmental politics. Thus, the next section describes the broader political arena as it relates to the AMD risk. This arena is defined by the overarching concept of 'subpolitics'. As the heart of risk society theory, it looks at the changing dynamics that take place between social actors in the face of these destabilising conditions of risk society. As is illustrated, this proves to be particularly important for addressing the many continuities in terms of traditional institutional approaches which the above has demonstrated. Specifically, the role of civil society is expanded upon as a way to initiate and manage change.

4.3.3 Emergence of Environmental 'Subpolitics'

Beck proposes that under the conditions of risk society, traditional politics no longer holds. By virtue of the fact that even the dominant institutions are able only to simulate power in a risk society, the traditional political sphere proves itself to be ineffective for managing and distributing risk (Beck, 2000). The result of which is the emergence of a new and alternative form of political interaction- 'subpolitics'. Here we see previously depoliticized areas of decision-making become politicized through the perception of risk. Beck specifically calls for these decision-making arenas to be "opened up to public

scrutiny and debate” (Beck, 1998, p.18). The concept of subpolitics then is perhaps the most fundamental theme in the risk society theory. So far, this discussion has exclusively analysed the destabilizing force of risk for modern institutions. Economics and the insurance logic are shown to be incapable of remedying the consequences of industry, while the previously unrecognized or hidden dangers of science have been made apparent. The emergence of subpolitics however, points not only to the unsettling and destabilizing implications of risk for modern institutions (as new debates are engendered), but also the possibility for change. Essentially, it is within the arena of subpolitics that we can begin to see modern society become reflexive- that is, concerned with its unintended consequences, risks and foundations (Beck, 1998).

Specifically, in light of subpolitics being a catalyst for reflexivity and institutional change, the importance of the role played by ‘grassroots’ politics (NGO’s, activists, environmentalists) is strongly emphasised and highlighted in Beck’s work. In this way, subpolitics allows for the creation of a new force, driven by extra-institutional actors, for social control of the corporate sector and better implementation of government regulations (Matten, 2004). Furthermore, the inclusion of such actors represents an important catalyst for achieving a more democratic and socially relevant risk discourse. Indeed, the role played by non-government and non-mining institutions has had a significant effect on how the AMD problem has been brought to the public and how it has become institutionalized. However, apart from the importance of exploring civil society as a new political component, another seemingly relevant subpolitical dynamic also became apparent during the research process. That is, the changing relationship between government and the mining industry. The reason this can be seen as ‘subpolitical’ rather than political, is that the advent of risk gave rise to new debates between the two institutions which necessarily occurred beyond the formal political boundaries. Thus, for the following discussion subpolitics is defined as the complex and changing interactions between government, the mining industry and civil society (NGO’s, activists and other non-governmental or industry related stakeholders, such a research groups and the media).

4.3.3.1 Subpolitics: Government and the Mining Industry

In the theoretical framework of modern society, the relationship between government and industry can be conceptualized as one whereby the two are institutionally separate, yet at the same time mutually dependent. On the one hand, government acts as the 'defender of security' and industry as the 'producer of economic wealth' (Beck, 1994). Here their roles are distinct and mediated by their respective institutional norms (Miller and Rose, 2008). On the other hand, both institutions operate under the same objective (economic progress) and necessarily rely on each other in this respect. However, in South Africa the historical relationship between government and the mining industry differs in certain respects to this more conventional perspective. From the time of British imperialism to more or less the end of apartheid, the relationship between the two institutions was one of mutual and exclusive economic benefit. Essentially, the political lines were blurred, particularly with regards to the apartheid regime, where it has been argued as having provided the blueprint for its establishment (TRC, 2003). In terms of environmental management, the mining industry, as the foundation of the political dictatorship, was subsequently able to ignore any such commitments and avoid any type of regulation. Although this relationship broke down in many respects as the apartheid era came to an end, there is still evidence of a certain continuity in terms of the industry's avoidance of environmental regulations. To a large extent this spill over is seen in the legacy of actual environmental damage. However, more concerning is the almost explicit continuity in the way it is regulated from a legislative point of view and in the way it conducts its own operations. While the global change in discourse within the industry itself has added a positive dimension, the political and institutional dynamics within South Africa have stifled any possibilities for real change. By virtue of the embedded status quo favouring economic growth over stronger regulation and being able to hide behind sustainable development rhetoric, the existing power structures have served to exacerbate the production of environmental risk by the mining industry (Van Eeden, 2008).

In light of this, it is thus unsurprising that the AMD problem was initially ignored despite various pre-emptive warnings:

“...what happened here was predicted in 1996. I was at the first forum meeting where it was announced by the mines. I was the person who discovered the decant from a borehole on the 27th of August 2002. I was the first person who went to the Gauteng legislator on the 20th of November 2000 before the decant started, trying to convince them that decisive actions and intervention needs to be taken to address a pending disaster. At that stage everyone was telling me that ‘no the decant will go towards the upper WFS, where there is a lot of wetlands and where they will deal with the problem’.”

(Stephan Du Toit, Mogale City Municipality)

Furthermore, it is also unsurprising that when it did happen, both government and industry were complacent in addressing the problem and unprepared for the political ramifications. Initiating the political conflict which followed was the fact that when AMD did begin to decant from underground, absolutely no management plans were in place (DME, 2008). In the period immediately following the decant not much attention was paid to the problem either. However, as it expanded in terms of broader social engagement and understanding of the severity and potential for further disaster, certain short-term strategies had to quickly be put into place. The risk society theory tells us that in this type of situation when risk becomes apparent, actions and decisions will still be taken on the basis of the old institutional patterns of industrial society. This certainly was the case and the following relevant strategies were turned to:

- Environmental Impact Assessments (EIA's)
- Site monitoring via the government appointed 'site monitoring task team'
- Individual water treatment plants and pumping systems employed by mining companies

For the most part these were short-term interventions. Over time they have proved incapable of changing the risk profile of the AMD threat. For example, the complexity of the chemical and physical nature of the risk means that still today, the treated water being discharged into the Tweeloopies is nonetheless damaging to aquatic life (Kruger; Keet; Zorab; Van der Walt, interviews, 2009). As a result of the poor foresight and these subsequently ineffective reactive measures then, significant amounts of political conflict and confusion developed. On the one, hand this is seen to have occurred within and

between various government spheres. On the other, a different kind of tension resulted between government and the mining industry.

Firstly, within government, confusion stemming from the novel character of the risk arguably rendered any initial intervention strategy on their part ineffective:

“...what GDARD (local government authority for environmental affairs) did at the time – 2006 – is that they wrote off their own accountability in terms of NEMA and said that it has now been transferred to water affairs, so they can make the decision as to what can be done with this water decant problem.”

(Stephan Du Toit, Mogale City Municipality)

However, whilst being the national body for all matters relating to water, the DWA's lack of knowledge relating to the EIA process resulted in a scenario where the impacts were assessed, but no mitigation plans were put in place (Du Toit, 2009, interview). Apart from the WUC project and water treatment plants (which are both exclusively mining initiatives), to this day evidence of government intervention is still absent. From a risk society perspective, this illustrates two things. Firstly, by the very nature of the risk which the problem engenders and the improbability of solving it in the short term, it has become a political 'hot potato'. The fear that it has invoked in terms of eroding political legitimacy has created a situation where no department wants to take responsibility.

“Their (government's) decision making process is delaying this process hugely; they don't want to take decisions, because if they do they are responsible and accountable. They do not want the accountability. That will not make them win votes in the next election.”

(Louis Kruger, Sustainability manager, Mintails)

Secondly, because of the much criticized fragmentation in environmental legislation (Kotze, 2006, Bond and Stein, 2000) no one department (local, regional or national) is able to take responsibility for the problem. Instead, as it is a problem related to the mining industry on a national level, but also impacts on local and regional water sources and the local environmental conditions, there are essentially three different departments who have to share responsibility. Given the competing agendas and difficulty of the

problem justification can be made not to get involved. That is, one department can argue that it is more the responsibility of the others. Thus, what transpires is a case of one type of institutional failure (at the level of environmental legislation) leading to another type of institutional failure (in terms of effectively being able address the risk). In turn, the undeniable social and political character of the risk is revealed. In the end, we simply return to a state of organised irresponsibility in the face of a manufactured risk.

Disquietingly, this confusion and disagreement also extends to the horizontal level of government in terms of who should take primary responsibility. Political dispute between the national authorities of DMR and DWA poses the greatest obstacle for more effective state intervention:

“We are sitting here with various challenges from a political point of view and a regulatory point of view, where the regulator is both the Department of Water Affairs, Mineral Resources and Environmental Affairs”

(Stephan Du Toit, Mogale City Municipality)

The DME has two roles: to promote mining and to monitor environmental management plans. As these two roles conflict, the ability of the DME to achieve success with both objectives is seen as controversial among environmental circles (Mara and Pressend, 2001). Emerging here is thus the fact that the institutions currently in place in South Africa are incapable of managing a risk of this extent. The political disagreement between the relevant government bodies strongly demonstrates that in no way are they able to handle the risk for two reasons. Firstly, AMD is the result of mining, but is a risk relating to water resources. Therefore, it is almost impossible to expect the current institutional model which differentiates between a department responsible for the risk generators (DME) and a department responsible for the subjects of the risk (DWA) to adequately manage the problem. Secondly, because the risk is of such a magnitude that current instruments for controlling or managing it are inadequate, there is the desire to avoid getting involved for fear of losing legitimacy. This explains the ‘passing of the buck’ between GDARD and DWA. What this sub-political development suggests is that the bureaucratic arrangement setup in terms of the state as a regulating body for environmental matters does not hold when ‘manufactured’ environmental risks are the problem. Inevitably, what develops is political conflict between two departments with

competing agendas- one economic and the other environmental. At this stage it seems that the former is being favoured, resulting in a situation whereby we remain stuck in a condition of risk society.

A further and more striking development in terms of the new political dynamic engendered by the AMD risk is that relating to the relationship between government and the mining industry. It is noted that there has been a response from government whereby they have used the AMD problem to re-instate their legitimacy and power:

“we can see the state in two roles: the regulator who beats us over the head, and as the state who says because there is no owners here, it is your problem.”

(Rex Zorab, Sustainability manager, Rand Uranium)

“Prior to the decant it was self-regulation. (Following 2002) they (government) were forced to take action. Their action is now lets look for someone who we can give a fine or put in jail. To be seen to be doing something. Because it takes the pressure away and puts it in a different sphere.”

(Louis Kruger, Sustainability manager, Mintails)

In this instance, the destabilising effect of the AMD risk has created a significant divide between government and the mining industry. This plays out on two fronts. Firstly, government have to an extent utilized the AMD problem to implement their legislative powers and assume the role of environmental regulator. Secondly, there have been large political ramifications in terms of the WUC project. Each is discussed separately.

Concerning the first point, it is necessary to take into account an important fact raised throughout this research. Given the mining industry's importance in terms of contributing to economic growth, despite often blatant environmental mismanagement, the industry's continued expansion has been given precedence by government over environmental standards (Wells, et al, 2009). In addition, this also means that 'self-regulation' has in reality been a guise to minimise public scrutiny and guard against the perceived need for stricter environmental standards. Ultimately, we can say in terms of environmental management, it was 'business as usual' for the industry up until the time of decant. In other words, below the surface, the mutually beneficial relationship

between industry and government, with its focus on economic growth, remained the dominant theme of the relationship.

However, come late-2002 and we see a discernable shift in discourse between the two. The fact that government are said to now be acting as 'the regulator beating the mines over the head' indicates that the subsequent entrance of the AMD risk onto the political stage has disrupted the mutually serving equilibrium between the two parties. However, this is the complete opposite to that of the politically disruptive effects that Beck proposes. Instead, what has actually transpired is a return to the conventional political framework described earlier of government as 'protectors' and industry as 'producers'. So, on the one hand Beck's assessment of risk forging a 'reinvention of the political' (Beck, 1994) is evident. On the contrary though, and to be sure, it is with caution that the term 'reinvention' must be used, for the assessment that this situation lends itself to is one of a return to the era when risk continue to be produced in the face of modern regulatory instruments. As Beck (1998, p.12) notes, "risk societies are characterised by the paradox of more and more environmental degradation... and an expansion of environmental law and regulation." Furthermore, when taking into account that risk society is said to presuppose or lead to the emergence of a reflexive second modernity, we see that the case above indicates little in the way of reflexivity. Instead, this situation is apparent of an inverted reflexivity- a reinstating of modernist principles with regard to how the environment is managed. On face value this could be taken to signal the reverse of what is thought to be ideal change for better risk management and in turn that we are digging ourselves into a deeper hole. However, a closer analysis reveals that perhaps this is the wrong place to be looking for signs of relevant and meaningful political change:

"Subpolitics, then, means shaping society from *below*. Viewed from above this results in the loss of implementation of power, the... minimization of politics. In the wake of subpoliticization, there are growing opportunities to have a voice and a share in the arrangement of society for groups hitherto uninvolved in the substantive technification and industrialization process: citizens,... social movements." (Beck, 1994, p.23)

So, change comes from outside the realm of institutional politics, not inside, for that would be restructuring not redefining. Then what does this changing political dynamic

between government and the mining industry really mean, for it is still part of the subpolitical? The assessment can be made that because this analysis is from 'the above' as oppose to 'from below', it is not a return to traditional politics being witnessed but rather a sign of 'the loss of implementation of power'. What is thus being witnessed is the destabilisation of the dominance that both parties had in the decision-making arena. Risk has split their hierarchical, mutually beneficial relationship- neither wants to take blame- and in the panic government is able to retreat to its (correct) position of authority "as the trustee of the nation's water resources... (acting to) ensure the water is protected... managed and controlled in a sustainable and equitable manner" (NWA, Act 36 of 1998, 1(3)). However, the mining industry is now left behind to deal with a problem which to be fair is not only their responsibility. The result is now twofold. Firstly, on the negative side, the problem is simply embroiled in more politics as the mining industry makes use of it's 'fall back position' by going to court and disregarding government stipulations¹⁰. The effect of which simply dragged out the process of finding a solution or putting in place mitigation strategies. All the while the toxic water levels were rising in the underground shafts. Here, the power play which has developed between government and industry and their subsequent strategic moves are taken to signal a fear of losing legitimacy and therefore either side's strategies are really one of a simulation of power. The most concerning aspect of this is that the relationship between the mining industry and government has suffered, thereby jeopardising the chance of moving towards a better governance strategy for the problem. Furthermore, this concern over a loss of legitimacy and credibility in the face of uncontrollable risk shows that accountability is also a key aspect. By not just asserting power, but also demonstrating a sense of responsibly government and industry are able to justify themselves to an increasingly sceptical public (Benn, 2004).

On the positive side however, it can be argued that a power vacuum of sorts that has emerged (and still exists today) because neither side knows what to do nor can either side agree on what to do. Beck (2000) explains that power is at risk and diminishes in institutions when rival expert groups become independent of one another and compete

¹⁰ In 2005 government finally issued a directive in terms of the quality of water allowed to leave the mine property in accordance with the NWA stating you can't allow pollution to leave your property. However, because the mines had no real other alternative beyond their already costly treatment plants they (rightfully in many respects) took government to court. Between 2005-07 numerous courts cases between government and the mines arose in trying to reach an agreement (Zorab, 2009, interview).

and confront one another. Not only is power at risk, but one could also say power is 'up for grabs'. Hence, environmental activists, NGO's and other extra-institutional actors begin to enter the frame. By way of making what are often undeniable moral claims and statements these groups and organisations are able to cultivate a foundation of both political and non-political legitimacy and power. At the same time, those formal institutional actors of government and industry struggle to re-cultivate their legitimacy which is in the process of being eroded as the perceived uncertainty and uncontrollability of the risk grows.

4.3.3.2 Subpolitics: NGO's, activists and civil society

Having discussed changing political dynamics at the level of traditional institutions, the focus is now on the role of subpolitics in opening up new arenas for disputation, negotiation and more importantly, transformation. This is essentially where the state of risk society begins to change course, allowing for a more positive outlook. At the local level of the AMD risk on the West Rand, three factors are identified as driving the process whereby new political arenas are created: NGO involvement; media coverage and research agendas. Arguably, these three factors have played the greatest role in bringing stakeholders together and opening the water problem on the West Rand up for debate in a more democratic manner (Turton, 2009, interview; Cobbing, 2009, interview).

Firstly, the activism that has been attracted to the area in many instances is considered to have been the single most important factor in mobilizing the mining industry and government involvement. Almost single handedly, the self-proclaimed 'whistle-blower' and environmental activist, Mariette Liefferink, CEO of the NGO Federation for a Sustainable Environment (FSE), brought the AMD problem to the attention of the public in 2003. Since then, her continued involvement in the issue at hand has helped keep it in the public domain. This is to the extent that she is said to personify NGO and environmentalist involvement (Zorab, 2009, interview). Several issues arise however in terms of defining her role in relation to government and industry. Firstly, the question of why and how she has gained credibility must be analysed. Secondly, it is important to interrogate the relationship the NGO (as represented by Liefferink) has, on the one hand, with government and, on the other hand, the mining industry. What do their

relationships mean and what does this tell us about the transformations taking place concerning the governance of the AMD problem? Admittedly, there are indications of both progressive, deep-rooted change and artificial restructuring. Determining what elements of change account for what is thus imperative in order for an assessment to be made regarding the long-term implications of the conditions of risk society. The following deals with these issues simultaneously.

In order to address the question of why and how Mariette was able to gain legitimacy, it is helpful to outline certain conditions thought to lead to the emergence of an environmental politics outside the traditional institutions. According to Hogenboom, et al (2000), environmental subpolitics is a result of the following three conditions: 1) government policy remains tied to natural-science based approaches to environmental risk, leaving questions of norms, public perception and values unaddressed, 2) decision-making is immobilized by internal conflicts of interest, and 3) current policy proves to be too bureaucratic and rigid to meet diversity of society-environment interactions. The previous sections concerning the apparent conditions of risk society are evidence that all three of these problems have been encountered since the decant became a political issue.

In addressing the first condition giving rise to subpolitics, it is clear that government policy has tended to remain tied to a natural-science based approach throughout the governance process. Its main contribution in terms of regulation came in the form two directives issued to the mines- both of which were defined in narrow scientific terms. In the first instance, a directive was issued in terms of the apportionment of liability (discussed above), based on calculations of how much water needed to be pumped and by who. Secondly, a directive stating the acceptability of the quality of water which was being pumped by the respective mining companies prior to discharge into the environment was drawn up¹¹. Evidently then, both were based on strict and exclusively scientific terms. The consequence of which resulted in the already affected communities and environment being neglected. In turn, Liefferink responded by advocating for the rights of both the community members and the environment to be included in the policy process. A particular example highlighting her efforts in this regard concerns a farm

¹¹ DWA issued a directive allowing the mines to discharged treated water with a maximum level of 2000 mg/L of sulphates into the Tweelopoies Spruit.

which borders the property of Rand Uranium (the initial and main decant point). The farm was a host to various livestock and horses; however when the AMD decant stuck most of the owners animals died. The water on the farm owner's property was then duly tested for toxic metals and found to be unfit for human and animal consumption. Eventually, the owner was made an offer by the mines after failed efforts at trying to sell what was now essentially untenable land. By virtue her intervention advocating for the farmer's rights, what was previously a problem judged in economic and scientific terms, into a problem which is of a distinct human and moral nature. That the mines finally bought out the farmer is indicative of their acceptance of the social nature of the problem. Thus, what we see here is a subpolitical situation which resulted from narrow government policy. In turn, actors in the extra-institutional arena were able to gain a strong degree of credibility and legitimacy by incorporating issues relating to the social nature of the problem into the policy framework.

Concerning the second condition, decision-making is indeed immobilized by internal conflicts of interest, as the example of organized irresponsibly and inter-government conflict illustrates. In this regard, Liefferink's credibility in particular has been enhanced via the role she plays in providing extra resources for both government and the mining companies. From a government perspective, her role of watchdog and public scrutinizer represent a channel through which government can better understand the problem, thereby informing them as to where to direct their influence. This consultative, 'outsourcing' role is beneficial for government as it takes pressure off them from a legitimacy point of view. In turn, the strategies may be perceived as more relevant and informed. However, there is also the expressed downside that her role can serve as a cover for government failure. By responding to her queries and criticisms, government is able 'to be seen to be doing something'. In relation to the mining industry, she is able to act as an inter-mediatory body between them and the communities. For example, she has been appointed to do workshops in order to warn the communities in terms of the impacts of mining and not to visit mining sites (Liefferink, 2009, interview). The main advantage here for the mining industry is that by working with the NGO in this manner, it limits their liability (Liefferink, 2009). At the same time, the funds they provide for her to implement such endeavours allows her to fulfill her role as a public role player and service provider to the community.

Finally, in response to the idea that subpolitics arises due to bureaucratic and rigid policy processes, evidence can be found in the decision-making process concerning the WUC project. Setting aside the fact that there is risk involved in the proposed solution itself, the project was first put to government formally in early 2009. The required draft feasibility and scoping assessment was conducted and handed to government for approval at that time. Following many delays it was finally accepted, in which case the final EIA report required in order for construction to begin was handed over to the relevant departments. This was in August 2009 and at the time of writing (early 2010) there has still be no finalisation or indication as to the future of the project. Instead, debate and argument between industry and government continues to unnecessarily extend the decision-making process. Not being roped into the politics of the process or allow herself to become complacent by the possibility of a final solution (which nonetheless would still leave much to be done by all stakeholders), Liefferink continues to lobby for sustainable change:

“We’re looking for a sustainable solution with immediate implementation, because its unfair and unethical for downstream users and an ecology which has no voice, to suffer these impacts while commercial companies are debating.” (Mariette Liefferink, quoted in Bega, 2010).

Thus, the effect of bureaucratic and inflexible policy process, coupled with poor government administration has enhanced the debate at the subpolitical level. In so doing, it also highlights the ineffective nature of the current institutional decision-making mechanisms for dealing with environmental matters. A point which is further highlighted by the fact that on the 14th of January 2010, amidst the debate, AMD passed the ECL and began overflowing uncontrollably into the surface environment, in what was judged to be an environmental disaster (Liefferink, 2010). The point here is that the bureaucratic policy process served to exacerbate the risk, whether or not the project was approved. Should it have been dealt with more efficiently (perhaps via other mechanisms), it would mean that either a solution would already be on track or, in the case of it not being approved, an alternative was being more readily explored. Instead, in many respects the situation seems to be getting worse, again demonstrating how and why actors outside the traditional institutions emerge as legitimate stakeholders. To the degree that institutions are unable to manage the AMD threat, Liefferink, as operating

outside the bounds of traditional politics, has now even be admitted to work within them. In late 2009, she was appointed to serve on the board of the National Nuclear Regulator, indicating a willingness from government¹² to recognize the importance of non-institutional knowledge forms.

In having now analysed how room is opened up as a result of the inefficiencies in the modern institutional risk management framework, certain other aspects of the subpolitical are important to discuss in relation to the case of AMD. For starters, one of the most powerful instruments serving to add credibility to Liefferink's pursuits has been the media (Liefferink, 2010, interview). Here, her relationship with reporters and other individuals within the field has been the key mechanism for both turning the issue into one of relevance for civil society and for allowing her to legitimately claim a standing of respect and authority within the political setting. Going back to the condition required for the construction of an environmental risk (table 5.1) the power of the media lies in its ability to dramatise the problem. Newspaper headlines such as: 'A Rising Acid Tide' (Fourie, 2005), 'Where poison water seeps from the earth' (Bega, 2010) and 'Acid mine drainage single most significant threat to SA's environment' (Naidoo, 2009) have served to elevated the status of the problem to one of national importance. Additionally, the AMD problem on the West Rand has been featured extensively in other forms of media too (e.g. Financial Mail (magazine); 702 Talk Radio; Carte Blanche and 50/50 (television)).

The third component operating outside the traditional political realm is that of research agendas. Most prominently, the Water Research Commission (WRC), the Council for Geosciences (CGS) and the Council for Scientific and Industrial Research (CSIR) have been involved in producing numerous studies implicating the mining industry as extensive polluters of the West Rand. It has been alluded to that in the past, despite, and because of knowing about the risk posed by mining pollution in the area, secrecy and information suppression was common regarding scientific reports (Adler, et al, 2007; Turton 2009; Liefferink, 2010, interview). However, the demise of apartheid in 1994 can be seen as a pivotal aspect that helped uncover the truth behind the risks

¹² The NNR is a recently formed government affiliated body responsible for the regulation of all nuclear related matters. Their relevance to the AMD problem is due to the radiological contamination in the water due to the presence of uranium on the West Rand goldfields.

posed by mining. Specifically, by virtue of the fact that information that had been, or would otherwise have been suppressed, now became public property. Considered pivotal in raising the alarm about the impacts and risk of AMD on the West Rand are the following documents:

Study	Broad Conclusions
Coetzee, et al (2006) – An assessment of sources, pathways, mechanisms and risks of current and potential future pollution of water and sediments in gold-mining areas of the Wonderfonteinspruit catchment	This study found that a significant amount of uranium is entering the WFS via controlled and uncontrolled point discharges. It claims that this pollution poses a threat to downstream water users and warns that future mine closures in the area could lead to further AMD decant into various water sources.
National Nuclear Regulator (2007) - Radiological Impacts of the Mining Activities to the Public in the Wonderfonteinspruit Catchment Area.	The report claims that the water in the Wonderfonteinspruit has been polluted by polonium and lead, by-products of gold mining activities in the close vicinity. There are claims that the natural water in the area affected by the pollution is unsafe for human, animal or plant consumption (NWDACE, 2008).
Winde (2009) – Uranium pollution of water sources in mined-out and active goldfields of Southern Africa – A case study on the Wonderfonteinspruit catchment on extent and sources of U-contamination and associated health risks	Study results indicate that uranium levels in water resources increased markedly since 1997, mainly due to the highly polluted water decant from the flooded mine void on the West Rand. A main concern is that the pollution levels found in the study area are comparable to those detected in the Northern Cape, which

	have been linked to increased incidences of leukaemia in the area.
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Table 4.2: List of studies relating to AMD and related environmental problems on the West Rand. These studies are thought to be fundamental to addressing current policy and institutional failures in management of environmental risks posed by mining activities.

While the role of the scientific community and these reports are not yet at the stage where they can be called ‘agenda-setters’ (Turton, 2009), their importance cannot be undermined. The reason for this is that concern has been raised about the extent to which the research community is being allowed to act in favour of society, as oppose to existing structures of governance. An interviewee involved in recent research relating to water indicated that the close affiliation between many of the research institutes and government meant final research publications are often watered-down (Whitcutt, 2009, interview). That is, broad statements in any reports citing that pollution and water contamination problems were due to mining activities are often deleted owing to the potential implications at the ministerial level of government. Instead, it was noted that “if you want a point like that raised you have to raise it outside South Africa” (Whitcutt, 2009, interview). Therefore, based on this assessment, the fact that the three studies illustrated above have made it into the public sphere can be seen to represent the further opening up of traditional decision-making centres. Indeed, each of the three papers are believed to individually represent distinct break through moments in their own right (Turton, 2009, interview).

Despite problems such as this though (which are by no way confined to South Africa alone), the importance of extra-institutional actors for broadening the institutional framework of risk management is well illustrated in the West Rand case. It is clear that Beck’s predictions of a new subpolitical arena are certainly being played out to a considerable extent over the AMD risk. Specifically, the above analysis reveals how a single activist operating outside traditional boundaries has been able to gain credibility in an environment where credibility and legitimacy are seemingly in short supply. In particular, by drawing on a discursive interpretation of risk beyond the realm of formal institutions, Liefferink has been able to bring the AMD problem out of its otherwise

narrow framework and take it to the affected public. Coupled with the role of a progressive research community and the media, it is thus possible to conceive of a strong coalition being formed. This coalition representing a growing force beyond the traditional institutions and one which is capable of changing the risk society dilemma which the situation on the West Rand seems to be caught in.

However, also clear is the fact that an interrogation of the meaning of what is emerging in this subpolitical arena is required. In other words, it is necessary to ask what this subpolitical 'trialogue' (see Adler, et al, 2007; Turton, et al, 2007) says about the direction in which the governance process surrounding the AMD risk is heading. This is perhaps the most fundamental question that needs to be analysed here for two reasons. Firstly, in-line with the notion that modern societies are becoming late-modern societies, it is argued that the relationships between government, the market and civil society are shifting (Arts and van Tatenhove, 2006; Beck, et al, 2003). The above illustrates this to be the case with regards to the process emerging for managing the AMD threat. However, that this 'shift' is simply a generic theoretical assumption, its significance on a contextual level requires interrogation. Furthermore, to do justice to the risk society theory it is necessary to expand on what has so far been a relatively pessimistic discussion. Despite being criticized and questioned for the "glumness of its attitude towards contemporary societies" (Dingwall, 1999, p.474), Beck's theory has an almost equally convincing, albeit implicit, positive outlook. For Beck, the 'opportunities of risk society' lie in the reconstruction of the social definition of risk and the management of environmental problems in different cultural frameworks (Beck, 1998).

Unsurprisingly, as the above discussion suggests this relies strongly on what happens at the level of the subpolitical. This is even more so in the context of South Africa, because unlike those countries of the West (on which Beck bases his insights), in no way is it possible to claim that risk distribution has replaced wealth distribution at an institutional level. Thus, subpolitics can be argued as possibly the most vital component in changing the tone of how the AMD risk is approached. As long as government and mining industry remain the dominant policy informants', one can have little hope of moving out of this risk society. Indeed, it can be imagined that without the intervention of civil society, the condition of organised irresponsibility would continue to betray those who are really at risk. All the while science would be given free reign as the panacea to

all the environmental and social ills related to mining. In reality though, the inequalities of risk would simply be perpetuated by unfettered technological intervention.

Considering this, the connection between a risk society and a reflexive society is now becoming more apparent. Without the cries and demands for 'institutional innovation' from the level of civil society, transformation is hard to imagine. Thus, to this extent the risk society theory has provided valuable in-depth insight into the process of institutional change. Indeed, subpolitics seems to represent a probable route out of the risk society dilemma facing the West Rand. Up to this point it is clear that the AMD threat has challenged capability of the modern institutions to cope with environmental risk. On the one hand then, Beck's prophecy has played out in this unexplored context of South Africa. Yet, on the other the idea that in the face of risk, societies become reflexive, that is they confront these condition of risk society, remains to be explored. To be sure, this is both a difficult and interesting point of departure. It is easy to imagine any society, developed or developing, first world or third world, faltering under the pressures of risk. However, it is far more difficult to ascribe a similar generic model to how they react. In other words, describing what reflexivity might look like, and what evidence there is of its occurrence in the case of the AMD threat is a different matter entirely. So, having reached the conclusion that the situation on the West Rand strongly resembles the conditions of a risk society, the question is now: in what way does the AMD risk, have the power to transform certain social and institutional dynamics? Or rather, what evidence is there to suggest that certain social and institutional dynamic are transforming?

4.4 Beyond Subpolitics: The Implications and Challenges of Risk in a Divided Society

Most evident in this examination of the subpolitical engagement between the NGO and the mining industry and government respectively is the ambivalent nature of the relationship. There is the positive aspect whereby sincere and socially important intervention is augmented (e.g. community workshops). Yet, there is also the downside whereby civil society involvement is easily manipulated into a tool to serve institutional interests (e.g. enhancing public perception of government legitimacy). Indeed, this is one of the dangers that is perhaps more threatening in a situation where probability of

change occurring (and being enabled to occur) is undermined by the context in which it occurs. That is to say that the huge divide between institutional stakeholders and community stakeholders in many ways invites government and industry to get away with action which is superficial and rhetorical at best. What you essentially have are multi-million rand business interests conflicting with the interests of the nearby communities who are literally the poorest of the poor. Certainly the advent of the AMD incident served to thoroughly uncover this incongruous 'relationship', throwing the institutional status quo into question along with that of experts and the legitimacy of government. However, the question as to the real effect risk has on social boundaries and inequality in South Africa seems unavoidable in this case.

A fundamental argument for risk society lies in the fact that society becomes increasingly concerned with the distribution of risk, over the distribution of wealth. If society indeed is transforming into a risk distributing society whereby 'some of the carefully erected boundaries between classes are whittled away', what might account for this on the West Rand? Is it possible to say that it is happening at all? Ultimately, the point here is an attempt to analyse the implications of the AMD risk beyond those of organised irresponsibility, the undermining of faith in science and the debates of subpolitics. Can it be said that society is becoming reflexive in response to the threat posed by the uncontrolled discharge of contaminated mine water?

The concept of a double-risk society (Rinkevicius, 2000) becomes relevant at this point, for it exposes the reality of South Africa as a less developed country having to simultaneously cope with economic insecurity and risk anxiety. However, to make what seems a fairly accurate statement is to also say that risk is *not* an equalizing force to the extent that Beck proposes for the 'welfare states of the West'. The truth is that those communities on and surrounding the area of decant are at direct risk, while the nearby hub of economic activity that is Johannesburg remains unaffected. They are facing the conditions double-risk society, not 'society'. Yet, this does not negate the fact that the risk has become a significant political concern (in 2009 it was elevated to the ministerial level of government) and it seems that at the micro-level, this concern is of similar magnitude to that of wealth distribution.

As stated previously, Beck understands reflexive modernization to be the stage whereby society begins a process of self-confrontation with the effects of the condition of risk society. So, indeed then we might have what could be called the rudiments of a reflexive society. This notion is based on the fact that concern for the risk has reached a level whereby institutions, coupled with pressure from an increasingly aware public, are necessarily having to confront the issue as more than just 'business as usual'. Interestingly though, those who are most at risk (the environment and communities) are largely voiceless and ignorant to the fact of the risk. Rather, as Liefferink explained from her efforts to educate the affected communities, they are more concerned with getting jobs than anything else (Liefferink, 2010, interview). This introduces a compelling argument now, because on the one hand there is genuine political concern for both the distribution and management of the risk, yet those most threatened do not form part of the debate¹³. So, in a way what we have is a political struggle dominated largely by groups disconnected from the direct implications of the risk. In other words, the debate between government, industry and civil society is being fought on behalf of, and out of concern for, the environment and affected communities. Thus, in reality it can be argued that it comes down to a debate of morals (not science or economics) more than anything else.

While this may be refuted or denied by those outside the official scope of the problem, inside things seem different. Yes, assigning responsibility and struggling over issues of finance are the rhetoric's of debate, however, inside each individual institutional structure- government, the mining industry and NGO's- a different story appears. There is little by way of resentment or animosity between these groups. Instead, a common theme is that many of the individuals interviewed feel they are able to maintain a good relationship, and are on good terms, with many of their individual institutional counterparts. Furthermore, representatives from government, industry and civil society alike, all unanimously agreed and raised the point that their concern for the environment and society was one of personal morals above all. The problem thus can be framed more in institutional terms (as predicted), as oppose to debating it at the level of agency. Particularly in South Africa and in the case of AMD, institutions are seen to be the obstacles to moving forward:

¹³ This is not to deny the fact that community concern exists, but rather to highlight the idea that the political concern for the risk and those affected stems largely from outside the communities themselves.

“You can do anything without the official structures”

(Mike Whitcutt, scientist, private).

“So, we believe it’s an institutional problem...we believe it requires some out of the box thinking. Change the policy- make it work.”

(Rex Zorab, Sustainability manager, Rand Uranium)

“It is not a relationship issue. It is the bureaucracies within the structures of government that results in the delays and the non-scientific understanding of what must be done and how. There’s good people in government.”

(Louis Kruger, Sustainability manager, Mintails)

Consequently, it would seem that despite posing a serious challenge to the existing techno-scientific knowledge base in terms of a solution, the problem can be defined in part as a moral dilemma, caught in the structures of traditional institutional apparatus. It is in many ways a moral struggle between the rigid institutions of government and industry on the one hand, and an increasingly educated and demanding civil society. Contrary to popular belief government do recognise their duty to protect the water resources, as does the mining industry recognise its duty to find a solution. However, the respective action each party has taken has been confined to the limits of the institutional order of the day. As Beck (1998, p.14) concedes, “we have to recognize the ways in which debates of this sort- by which... industries have been forced to justify and defend their activities in the public domain- are constrained by the epistemological and legal systems within which they are conducted.” For example, government acts within its ‘system’ by doing what it ought to do: issue directives and set legal precedence. The same goes for the mining industry, who in accordance with the apportionment of liability (and at a significant cost to themselves), pump water in order to avoid any further and preventable toxic overflow.

Two things are now apparent from this discussion. Firstly, the insight provided by the risk society theory has proved to be extremely effective means of examining the circumstances. That is, it has guided this research in the right direction by forcing an interrogation at the level of institutions. Secondly, it was argued that risk in the context of South Africa’s socio-economically unequal climate cannot be an equalizing force that

‘whittles away carefully erected boundaries. However, after second thought perhaps it is indeed true. By virtue of the fact that risk is clearly a moral issue amongst government, industry and civil society (they are all human beings remember) the result is that they are involved in a struggle of how to best legitimate their actions on a moral basis. They are involved in a debate which in the end is engendered by concern for society and the environment. In this way, the AMD risk has had a levelling effect in that, it has forced “people, expert groups (and) cultures... to get involved with each other whether they like it or not (Beck, 1998, p.11)”. That individuals are also tied to their respective institutions and institutional norms is essentially what limits action of a higher order.

“People (in government) belong to a structure they can’t change and have to act accordingly”

(Mike Whitcutt, scientist, private)

Ultimately, made clear here is that the main implication of the AMD risk has been to cause institutional failure in terms of government and industry intervention. It has also been illustrated that to a large extent they are pinned down by rigid traditional institutional structures which have rendered them incapable of effectively managing the problem. Specifically, the case of organised irresponsibility and the challenges that risk poses for science testify to this fact. Crucially, both analyses have also demonstrated that most of the decision-making and intervention strategies remain tied to a traditional approach to environmental governance. In turn, this explains the institutional failure. As explained previously, the traditional approach to environmental governance is defined as the command-and-control approach. Thus, the challenge of risk in the AMD case is to break from this approach and make the transition to what was described previously as the ‘progressive approach to environmental governance’. Indeed then, this would mean that society would have to become reflexive. In this way, it is possible to conceive of a changing form of governance in reaction to the apparent institutional failure to represent Beck’s idea of reflexive modernisation. Unfortunately, in the case of the AMD situation, moving from a traditional governance approach to a progressive approach is fraught with challenges. The following and final section highlights the challenges.

4.5 From Risk to Reflexivity: Challenges to Reflexive Governance in South Africa

It has become clear that in order to better manage the conditions of risk society that have developed on the West Rand, society needs to become reflexive. Although described previously, the following elaboration on Giddens' (1990) concept reflexivity places it in direct relevance to the environment as is thus useful here:

“Reflexivity can be regarded as the condition that arises when a society actively becomes concerned by the unintended consequences of their historic developmental trajectories; and actively seeks to do something about altering the outcome in a more environmentally-sustainable way.”

(Giddens, 1990, as cited in Turton, et al, 2007, p.11)

Specifically, the usefulness of this understanding can be seen in providing a fitting understanding of exactly how we might examine (or look for) reflexivity in relation to the management of an environmental risk. This now allows us to ask the question as to how might society be seeking to do something about addressing the AMD risk in a more effective way than has been described so far? Considering that managing the environment is necessarily a governance process, progressing from a state of risk society to one of reflexivity can be argued to be symbolized by the transformation from one form of governance to another. That is, from a traditional (command-and-control) form of governance to a progressive form of governance. This could be called ‘reflexive governance’. As the above has made clear, in order to realize reflexive governance, it is key that institutional transformation takes place. However, as was also explained above, it seems we are in an institutional dilemma characterised by rigid, inflexible structures. On the one hand government is constrained by its institutional structures, whereby it is only able to act as a decision-maker and regulator:

“Government’s position is that in terms of their value systems they have no options. Without a cost effective answer (from the mining industry), they will say no to any solution.”

(Mike Whitcutt, scientist, private)

On the other hand, the mining industry acting within its parameters as a corporate institution is unwilling to properly finance a solution. They will pump the water, but not pay for a long-term solution. This is because, as Beck argues, the institutions of industrial modernity were formulated around the notion of economic progress and the distribution of wealth (Matten, 2004). So when faced with risk, the dilemma is that their institutional rationale is in conflict with the necessary action:

“... I can say the problem with pollution is not really our problem, our real problem is getting the funds and getting the will power for people to get together and solve it. But it's going to cost.”

(Basie Van Der Walt, Rand Uranium)

In order to escape the risk society which has developed on the West Rand would mean that this institutional wall needs to be overcome. According to the risk society theory, the subpolitical role played by civil society is where the necessary institutional innovation might come from. Implicit in this idea is that civil society has the power to engender institutional change. As they are not bound to the same structures, orders and norms as either industry or government, their range of options in terms of action and advocacy is that much wider¹⁴. This idea finds support in what has been termed ‘good governance’ (Pegram, 2006). Good governance is taken to require participation, transparency, equity, accountability and integrated and ethical decision-making. Importantly, it is stated that this process must be built around open policy-making and a strong engaged civil society. Both Beck’s idea of subpolitics and the concept of good governance find similarities in terms of the need for civil society to be both present and accepted in the overall political arena.

The fact however, is that despite the role being played by activist, NGO’s, research groups and the media, the ideals of good governance are yet to be realized in terms of the AMD problem. That is to say that we are yet to have moved into a situation characterised by reflexivity and a reflexive form of governance. Instead, progress towards what would be a more effective form of governance for managing the AMD

¹⁴ Certainly, they are limited by other means. Most significantly in the case of the activism on the West Rand, insufficient funding and the multidisciplinary stakeholder input necessary are the two main factors limiting civil society’s actions (Van Eeden, 2007).

problem faces several challenges, many of which are not unique. Pegram (2006) specifically outlines common challenges facing good governance:

- Change and maturity in the governance systems
- Institutional memory
- Information and communication

(Pegram, 2006, p.62)

These challenges are all evident in the case of the AMD problem. The fact that South Africa is in many ways a fledgling democracy has resulted in a governance system which is having to continuously change and mature. When the AMD risk first became a serious problem (in 2002), it was a direct challenge to the way in which the environment was governed in relation to mining. Essentially, no strategies or systems were available to handle a problem of this magnitude:

“...it's the first time it's happening in South Africa, so it's really groundbreaking work.”

(Marius Keet, Regional-Director, DWA)

It was really only in 2005 that the problem received any attention from the formal structures of government (Zorab, 2009, interview). The effect of which has had consequences for the stability and predictability of governance (WRC, 2006). The multi-departmental nature of the problem, whereby both DWA and DMR had to get involved despite their conflicting interests, seriously delayed progress towards relevant policy-making. So, for several years following the emergence of the problem the situation resembled that of a risk society in terms of undermining institutional capabilities. Subsequently, almost eight years since the decant started, there has been some evidence of reflexivity relating to governance. Most significantly, this came in the form of a ‘government task team on mine closure and water management’¹⁵. The real impact this may have on the future management of the risk posed by AMD is yet to be seen.

¹⁵ The government task team on mine closure and water management was established by the directors-general of the Departments of Minerals and Energy (DME) and Water Affairs and Forestry (DWAF) in August 2005 with the objective to facilitate decision making on water management and related problems. It was also set up to implement safe and sustainable mine closure options within mining areas in South Africa (DME, 2010).

While on paper it is lauded as a very fruitful strategy, it is still in its infancy and yet to unfold to any significant extent.

A second challenge that surrounds the governance of the AMD problem is that of institutional memory. In fact, institutional memory is one of the most cited challenges facing the governance process of the AMD risk. Due to the complexity of the problem, both from a political and scientific point of view, the high turn over in staff in the public sector seriously challenges government's legitimacy. This is explicitly highlighted by the fact that in 2009, the Director-General of Water Affairs was suspended. As a key government figure involved in the AMD issue, who also co-chaired the government task team mentioned above, the capacity for reflexive governance on government's part is again seriously challenged. An additional problem relating to institutional memory is the fact that there is also very little continuity in terms of personnel between presidential terms. In turn, because the AMD problem is a long-term situation, the political will for dealing with the problem seems to continually be undermined. The following quote perfectly illustrates this point:

"...we are dealing with a system where people are being elected on a five year term and that accounts for the political office bearers and the executive management at local government. Now if you look at the continuity of those people that had been in office the previous five years then you will see that there is less than 10% of office bearers that were successful and continued with the next 5 year term. So we are getting new people on board. So now for example if I take the political component in this particular area you will see that there is a very limited presence and involvement from a political point of view in a problem that affects their constituents."

(Stephan Du Toit, Mogale City Municipality)

Finally, a major challenge to good governance in South Africa is understood to relate to information sharing and communication between institutions (WRC, 2006). Indeed, information sharing is a stumbling block which is concerning for the governance process on the West Rand. Most significant is the fact due to the political nature of the problem, information continues to get suppressed and hidden from the public:

“There’s been no education, too much defending, too many things hidden from the public, instead of saying we admit we have a problem.”

(Basie Van Der Walt, Rand Uranium)

“The mines don’t want to talk chemical toxicity, so they will always try to deflect the ball, what they trying to do is say you don’t understand (the problem), only a handful of people understand... trust us.”

(Dr. Anthony Turton, scientist, private)

Furthermore, despite initiatives such as the government task team, communication between institutions is seen to be lacking. Poor institutional linkages can be seen to perpetuate the state of risk society. The fact that decision-making remains bureaucratic as oppose to democratic, is seen to have the consequences of separating decision-makers from those with on-the-ground knowledge:

“...the structure of the government task team is also fatally flawed because it does not allow involvement from civil society or local municipality or local government for that matter. So it is open for debate what information they are getting and how they respond to that.”

(Stephan Du Toit, Mogale City Municipality)

Beck’s (1998) understanding of a reflexive society rests on the idea of an ‘ecological democracy’. An institutional culture characterised whereby the areas of economic, scientific and development decision-making are be open to public scrutiny and debate. From this perspective, the fact that information continues to get suppressed and communication between stakeholders is poor can thus be seen as problematic for the future of the situation on the West Rand. Essentially, what this indicates is that decision-making continues to occur within the formal institutions of government and industry. Coupled with the above challenges facing government in particular, there is little hope that those decisions made are relevant for the conditions of a risk society.

Most evident from the discussion above is that reflexive governance in terms of dealing with the AMD risk is far from being realized. While civil society pressures continue to be exerted on government and the mining industry, so as long as the challenges to good

reflexive governance are not overcome by the institutions themselves change will certainly be limited. Indeed, grassroots subpolitics is where Beck finds hope for institutional innovation. Yet, civil society pressure alone cannot change the status quo. On the one hand, subpolitics is necessary to initiate institutional transformation. At the same time though, the formal institutions need to be permeable to the ideas, creativity and knowledge possessed by civil society. So, it can be said that a dynamic relationship between civil society and the institutions of government and industry is essentially what defines a reflexive approach to governance. At this stage however, it seems that government and industry are both unwilling and unable to change. All the while civil society continues to press on.

Thus, it is argued that the political has not broken open and erupted beyond the formal responsibilities and hierarchies (Beck, 1994) sufficiently to the point that Beck's vision of a society beyond that of risk may be realized. Certainly, it is apparent that those arenas that were previously 'unpolitical' (i.e. civil society) have become political. Unfortunately, those institutions which were (are) political (i.e. government and the mining industry) have not as yet become 'unpolitical'. Instead, government and industry continue to enforce the status quo by sticking to their "current narrow-mined more-of-the-same attitudes" (Beck, 2000, p.138). They continue to (incorrectly) consider themselves exclusively capable of making the correct (and just) decisions, despite their failure to overcome the self-imposed obstacles to achieving good governance. Furthermore, they seem unwilling to accept that fact that risk in the age of risk society cannot be controlled by the same logic which created it. Clearly then, until the formal institutions come to terms with the 'real' problem, the realization of a reflexive governance system and a long term sustainable solution to the problem facing the West Rand seems far off.

CHAPTER 5 – CONCLUSION

5.1 The Implication of Risk in a Divided Society

The environmental risk facing the West Rand has served to uncover the paradoxical reality of South Africa's process of modernization. The risk of AMD stems from what was a development approach that subscribed to a strictly industrial modern conceptualization of the environment. This approach was embodied by a policy of simple mineral extraction whereby no consideration was given to the qualitative dimensions of such action. In this way, material gains were formulaically sought as a rational means for achieving progress. However, by virtue of the fact that today the traditional institutional processes are unable to guarantee security from a threat which is the consequence of such rationality, those processes themselves are becoming questioned. To this extent, the idea that modern societies, on their way to a stage of reflexive modernity, become increasingly dominated by and unable to control the dangers that have been produced during the stage of industrial modernity, has just begun to play out on the West Rand. That certain institutional features of society have become socially and politically problematic (Beck, 1998), it is argued that the situation unfolding on the West Rand is tantamount to that of a risk society. Specifically, the problematic nature of trying to establish a meaningful environmental agenda with regards to the mining industry in a country which necessarily has to pursue a discourse of economic growth testifies to this fact. At the same time, given such unique socio-political circumstances in South Africa, the institutional implications and effects of risk also play out in some rather novel and contradictory ways. Both the predicted and novel implications are outlined below.

In certain respects, the situation on the West Rand follows in near parallel with Beck's prophecy of a risk society. Notably, the surprise and unexpected force with which the conditions of risk arose meant that as predicted, decisions and action were taken according to the embedded and conventional patterns of industrial society. Such was the case that the instrumental approach adopted was accepted as necessary and sufficient for the appraisal of the risk posed by AMD (Stirling, 2003). In turn, the truth behind the idea that modern institutions and instruments are in fact unable to cope with the self-imposed consequences of modernity has since become apparent. Specifically,

the insight generated in this study shows how attempts to employ the principle logic of economics and science to solve the problem are ineffectual. Firstly, governments attempt to apportion liability in financial terms has only succeeded in engendering further political conflict between themselves and the relevant mining companies. Subsequently, a state of organized irresponsibility has emerged, whereby the question of who is specifically accountable remains unanswered while the risk itself has been left to intensify. Secondly, the mining industry claimed to be able to offer a scientifically sound, long-term solution in the form of the WUC water treatment plant. However, this essentially conventional strategy is now being questioned on the basis of its ability to provide certainty in terms of the quality of water that will be produced for consumption. Ultimately, these implications of risk in the context of the AMD problem demonstrate that the risk society theory is revealing of some valuable insights. Most significantly, the need for institutional transformation characterized by an approach of less-of-the-same and more-of-the-new is seen as necessary. In this instance more-of-the-new is represented by a reflexive approach as oppose an instrumental one. The challenges to realizing this are elaborated upon later in this section.

While there were distinct similarities between the implications of the AMD risk and the risk society theory, there was also evidence to the contrary. In particular, this became apparent in the form of what might be called an inverted reflexivity. Here, the force with which the risk has undermined, delegitimized and destabilized the institutions of government and the mining industry, as is said to occur under conditions of risk, is questionable. Instead, there is reason to suggest that both have been able to reassert and re-legitimate themselves somewhat by more rigorously adopting an instrumental approach (as oppose to simply continuing to do so). Evidence for this is found on the one hand, in the forceful regulation of the mining industry whereby the quality of water it releases into the environment is now strictly monitored. Indeed, prior to the risk becoming problematic this was never the case. On the other hand, we see industry eagerly trying to compel government to adopt a scientific approach (i.e. the water treatment company) based on an unquestionable faith in the ability to guarantee certainty, despite evidence suggesting otherwise. So, from this perspective, the respective institutions are seemingly able to deny what is otherwise argued to be the inevitable eventuality of risk- the emergence of a reflexivity modernity where faith in the

political, scientific and technological foundations of modern society are openly contested (Burchell, 1998).

Importantly, the reason for this can be argued to have some relation to the political context, whereby the legitimacy of the state in particular is already under question. Taking what is a seemingly authoritative stance, allows for a public perception of credibility thereby potentially reinstating a degree of legitimacy. In reality, this situation can be explained as the symbolic use of politics, whereby the announcement of certain measures and regulatory actions represent sheer rhetoric (Matten, 2004). This applies to both government and the mining industry. In parallel to this, a tactic of complete avoidance was also used at times, especially by government. In this case, the risk itself was explicitly ignored out of fear of getting involved in a problem known to be beyond their (i.e. government's) already compromised capabilities. Capabilities which are particularly compromised at the level of environmental management. As Beck (2000) notes, the interrelationship between ignoring a risk and enforcing risk production is significant.

Consequently, one cannot afford to overlook the effect that risk has on weak or incomplete institutional arrangements, such as those present in South Africa. In contrast to Beck's welfare states of the West, the confusion and uncertainty engendered by the risk is superimposed on what are already unstable institutional foundations. In which case the effects of risk are compounding and result in a potential shrinkage in creativity and institutional flexibility, leaving little room for society to maneuver out of the conditions of risk society. In other words, as has been demonstrated, in such circumstances there is the possibility of a move towards a *more* authoritarian state of control. Thus, if we are to concede that certain contextual factors render the management of risk that much more challenging, it can also be said that the potential for those countries beyond the scope of Beck's work to deviate from the prescribed risk trajectory (i.e. towards reflexivity) is increasingly probable. Rather than the gradual and sequential transition implied by Beck, the situation becomes that much more complex and turbulent. The implication here is that the AMD risk has forced an instrumental response which in turn presents the possibility that the conditions of risk society are unwillingly exacerbated.

Despite the continuity of this embedded approach though, transformation is slowing taking place. In large part this is in the form of a concerned society reacting to an institutional system which seems to be perpetuating the risk. Following the unique and intense political nature of risk for modern societies, the traditional political and policy arena is said to be converted into a 'subpolitical' arena. In this case, the subpolitical is characterized by an active dialogue between government, industry and civil society. Within this new decision-making arena, civil society (in the form of NGO's, activists, the media and research groups) is increasingly questioning, exposing and attempting to deal with what amounts to institutional failure. Having witnessed over six years of ineffectual crisis management on the part of government and industry on the West Rand (van Tonder and Coetzee, 2008), civil society has become an increasingly prominent and influential role player. As Beck (2000) argues, the reality of 'self-annihilating progress' casts doubt on the status-quo and places society under pressure to negotiate new foundations. Here, the pressure to realize new foundations is in fact pressure to realize old promises of new foundations- promises that were made following the advent of democracy in 1994 and which reside in the Constitution (1996) of South Africa. To the extent that the threat of AMD continues to pose a threat to the environment and society, civil society is indeed beginning to question the status quo and pressure government and the mining industry to transform. In doing so, it is argued that the risk itself is contributing to the growing conflict which is understood to be occurring between an increasingly reflexive civil society and an ineffective institutional system unable to fulfill the ideals of its legislative underpinnings.

In this way, the AMD risk can be seen to represent both an opportunity and a danger for South Africa. The opportunity lies in the fact that South Africa has the chance to break from the continuity of past policy injustices and begin to institutionalize what would represent sustainable *social, environmental and economic* development. However, the danger is that the conditions of risk society in a divided society may allow those who produce the risk to distance themselves from it, while for others the risk grows. Risk is claimed to have a levelling effect that whittles away the carefully erected boundaries between classes (Beck, 1998). In South Africa though, the opposite is also a possibility. If the risk of AMD is not dealt with in a way which breaks from the modes of industrial society, whereby risk is managed without reference to the human beings affected by it (Dingwall, 1999), change will be difficult to imagine. That is, a change at the level of the

risk itself which continues to defy claims of scientific certainty and a change in political discourse whereby the idea that “everyone has the right to an environment which is not harmful to their health or well-being” (Paragraph 24a of chapter 2: Bill of Rights) continues to be violated.

5.2 The Future of the AMD Risk on the West Rand

Predicting the risk trajectory South Africa is following is unsurprisingly difficult, given the uncertainty that society is subject to in the era of risk society. Although Beck seems quite certain that under conditions of risk society, whatever happens, society necessarily becomes reflexive (see Beck, 1998, p.18), the account given here does not open itself to the same degree of optimism. A reflexive society is defined as one which *confronts* the “effects of risk society that cannot be dealt with and assimilated in the system of industrial society” (Beck, 1994, p.6). This means that in order to break from the socially and politically destabilizing effects of risk society, an environmental risk must be understood to constitute more than just a problem of the environment. Instead, it must be understood as a problem of the environment and a problem of (and for) society. Essentially, the threat posed by AMD is a problem which is the result of poor environmental governance. Therefore, it is argued that a form of ‘reflexive governance’ is required. In this case, reflexive environmental governance is taken to be a process of governance synonymous with that ‘good environmental governance’ (Pegram, 2006). The foundations of this approach are built around a process of open policy-making, a professional bureaucracy and a strong, engaged civil society.

Unfortunately, the situation on the West Rand faces many challenges to achieving what would be a more effective governance approach. Despite a strong and engaged civil society, the policy-making process remains largely dominated by the institutions of government and industry. Considering the current challenges within and between the two institutions (e.g. immaturity of government and lack of effective information sharing and communication), it is unsurprising that they have yet to become genuinely reflexive. Policy amendments to NEMA and MRPDA and the recently established government task team on mine closure and water management still need to be scrutinized in terms of their true intentions. In light of the possible ineffectual outcome of such strategies, there is still support for Beck’s prophecy that inevitably society does become reflexive.

This is found in the idea that faced with extreme circumstances of environmental risk, societies are forced to become reflexive (Turton, et al, 2007). The danger for South Africa then is that the action taken is necessarily reactive and done so only because certain costs have materialized. While we are not at that stage just yet, it seems that we are certainly on a water-shed, where the decisions made now are going to influence the future of South Africa's water resources for the long-term.

This water-shed being a metaphor for the emerging tension between the two policy perspectives relating to the mining industry. That is, a policy approach of continued simple extraction and its opposite, in an approach of environmental sustainability and human rights realization. Importantly however, it is argued here that the policy of simple extraction per se, cannot be blamed for the tension regarding the risk. Rather, it seems that the conflict over liability avoidance and the resulting state of organized irresponsibility is playing a large part in perpetuating and intensifying the tension. In this way, organized irresponsibility sends a clear message to proponents for sustainable and rights-based change of an institutional system which is unable to cope with the consequences of its policy decisions and therefore, unable to cope with the consequences of modernization.

In which case, despite the importance of civil society's role in the decision-making process concerning risk management, government's role cannot be underestimated or neglected. The reason for the conditions of risk society which currently overshadow the West Rand is almost exclusively due to the interrelationship between industry and its institutional context. The result of which has brought about a viscous cycle of irresponsibility and minimal collaboration (except where profits were at stake) (Hamann, 2004). If government is able to overcome the current challenges, which it both faces and creates, to establishing a state of reflexive governance, it can be expected that a renewed institutional context will emerge. A context that will encourage greater co-operation between government, industry and civil society, allowing for reasonable trade-offs to be agreed upon in contrast to what has proved to be ineffectual centralized decision-making.

To this end, the risk posed by AMD on the West Rand has also been recognized as an opportunity to learn from our mistakes and plan for the future. The West Rand is by no

means the only area in South Africa face with the problem of AMD, but it is the most publicized, recognized and politicized. The adjacent central basin, underlying Johannesburg's city centre is predicted to overflow in early 2011. Additionally, AMD pollution from the coalfields of Mpumalanga is argued to poses an even greater threat to the environment than has been seen on the West Rand (Jones, 2009; Turton, 2009). As a result of a reflexive civil society, embodied by the activism of Mariette Liefferink, the situation on the West Rand offers itself as a 'pilot project' for what the future hold in terms of managing the consequences of our modernity. The agreed upon fact is that South Africa actually possesses much of the required scientific and technological know-how to deal with the problem (Cobbing, 2009; Van Der Walt; 2009; Turton, 2009, interviews). This means that how we choose to embrace the shift from being a risk society to being a reflexive society rest squarely with the institutions that caused the problem. The challenge for both industry and government is thus for them to break from their out-dated institutional moulds, engage with the efforts of civil society and reform their practices in conditions of reflexivity.

Finally, with regards to this research, it is clear that Beck's theory has been able to provide valuable insight into the implications of the AMD risk. Crucially it has revealed that the major problem facing society is not the risk itself, but the redundancy of the institutional mechanisms being employed. In this way it has proved to be relevant in conceptualizing the nature of the impacts of the risk and identifying where the true weaknesses lie in terms of current risk management processes. Essentially, it has taken it out of its conceptual framework wherein it was perceived as a problem of science and finances, and placed it firmly in a framework which reveals it as a distinct procedural problem. Accordingly, this research as a whole has highlighted the need for greater attention to be paid to the socio-political and institutional context of the risk. While scientific insight remains an imperative, there is an apparent deficit in the amount of multidisciplinary research being undertaken. Ideally, such research could also be filtered back into the plethora of existing scientific content relating to AMD. In this way, this research is seen as a small, but contributory effort towards that endeavor.

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Coetzee, H. Scientist at the South African Council for Geosciences. 20th November, 2009

Du Toit, S. Official, Mogale City Municipality. 30th October, 2009

Durand, F. Scientist at the University of Johannesburg. 27th October, 2009

Keet, M. Regional Director, Department of Water Affairs. 2nd December, 2009

Kruger, L. Sustainability Manager at Mintails. 3rd December, 2009

Liefferink, M. CEO of the NGO Federation for a Sustainable Environment. 24th January, 2010.

Turton, A. Private Scientist. 4th November, 2009

van der Walt, B. Site Manager at Rand Uranium. 5th November, 2009

Whitcutt, M. Private Scientist. 30th November, 2009

Zorab, R. Sustainability Manager at Rand Uranium. 16th November, 2009

APPENDIX – A: Interview Schedule

1. How do you interpret the AMD problem in the Western Basin? Is it fair to call it a risk to both the environment and society and is it really such a problem?
2. What are the risks?
3. Do you think the problem is being controlled to some extent?
4. Are the media reports accurate in the sense of alarm they engender?
5. Are the tool and mechanism currently available adequate to deal with the problem?
6. What are your views on WUC?
7. In your view, how are the following issues helping or hindering the process of addressing the problem?
 - scientific evidence
 - government intervention
 - public participation
 - political framework and actor dialogue
8. What are some other significant obstacles to overcoming the problem?
9. Is decision-making a problem? What are some key issues?
10. Do you feel that the scientific facts are being taken cognizance of or are they being ignored or debated to some extent? What effect is this having on the outcome of the problem?
11. How is fact that the mining companies multi-nationals influencing the approach to the problem?

12. Can you comment on any significant political changes regarding the process of managing the AMD problem, such as increased stakeholder involvement or how knowledge is being used?
13. Do you feel there is a disconnect between government departments in terms of their approach to environmental issues such as this?
14. What has the significance of NGO and activist involvement in the issue relating to AMD been with regards to highlighting and broadening the issue in terms of public awareness and political and corporate mobilization?
15. What warrants the West Rand pollution problem getting media attention over other sites?
16. What is your feeling about the issue of liability? How should it be apportioned?
17. What is your view on the future in terms of the problem and how it may transpire further? Do you think we are closer to dealing with the problem? Do you feel we are in a transitional stage in terms of dealing with problems such as AMD?
18. In terms of stakeholder involvement, where does the power lie? Is there a particular side dominating the debate over the issue? Are there certain stakeholders that are influencing the debate unfavorably?

APPENDIX B: Photographic Material



Photo 1 – The first water to decant from the flooded mine void occurred from a borehole in late August 2002. This borehole was alongside the Tweelopiespruit.

(taken from Krige, 2006)

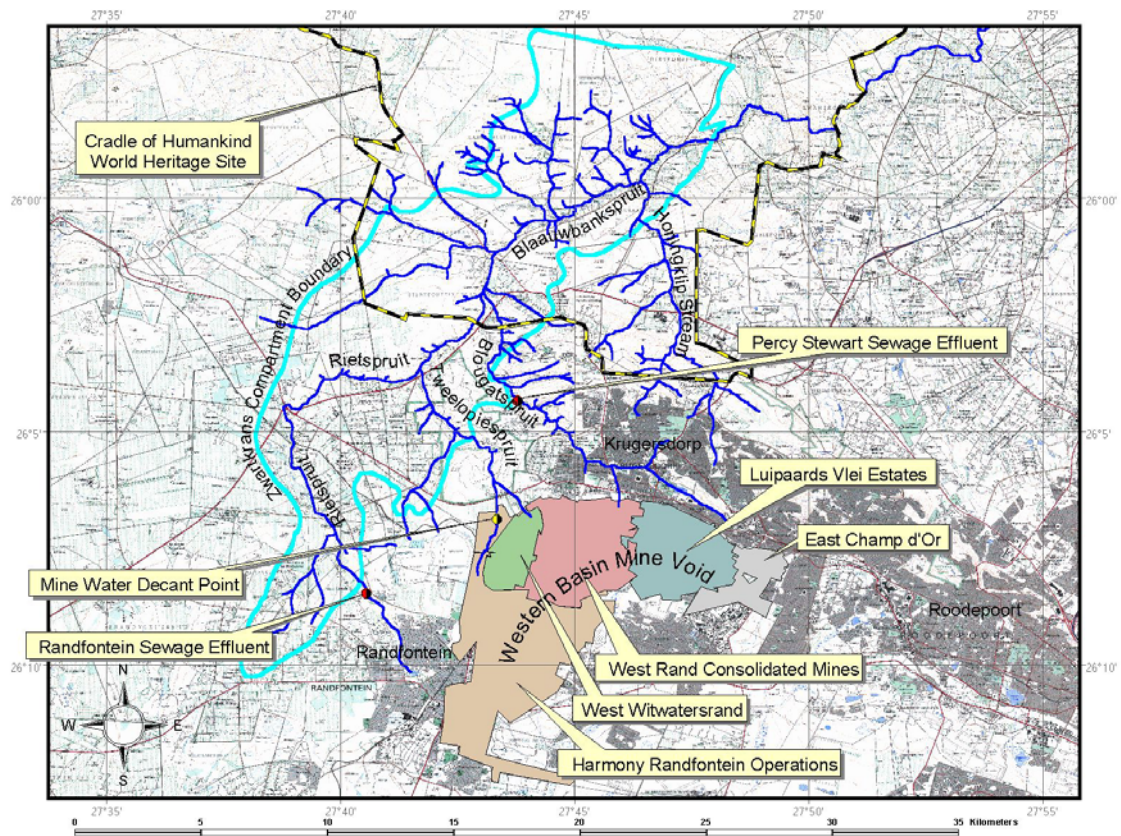


Figure 1 – The Western Basin Mine Void. The water decant point is shown as well as the affected water systems flowing north.

(taken from Krige, 2006)



Photo 2 – The dam constructed to intercept water decanting from the underground mine void.

(Krige, 2006)

