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JOHANNESBURG

Water Grabbing?: Water Struggles over the Water Regulation of the Water Use Licenses of Coal Mines in Delmas, South Africa

by

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Supervisor: Dr. Alex Wafer
Co-Supervisor: Professor Sonwabile Mnwana

15 April 2024

Declaration of Originality

I, Lesego Loate, declare this thesis I am submitting for the Degree of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg is my own original work, that has not been previously submitted to any other university for any degree and all referencing has been done according to convention.



Lesego Loate

15/04/2024

Date

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Abstract

In various international contexts, attention has been given to the impact of the water use of extractives on water bodies. Some of these discussions are on the role of water regulation of the water use of extractives in the impacts on water bodies contributing to water scarcity for other water users and thus extractives based water struggles.

Literature teases out the dynamics of the regulation of the water use of extractives through the three elements of water struggle that mirror elements of water regulation. These discussions focus on the allocation of water rights, the diverse forms of (non)recognition of water users in regulatory rules and participation in regulatory processes and exercise of rules.

This study contributes to this literature focusing on coal mining water struggles in Delmas, South Africa. Despite an extensive history in mining, a leading country in coal reserves, as well as a country often touted as water scarce; research in South Africa on extractives based water struggles, in general, and coal mining water struggles in particular is limited.

This study uses a case study approach using three coal mines in Delmas to address this gap in discourse. The study is based on interview and focus group data from key informations. The thesis focuses on the role of water regulation in the water problem behind coal mining based water struggles. The study also interrogates the mechanisms water regulation's influence on the water problem behind coal mining based water struggles in Delmas.

This study finds unfair and unequal regulatory practices in allocation enabling extra-legal water use by coal mines and the failure to enforce the water use of coal mines. Water regulation inequitably benefits coal mines whilst burdening agricultural water users with pollution. Thus the study argues the water regulation is central to the resultant normalisation of the potential of future water scarcity. Water regulation exposes agricultural water users to structural and future reality. The (dys)function of water regulation of coal mines is the outcome of coal-centric socionatural relations of water that facilitate the water use of coal mines and normalise water scarcity.

List of Abbreviations

AMD: Acid Mine Drainage

BFAP: Bureau for Food and Agricultural Production

BEE: Black Economic Empowerment

DEA: Department of Environmental Affairs

CER: Centre for Environmental Rights

DG: Direct-General

CMAs: Catchment Management Areas

CSA: Coal Supply Agreement

DMR: Department of Mineral Resources

DMRE: Department of Mineral Resources and Energy

DWA: Department of Water Affairs

DWAF: Department of Water Affairs and Forestry

DWS: Department of Water and Sanitation

EIAs: Environmental Impact Assessments

ELUs: Existing Lawful Uses

EMIs: Environmental Management Inspectors

EMP: Environmental Management Plan

FY: Financial Year

GA: General Authorisation

GHG: Greenhouse Gas

IDP: Integrated Development Plan

IWRM: Integrated Water Resources Management

IWWMP: Integrated Water and Wastewater Management Plan

JSE: Johannesburg Stock Exchange

LoM: Life of Mine

Middle-Income Countries: MICs

MPRDA: Minerals Petroleum Resources Development Act

MEC: Minerals-Energy Complex

NAFTA: North American Treaty Act

NEMA: National Environmental Management Act

NPA: National Prosecuting Authority

NWA: National Water Act

NWRS: National Water Resource Strategy

NWRS2: National Water Resource Strategy 2

OES: One Environmental System

OWMA: Olifants Water Management Area

PCD: Pollution Control Dam

PPPs: Public Private Partnerships

RoM: Run of Mine

SAPS: South African Police Service

SENS: Stock Exchange News Service

SWSA: Strategic Water Source Area

TDS: Total Dissolved Solids

VKLM: Victor Khanye Local Municipality

WARMS: Water Authorisation and Registration Management System

WMAs: Water Management Agencies

WUL: Water Use License

List of Metrics

Mt: Metric tonnes

Mtpa: Million tonnes per annum

km^2: Kilometers squared

tpm: Tonnes per month

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1. Introduction of the Study

1.1 The Water Problems Behind Extractives Based Water Struggles

Debates on extractives based water struggles abound with perspectives on the transformation of water as nature as a result of the water use of extractives. The impact of the water use of extractives on water was posited as key to water problems affecting the water use of non-extractive water users. The water use of extractives changes the biophysical character of water resulting in various water problems such as water shortages, floods, excessive sedimentation and pollution. Discussion centred on countries such as Colombia, Mexico, Peru and Chile argue water problems relating to the transformation of the biophysical character of water are the locus of extractives based water struggles amongst water uses (Boelens, 2015; Boelens *et al*, 2005; Boelens, Vos and Perreault, 2018, Bebbington and Williams, 2008; Hommes *et al,* 2018).

Water problems associated with the water use of extractives, are positioned in academic discourse, as impeding the availability of water for non-extractive water uses. The impact of the water use of extractives on water, and the problem of the availability thereof for non-extractive water users, is behind extractives based water struggles. One water problem that looms large in literature as an outcome of the water use of the extractives industry, is water pollution. South American countries with established extractives sectors, such as Chile and Peru, are leading cases in explanations of extractives based water struggles as the result of the polluting water use of extractives industries (Bebbington and Williams, 2008; Delmote, 2016; Rodrìguez-Labajos and Martinez-Aliez, 2015).

Water pollution due to the polluting water use of extractives results in the lack of availability of water suitable for other water users; in other words the water problem of water scarcity. The extractives industry as a polluting water user often transforms the biophysical nature of water in terms of its chemical composition making water unsuitable for other uses. Hence, the water use of the extractives industry, such as in the Andean countries of South America, results in water scarcity being the root of extractives based water struggles. This includes cases wherein extractive water users are located at headwaters and thus upstream of non-extractive water users situated downstream. Polluted water flowed downstream for the water use of downstream water users (Boelens *et al*, 2018; Boelens, 2015; Rodrìguez-Labajos and Martinez-Aliez, 2015; Himley, 2014).

Discourse on extractives based water struggles also highlight the extractives industry's diversion of water bodies to suit the water use of extractive operations. Thus in Ghana and the South American context, water problems are associated with changes in the natural course, and thus physical availability, of water for downstream water users. Downstream water users are exposed to water scarcity (Boelens *et al*, 2018; Perreault, 2012; Danoucaras *et al,* 2016).

Another form of water problem, associated with the water use of extractives, relates to changes in elements of hydrological systems such as in the form of water flows degrading systems as a whole. In Peru, the over-extraction of water by extractives for the support of their operations means water scarcity for other water users dependent on those water bodies. This was because the reduction of water flows affect not only water quantity but also water quality thereby also affecting the usability of available water (Sosa and Zwarteveen, 2016; Sosa and Zwarteveen, 2012; Boelens, 2015).

Water problems also emanate from the location of extractive operations in areas that are water scarce and/or ecologically sensitive for water. Extractive operations with a high potential for the pollution and damage of water bodies are nonetheless located close to water bodies. Water struggles in this context focus on the setting of policy (and thus the law and regulation) that prioritise development and extractives as an economic activity at the expense of water bodies (Hommes *et al*, 2018; Boelens, 2014; Delmote, 2016; Bonelli, Roca-Servat, de Mesquita, 2016; Patrick and Bharadwaj, 2016).

The effects of the water use of extractives also emerge through the interconnection of land and water as nature. In countries such as Ghana, Mexisco, Peru and Bolivia, literature highlights control over, and use of, land is integral to extractive operations. The effects of extractive operations on land are, in turn, critical to the pollution of water bodies. Extractives based water struggles also revolve around land as a nature that is interconnected to water and whose use, and effects, by extractives in turn affects water (Perreault, 2012, Stoltenborg and Boelens, 2016; Danoucaras *et al,* 2016).

Some approaches to extractives based water struggles are from a position of geographical cost-benefit. This approach emphasises the geographical location of extractive operations, and water use, as opposed to the transferral of the benefits thereof to geographies removed from those operations. The burdens of the extractives industry, including water damage and pollution, are experienced in the geography of the extractives operation whilst the benefits are enjoyed elsewhere. Therefore water scarcity, and extractives based water struggles, are an

outcome the extractive industry burdens water users in areas of extractives operations (Vos and Boelens, 2018; Patrick and Bharadwaj, 2016).

1.2 Water Regulation and Extractives Based Water Struggles

Water problems due to transformation of the biophysical nature of water are not simply the outcome of the water use of extractives. Literature on extractives based water struggles outlines the social control of water use, through the water regulation of water rights, facilitates the water use of extractives. Thereby water regulation is captured in literature as prominent in changes to the biophysical nature of water and water problems that arose from the water use of extractives.

Particularly in the South American context, literature on extractives based water struggles focuses on the ontological influence of water regulation in determining what is water, what water is used for, how is water used, who can use water. The ontological dimension of water regulation facilitates the water use of extractives. Resultant biophysical changes lead to water problems such as water scarcity for non-extractive water users. Accordingly, in such discussions water problems encompass not only the effects of biophysical changes to water but also the water regulation (of the water rights) of extractive water users (Boelens *et al*, 2005; Hommes *et al*, 2018; Johnston, 2018; Babidge, 2016; Budds, 2010).

There are diverse means through which water regulation set the ontology of water to prioritise the water use of extractives leading to water problems for non-extractive water users. Water rights, and the regulation thereof, is noted in literature on extractives based water struggles as integral to water problems associated with the water use of extractives. Countries such as Indonesia, Mexico and Peru; constructed and regulated water rights to facilitate the water use of the extractives industry. The construct of water regulation to facilitate the water use of extractives leads to water problems such as water scarcity for some users. The water regulation of water rights are integral to extractives based water struggles (Guevara-Gil *et al*, 2010; Bruns, 2005; Stoltenborg and Boelens, 2016; Sosa, Boelens and Zwarteveen, 2017). Chile, Peru and Bolivia constructed water regulation to support individualised property rights to facilitate economic activities through a property rights regime corporates and international capital understand and are familiar operating within (Sosa *et al*, 2017; Stoltenborg and Boelens, 2016; Hendriks, 2010; Budds, 2010; Sosa and Zwarteveen, 2016; Nicolas-Artero, 2016).

Some discussion on extractives based water struggles argues the predominant orientation of water rights, and thus regulation; is to support strategic high value economic water uses, such as extractives. The prevention, and mitigation, of water pollution and damage to water bodies as known outcomes of such use is, if not always *de jeure* then *de facto*, a lesser priority of regulation in this context. Water problems behind extractives based water struggles are a result of the ontological prioritisation of the support of the economy, and indeed particular economic activities, through water regulation.

Water law, in shaping water rights and regulation, is a key means for framing the ontology of water that ordered water access for preferred water uses such as extractives. Consequently, control over participation in, and processes and outcomes of, regulatory reforms are contested by industries such as extractives. Extractives based water struggles - in settings such as the South American Andes - took on the form of contestations to control, the practical outcomes of, regulatory reforms; in the function of water regulation creating water problems such as water scarcity for water users (Linton and Budds, 2014; Budds, 2010; Brooks *et al*, 2017; Boelens, 2015).

An element of this body of literature was also preoccupied with the influence of reforms of water rights and therefore water regulation. Reforms on water rights as property rights are key to determining water availability or scarcity for water users. The form of water rights, as an outcome of reform processes; is key to the form, rules and processes of allocation and thus the accessing of water by water users (Budds, 2010; Bruns, 2005; Stoltenborg and Boelens, 2016; Boelens *et al*, 2018).

Some debates highlight water problems, and extractives based water struggles, as an outcome of the hierarchical ordering of regulatory decision making on water rights. Regulatory decision making, often centralised in the state and/or mining corporations; undermines local regulatory participation, generally, and specifically in decision making on the water rights of non-extractive water users. The top-down ordering of regulatory decision making enables centralised decision making on the prioritisation of the water use of extractives that often leads to water problems for non-extractive water users (Assies, 2010; Boelens *et al*, 2010a; Perreault, 2018; Boelens *et al*, 2010b; Assies, 2010; Singh, Koku and Balfors, 2007).
Water problems due to the water use of extractives is also the result of, according to literature, the undermining of water regulation. Part of the argument is that the regulation of mining undermines the regulation of extractive water users. This argument had a number of angles

including; the prioritisation of extractive industries as high value economic activities, the power and thus influence of extractive industries on regulation, the interests of political and economic elites and so on. Water problems, and extractives based water struggles, are thus the outcome of the undermining of the regulation of extractives to benefit extractive water users (Boelens 2008; Bebbington, Bebbington and Bury, 2010; Bebbington and Williams, 2008).

Another thread of the argument on the influence of the regulation of mining on the efficacy of water regulation relates to the influence of the regulation of mining as land use and the influence thereof on the efficacy of water regulation. Water problems, such as water scarcity, for non-extractive water users thus emerge due to the impact of extractives based land use on water bodies and the challenges of the effective water regulation of these impacts (Boelens, 2008; Assies, 2010; Getches, 2010; Bruns, 2005).

The interconnection of water with other forms of nature is also legally underpinned by property rights. The interconnection of the construct of land, water and minerals property rights, and the regulation thereof, influences the praxis of water rights and their regulation. Water problems are thus a result of the interaction of these varied property rights, and their regulatory processes, to the benefit of the water use of extractives (Boelens, 2008; Assies, 2010; Stoltenberg and Boelens, 2016).

Literature on extractives based water struggles argues water problems associated with the water use of extractives arose from the ineffectiveness of the water regulation of the water use of extractives. Some literature notes ineffective water regulation undermines water rights leading to extractives based water struggles. Water problems such as water scarcity are the result of the ineffective enforcement of water and environmental rights of extractive water users thereby affecting the water use of non-extractive water users (Vos and Boelens, 2018; Hommes *et al*, 2018; Boelens, 2014; Bruns, 2005).

However, water rights are also, in some instances; designed to undermine regulatory enforcement. In these cases water rights are difficult to interpret allowing for regulatory loopholes in praxis. These loopholes could then be utilised to support the water use of socially powerful water uses such as extractives industries. Water problems are thus the result of the unenforceability of water rights (Boelens *et al*, 2005; Bruns, 2005; Nicolas-Artero, 2016).

The poor construct of water regulation is part of a thread in literature that argues extractives based water struggles are due to the failure to implement water regulation. Moreover, this

failure is not just a capacity issue but lay in the construct of overcomplicated, imprecise, contradictory and simply unimplementable water regulation (Bruns, 2005; Boelens *et al*, 2005).

Further some discussion on water regulation also argue, the complexities of the determination and control of water use; water problems associated with the biophysical nature of water emanating from the social use of water encompassed water regulation. Thus even as it responds to natural water problems such as seasonal scarcity and overabundance (flooding) of water as well as balancing different water use needs and their impacts on water; water regulation is integral to water problems that undermined other water uses (Thompson, 2006; Boelens *et al*, 2010b; Bruns, 2005; Perreault, 2014; Van Koppen, 2007).

1.3 The Socionatural Relations of Water that Frame the Water Regulation of Extractives and Extractives Based Water Struggles

Some arguments on extractives based water struggles view water regulation, and water uses such as extractives, as influenced by socionatural relations of water. The socionatural relations of water is the framing of society-water interrelations that in turn frame regulation and water rights. This means socionatural relations of water influence the praxis of the water regulation of extractives and the water problems behind extractives based water struggles. The interrelation of society and water means water regulation, and therefore water rights; was not just a product of, but also a means of reinforcement, of socionatural relations of water. Thus water regulation, and water rights, are framed by the socionatural relations of water to facilitate the water use of powerful social interests such as extractives; meaning water regulation also influences society and thereby the socionatural relations of water.

Discursive constructs are central to the interrelations of water and society that underlay the socionatural relations of water. The discursive constructs at the core of the socionatural relations of water frame water regulation and thereby mutually influence water - for instance the biophysical nature of water - and society - for instance in terms of the benefits of water use - in a range of ways. Consequently, the socionatural relations of water impact the water problems that arose from the water use of extractives. Therefore the impact of the socionatural relations of water on the water regulation of the water use of coal mines influences extractives based water struggles.

One perspective of this discussion focuses on discursive constructs behind the socionatural relations of water as reflections of the interests and views of the political and economic elites. Socionatural relations of water are the result of social power dynamics that shape the interconnection of water and society to the benefit of powerful social interests. Therefore the socionatural relations of water influence water use for the benefit of powerful water use interests such as extractives (Boelens, 2014; Linton and Budds, 2014; Finewood and Stroup, 2012).

A key way the discursive constructs of the socionatural relations of water influence water regulation is in the framing of a socially predominant ontology of water. Thereby, discursive constructs determine the water uses that were to be prioritised. In terms of water socionatural relations of water are exclusionary for water users and uses that are not key to powerful interests. This translates to water problems such as water scarcity for marginalised water users and uses (Perreault *et al*, 2018; Finewood and Stroup, 2012; Boelens, 2014, Budds, 2013).

Divergent ontologies of water are sometimes central to extractives based water struggles. These divergent ontologies underscore divergent values of water. These different understandings of water directly affecte understandings of not only what water should be used for and by whom but also how water should be regulated to effectively facilitate such water uses (Hommes *et al*, 2018; Boelens, 2014; Linton and Budds, 2014; Yates *et al*, 2017; Bonelli *et al*, 2016). Behind seemingly simplistic contestations over ontologies lay complex social fissures. These form around competing social interests, economic inequalities and understandings of the economy, social exclusion, cultures, world views and knowledge systems. The structuring of water regulation around particular dominant ontologies effectively means the domination of particular social interests' views and interests over those of others (Hommes *et al*, 2018; Boelens, 2014; Yates *et al*, 2017; Linton and Budds, 2014).

The structure of a country's political economy is prominent in debates on extractives based water struggles as a key influence on the ontology of water and the consequent prioritisation of the water use of extractives. The economic role, and benefits, of the extractive industry to a political economy leads to the prioritisation of the water use of the extractive industry. The water use of the extractive industry within the political economy was ordered despite environmental destruction and damage, including to water bodies. The consequent water problems undermine economic activities viewed as having limited economic benefits in contrast to extractives.

Implicit in this focus is the discursive construct of efficiency that rationalises the use of water as a scarce resource to the attainment of the highest economic benefits. The state facilitates the extractivist political economy as a means to secure, and benefit from, economic growth. Thus in some circumstances, the political economy structurally leads to water problems such as water scarcity and therefore extractives based water struggles (Perreault *et al*, 2018; Vos and Boelens, 2018; Marston and Perreault, 2016; Budds, 2010).

Extractives based water struggles are also approached in debates from the perspective of contestations over the function of water regulation. For instance, some literature argues control over water knowledge facilitates control over water regulation and thereby the facilitation of the water use of extractives. Water problems are the result of control over water knowledge, and thus water regulation by powerful water uses such as extractives. This means non-extractive water users are exposed to water problems such as water scarcity leading to extractives based water struggles.

Science is used by varied water users to suit their cases for the protection of their preferred water uses from water scarcity. In other words, science is contested in terms of control over science and the knowledge outcomes of science. Accordingly, literature points to the utility of scientific knowledge in terms of sustaining extractives based water uses as well as protecting water users from the outcomes of extractives based water uses (Boelens, 2014; Linton and Budds, 2014; Sosa and Zwarteveen, 2016; Himley, 2014).

Some academic discourse argues powerful water use interests such as extractives frame and determine water knowledge and in turn controls water regulation. Powerful water use interests such as extractives control water regulation to facilitate the water use of the extractives industry. Literature identifies water problems behind extractives based water struggles as a result of the prioritisation of science as knowledge over other forms of knowledge. Scientific expertise is legitimised over indigenous, local, memory, etc based forms of knowledge that water users affected by the water use of extractives attempt to use to prove the negative effects of that water use. The preference for particular forms of water knowledge facilitate control over water regulation's ability to determine water problems (Hommes *et al*, 2018; Perreault, 2018; Marston and Perreault, 2016; Boelens, 2014; Bonelli, Roca-Servat, de Mesquita, 2016).

1.4 Extractives and Coal Based Water Struggles in South Africa

As explained earlier, literature on coal mining water struggles in the international arena was limited. Consequently, this study is nestled in broader literature on extractives based water struggle. Further, literature on broader extractives based, as well as coal mining, water struggles in South Africa is also limited. Hence, this study utilises literature on both extractives and coal mining water struggles in South Africa.

Approaches to water problems due to the water use of extractives and, in particular, coal mines in South Africa is through a number of focus areas. Some focus is on the historical role of the law in supporting the water use of preferred water uses such as the mining sector in South Africa. The argument focuses on the long history of the use of the law in South Africa as a mechanism for structuring water rights, and the regulation thereof, to legally facilitate water uses preferred by the state and powerful economic interests such as the mining sector; and at the same time exclude other water users (Van Koppen and Jha, 2005; Van Koppen, 2008; Turton, 2017).

Another angle in discussions argues the extractives industry, as a longtime backbone of the South African economy, is a predominant preferred water use. The importance of the extractive industry in South Africa means the water use of extractives is facilitated through mining and water rights and regulation. Thus literature argues mining and water law are structured to facilitate the water use of extractive industry in South Africa. In particular, the legal support for the water use of extractive industry is in the lack of adequate mining and water regulation to ensure compliant water use by extractives industry (CER, 2016; Hallowes and Munnik, 2016).

An outcome of the legal and regulatory facilitation of the operation of coal mines is in their land use and the effects thereof on water. Nel *et al* (2013: 22) identifies mining as taking up limited land use in comparison to other land uses such as plantations (though they do recognize the potential for an upshot in mining land use). However, the Centre for Environmental Rights (CER) (2016: VIII) in a later study put 61, 3% of Mpumalanga's surface area under prospecting and mining right applications. This indicates recent land use changes have predominantly favoured the mining sector in the province (CER, 2016: X).

McCarthy (2011: 6-7) notes the authorisation of mines is significant in determining the location of mining and consequently the level of impact of mining on water bodies. This is especially relevant as coalfields, and thus coal mines, spatially overlay some areas that are critical water resources (Colvin *et al*, 2011: 71). The upsurge in mining and prospecting authorisations poses a threat to water quality and water availability and therefore heightens water struggles amongst water users (*Ibid*.). The CER (2016: 32-33) outlines a number of mining regulatory shortcomings including inadequate environmental rehabilitation, failure to monitor and enforce environmental aspects of mining legislation, poor implementation of rehabilitation regulations that ensure mining companies that pollute pay for their pollution.

The state is responsible for the licensing of mines and thus facilitates mining that potentially pollutes water resources to the detriment of other water users. This means the state determines which economic interests are prioritised as water users even as certain water uses such as coal mining had negative impacts for other water users. Part of the state bias for coal mining in water regulation can be understood through the designation of electricity generation (a function that fell under Eskom) as a strategic water use under section 6 (1)(b)(iv) of the National Water Act (NWA) (National Water Resource Strategy, 2013: 10). The only other water use designated a strategic water use is the inter-basin transfer of water from one WMA to another (*Ibid*.). Though the strategic water use status is conferred on electricity generation (thus Eskom), in practice likely implicitly extends to Eskom's coal suppliers critical to its power generation activities.

Continuing with the argument of the role of the state, some literature argues the the law, for instance through water rights and the regulation thereof, is critical to extractives based water struggles in South Africa. This argument is linked to the state-centric and economic development focused approach to water in South Africa. The focus on economic development, particularly centres on supporting the water use of the extractives industry to ensure South Africa's economic development. Hence, the state is a key facilitator of the extractives industry (Turton, 2010; Hallowes and Munnik, 2016).

The role of facilitator of the water use of the extractive industry that has fallen to the state has also come in the form of the poor construct of water rights, and the regulation thereof. This is in terms of the development of water rights provisions that are difficult if not near impossible to actually implement in terms of water regulation. The outcome of this is effective regulatory paralysis in the context of continued water use, including pollution of water bodies, by the extractive industry (CER, 2016; Hallowes and Munnik, 2016).

From a natural science and environmental perspective, some discourse focuses on the ecological impacts of Acid Mine Drainage (AMD). Mine water literature approaches AMD as a technical mine water industry problem to be solved by technical innovations. Some of this literature touches on regulatory shortcomings behind the water regulation of the extractives industry that led to a lack of accountability for, and failure to control, AMD (McCarthy and Pretorius, 2009; Turton, 2010; Ochieng, Seanego and Nkwonta, 2010; McCarthy, 2011).

Another branch of literature took an environmentalist approach emphasising the effect of coal mining on water quality in the form of water pollution (Hallowes and Munnik, 2016: 140). Coal mining presents serious water quality risks such as AMD (McCarthy, 2011: 3). Further, coal mining affects the aquifer structure and contaminates mine water that fills mine voids and could mix with aquifer water which decants, flowing into surface water such as streams and wetlands (CER, 2016: 8). Some environmentalist literature touches on the effects of the water use of coal mines, in terms of poor water quality, on other economic activities, such as farmers; that depend on the same water bodies coal mines use (CER, 2016: 8). For instance, poor water quality due to the effects of coal mining on the Olifants River threatens agricultural exports to the EU market (CER, 2016: 8).

Some literature on coal mining water struggles in South Africa have taken an environmentalist approach to the energy debate to emphasise the damage and pollution of water bodies due to coal mining. This approach argues for the replacement of coal as an energy source in order to protect water as a much more important and scarce resource than coal in South Africa. Such discussion emphasises the purposeful degradation of the environment, including water, in order to maintain the energy economy. Moreover, this literature also argues against coal as an input for energy generation given the long-term impact of climate change on water scarcity (Colvin *et al*, 2011; CER, 2016; Steele and Schulz, 2012).

1.5 Water Grabbing as a Theoretical Framework for Water Struggles

The relevance of water grabbing as a theoretical framework in this study is in the interpretation of the socionatural relations of water that shape and influence the praxis of the water regulation of the water use of coal mines. Specifically, water grabbing is useful for the interpretation of the contribution of water regulation to the emergence of water problems at

the core of coal mining water struggles. Water grabbing's relevance is its focus on social dynamics leading to water problems such as water scarcity for less powerful non-extractive water users. Conversely, water grabbing's focus on social dynamics of water problems means it is well suited to the interpretation of water availability for powerful water uses such as coal mining.

Water grabbing is when powerful social actors control water and/or use water for their own benefits (Mehta, Veldwisch and Franco, 2012: 197). Control of water or the redirection of the use of water to secure the benefits thereof; means the exposure of other water users to water scarcity (*Ibid*.). Water grabbing is when "powerful actors (social groups, corporations and/or interests) are able to take control of or reallocate to their own benefit water resources at the expense of previous (un)registered local users or the ecosystems on which those users' livelihoods are based" (Franco *et al*, 2014: 3).

Water grabbing is the facilitation of the water use of the extractive sector as a prioritised economic water user is more prevalent in Latin America. This literature is part of, and complimented, longstanding research into extractivism on that continent (Torres, 2012; Ortiz *et al*, 2014; Sosa and Zwarteveen, 2012; Perreault, 2012). However, there is much less focus on the use of water grabbing to interpret the facilitation of water availability for extractives in the general African, and South African context.

Water grabbing correlates with the focus of this study in critiquing the utility of water regulation to water grabbing from the perspective of water use licences as administrative water rights, and the water regulation thereof (Franco *et al*, 2013; Franco *et al*, 2014). This touches on the regulatory authority prioritising water rights, and thus biased regulation, for big economic projects such as mining to the detriment of small-scale economic activities such as livestock farming (Ortiz *et al*, 2014; Perreault, 2012). The consequence of such ordering was that extractive industries execute legal water grabs without fear of state repercussions (Perreault, 2012; Sosa and Zwarteveen, 2012; Ortiz *et al*, 2014). This is pertinent for this study as water regulation could play a similar role in the regulation of the water use of coal mines, fostering water scarcity and thus coal mining water struggles.

Another angle for understanding the relevance of water grabbing is in the argument that water grabbing facilitates the extra-legal water use of preferred water uses, outside of the water regulation of water rights. Extra-legal water grabbing is not just the direct use of force

for extra-legal enclosure of water. Instead extra-legal water grabbing relates to the sophisticated exploitation of the legal and extra-legal regulatory interconnection. This perspective views water grabbing beyond the legal-extra-legal binary (Hertzog *et al*, 2012; Williams *et al*, 2012; Franco *et al*, 2013; Franco *et al*, 2014). This element of water grabbing provides tools for the understanding of coal mining water struggles linked to water scarcity as an outcome of extra-legal water use, and further allows for the sophisticated interrogation of, and thus understanding of coal mining water struggles, the manoeuvring of the water use of coal mines between the legal and extra-legal.

Capitalism is a key theme in water grabbing discourse. Literature argues capitalism influences society-nature interrelation in the form of water grabbing. The influence of capitalism is discussed as variations and intensifications of certain forms of investment of capital; on water demand, availability and scarcity. Behind the influence of capital on water grabbing is the state-capital interrelation that in turn influences society-nature interrelations (for instance, through water regulation). For instance, some literature on water grabbing emphasises the ontology of water centring on water as a commodity. Water is also discussed as a target for products such as agricultural products, that depend on natural resources; leading to an increase in investments in agricultural land, and thus water as an input for agriculture, in the Global South, including Africa. Herein, water grabbing often takes a state-capital cooperation look as particular water uses important to investors are ordered in the regulatory process to the detriment of other water users' water availability (Tortajada, 2013; Bakker, 2003).

1.6 Background on Delmas as the Research Site

Delmas is a small urban town, in a broader rural area, that forms the main population centre of Victor Khanye Local Municipality (VKLM) (Victor Khanye Local Municipality IDP, 2011: 39). Victor Khanye Local Municipality, headquartered in Delmas, is part of Nkangala District Municipality in the province of Mpumalanga (*Ibid*.). Victor Khanye Local Municipality covers 1567 km^2 and alongside Delmas other prominent settlements are Arbor, Argent and Brakfontein (Victor Khanye Local Municipality IDP, 2011: 26). The municipality borders Gauteng Province to the north, west and south (Nealer *et al*, 2011: 8).

In a place specific assessment of the town's population, Statistics South Africa (Stats SA) states there were 7 399 people residing in 1 928 households in Delmas (http://www.statssa.gov.za/?page_id=4286&id=11523). Botleng, a township about seven kilometres from Delmas

(unofficially considered part of Delmas but officially designated as separate) has 44 727 people living in 12 452 households (http://www.statssa.gov.za/?page_id=4286&id=11523). In this study Botleng is taken as part of the broader Delmas area. When combined (including Botleng) the Stats SA figures place Delmas's broader population at 52 126 people in 14 380 households.

At 52 126 of Victor Khanye Local Municipality's total population of 75 452, Delmas as the urban core holds 69.08% of the municipality's total population. Victor Khanye Local Municipality's population makes up about 5.8% of the total population (1 308 129) of the Nkangala District Municipality (with Delmas making up 3.98% of the district's population) and 1.8% of the total population (4 039 939) of the Mpumalanga province (with Delmas making up 1.29% of the provincial population) (http://www.statssa.gov.za/?page_id=993&id=victor-khanye-municipality).

1.6.1 The Agricultural Economy of Delmas

With regards agriculture, the area of the local municipality, including the Delmas area, is a major maize producing area with annual maize production of between 230 000 and 250 000 metric tonnes (Victor Khanye Local Municipality IDP, 2011: 43). Other important crops in Mpumalanga (and by extension Delmas) include soybeans, sunflowers and sorghum (Van Der Burgh *et al*, 2012: 8).

Although there is a lack of specific data on Delmas, there are some rural households within Delmas, an area characterised by a strong agricultural sector. With regards agricultural households; the majority at 31.5% are engaged in poultry, 21.9% are in livestock farming, 19.6% are involved in vegetable farming, 9.6% are engaged in other kinds of crop farming and 17.4% undertook other kinds of farming (http://www.statssa.gov.za/?page_id=993&id=victor-khanye-municipality). The importance of agriculture to the VKLM - and Delmas - is partly due to the favourable location of the municipality in the N12/N4 Maputo corridor (Delmas is close to the N12) and large cities like Johannesburg and Pretoria (Victor Khanye Local Municipality IDP, 2011: 44). The other dimension of the importance of agriculture Delmas was due to the area's soil.

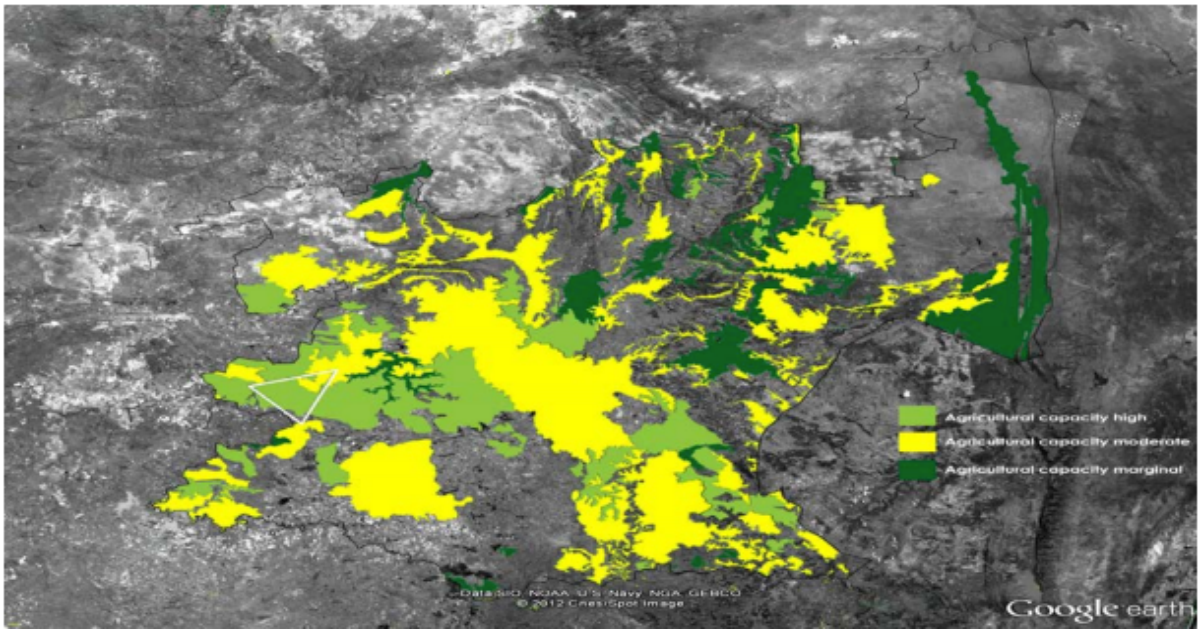


Figure 1.1 Arable Land Potential in Mpumalanga; Delmas, Ogies and Leandra
MENCO Consulting, 2012 in Van Der Burgh *et al*, 2012

The above map on the agricultural capacity of land in Mpumalanga illustrates the province is a key area of high potential agricultural land (Van Der Burgh *et al*, 2012: 9). Furthermore, the map classifies Delmas (identified in the white triangle as the BFAP report's area of study including Ogies and Leandra) as an area with high potential agricultural land (*Ibid*.).

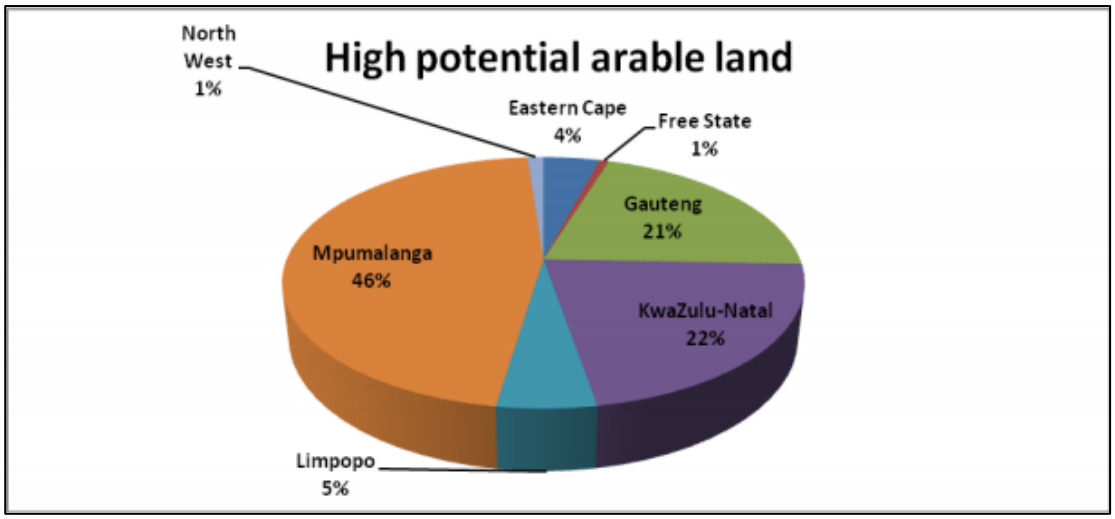


Figure 1.2 High Potential Arable Land in South Africa
Van Der Burgh *et al*, 2012

Thus high potential agricultural land in the Delmas area fits a province wide pattern. Of the 1.5% of high potential arable land in South Africa; Mpumalanga Province holds 46% as compared to KwaZulu-Natal at 22%, Gauteng at 21%, Limpopo at 5%, Eastern Cape at 4% and North West and the Free State both at 1% (Van Der Burgh *et al*, 2012: 9). However, agriculture

in the Delmas area is under threat. A provincial perspective gave insight into the challenges facing agriculture in Delmas. In 2007 it is estimated that 993 301 hectares of land was under cultivation; when this land is overlain with land under mining licenses then 326 022 hectares of agricultural land is lost to mining (Van Der Burgh *et al*, 2012: 10).

A further 439 577 hectares of agricultural land is lost when land under prospecting licenses is added meaning as much as 765 599 hectares of agricultural land is estimated to be potentially lost to mining (*Ibid*.). If mining continues to expand in Mpumalanga, about 12% of South Africa's total high potential land (in Mpumalanga) could be lost to mining with a further 13.6% at risk due to prospecting licenses (CER, 2016: 8). According to Hermanus *et al* (2015: 24), 61% of Mpumalanga's land surface is under mining or prospecting licenses.

1.6.2 The Mining Economy of Delmas

Mining in the Victor Khanye Local Municipality centres on coal and silica, with 3 million metric tonnes of coal produced annually as opposed to 2 million metric tonnes of silica (Victor Khanye Local Municipality IDP, 2011: 43). The map below shows Delmas to be a site of intense mining and prospecting.

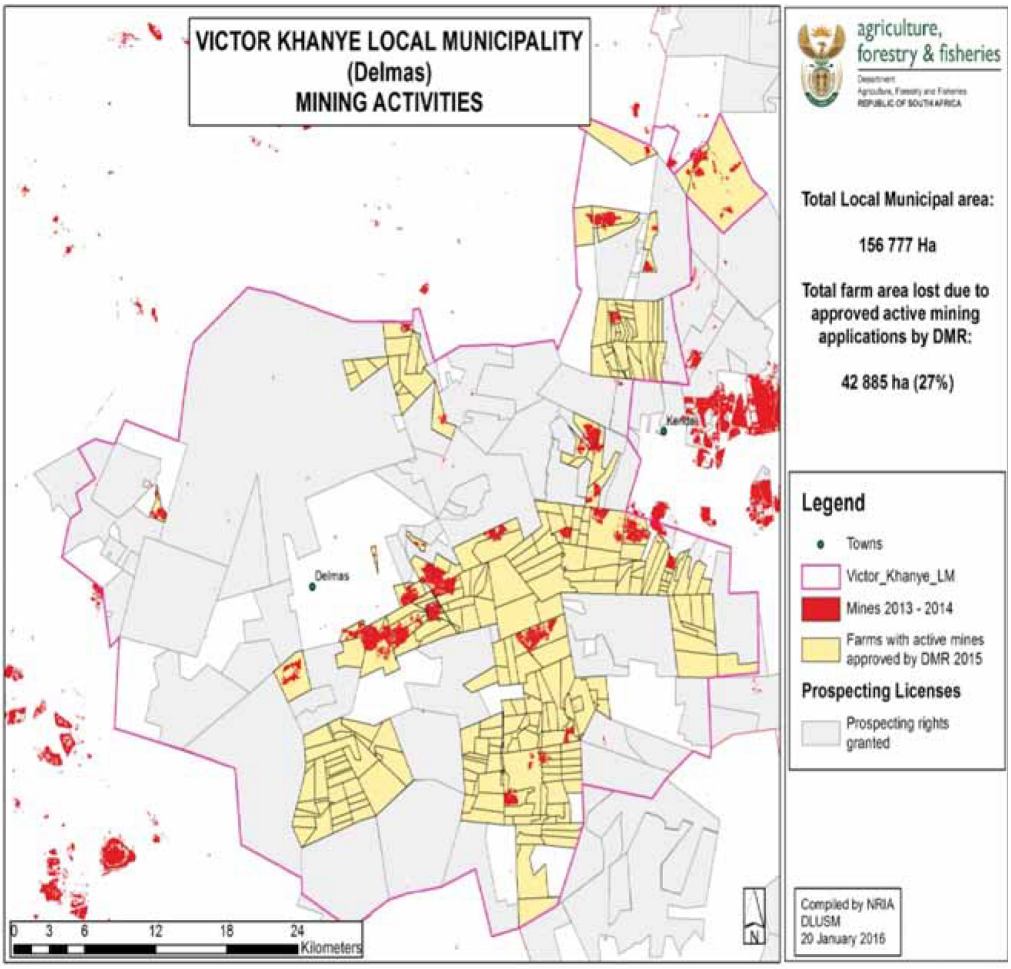


Figure 1.3 Victor Khanye Local Municipality Mining and Prospection Licensing
Forrest and Loate, 2017

The above map illustrates most of the land in Victor Khanye Local Municipality is either under mining or prospecting licenses. It is evident from the map that much of the broader Delmas area is either being mined or is earmarked for mining via prospecting. According to Van Der Burgh *et al* (2012: 17) an estimated 79 343 ha of farming land is estimated to be lost to coal mining in the Delmas, Ogies and Leandra area by 2020.

1.6.3 Delmas, Coal and the Political Economy of South Africa

Much of the rationale behind the intensification of coal mining in Delmas lay in the broader political economy of South Africa, and specifically the role of coal therein. South Africa is a leading coal producer and much of its economy is dependent on coal, for instance in terms of electricity generation. The distribution of coal determines the spatial outlay of coal mining and subsequently energy infrastructure. This carries profound implications for a place with coal reserves such as Delmas.

Table 1.1 South Africa's Top Coal Fields

Coalfield	Resources (Baruya *et al,* 2003)	Recoverable Reserves (Baruya *et al*, 2003)	Reserves 2009 (Prevost, Pers. Comm. 2011)
Witbank	16 241	12 460	8 509
Highveld	16 909	10 979	9 475
Ermelo	7 525	4 698	4 388
Vereeniging-Sasolburg	4 757	2 233	1 708
Free State	8 876	4 919	N/A
Waterberg	55 614	15 487	6 744

Adapted from SACRM, 2011: 25-26

From the above table it is clear the Central Basin coalfields – Witbank, Ermelo and Highveld – played, and continues to play, a dominant role in the coal mining industry. The Witbank Coalfield has been explored and mined for over 120 years and is crucial in the development of the gold mining industry and the industrialisation of South Africa (Hancox and Gotz, 2014: 21).

A number of mega-mines that produce over 10Mtpa are based in the Witbank Coalfield. These include Anglo Coal's Kriel mine at 10.3 Mt (in 2008) (supplying Kriel power station); Exxaro's Matla mine that produced 14 Mt (supplying Matla power station); BHP Billiton's (coal business unbundled to its subsidiary South 32) Middleburg mine at 12.1 Mt (in 2008) (supplying Duvha power station and the export market), BHP Billiton's Khutala mine produced 13.3 Mt (in 2008) (supplying Kendal power station), and BHP Billiton's (later acquired by Tegeta Exploration and Resources) Optimum mine produced 11.3 (in 2008) (supplying Hendrina power station and the export market (Eberhard, 2011: 10-13).

Given the historical importance of the Central Basin in coal reserves much of South Africa's electricity generation infrastructure and energy supply system is based in the Central Basin (Burton and Winkler, 2014: 3). For instance, seven of the eight mega-mines, owned by the five majors, critical for the majority of coal production are based in the Central Basin, with only one being based in the Waterberg Coalfield (Eberhard, 2011: 3).

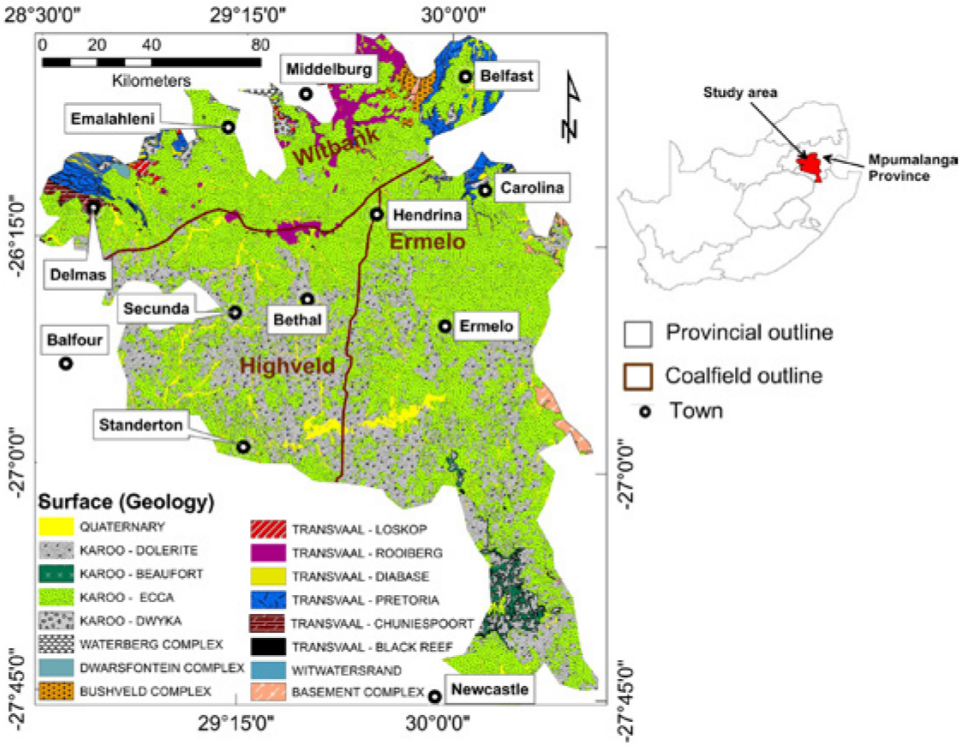


Figure 1.4 Map of Central Basin Coalfields – Witbank, Highveld and Ermelo Coalfields
Sakala *et al*, 2017: 565

As outlined in the above map, the Witbank Coalfield underlay towns such as Delmas, eMalahleni, Middleburg and Belfast. There are about 65 collieries in the vicinity of these towns that fall within the Central Basin (when including the less significant KaNgwane and

South Rand Coalfields) (Water Research Commission, undated: 32-34). Delmas is situated on a key coalfield, the Witbank Coalfield. This means Delmas, though historically an agricultural town, has long been in proximity to coal mining situated elsewhere on the Witbank Coalfield such as in places such as Witbank.

However, coal reserves in the Central Basin are generally in geological decline in quantity and quality (Burton and Winkler, 2014: 3). These contextual changes in the coal supply chain created concerns regarding the continuation of sufficient coal supply to meet current and future domestic energy security (SACRM, 2013: 1-3). According to the SACRM (2013: 4), key to ensuring domestic energy security through the coal supply chain is "investment in and development of new mines". The SACRM (2013: 4) further advocates for coal mine development particularly in the Central Basin and Waterberg coalfields.

Accordingly, licenses for coal prospecting and coal mining in the Mpumalanga province (that include the Central Basin and Witbank Coalfield in particular) grew significantly with 505 mine licenses issued since 2004 and another 6000 applications still under consideration (Filitz, 2011: 18). Consequently, the geography of coal mining has changed as new mines have emerged in areas of the Central Basin that previously had no, or were limited in, coal mining. With regards the Witbank Coalfield this has led to the emergence of new coal mines in places such as Delmas.

1.6.4 The Hydrological Context of Delmas and Coal Mining

The study site of Delmas, falls within the Upper Olifants sub-catchment of the Olifants Water Management Area (OWMA). The main river of the OWMA, the Olifants River, originates in Bethal in Mpumalanga's Highveld (Department of Water Affairs, 2013: 1). The Olifants is a tributary of the Limpopo River shared by South Africa, Zimbabwe, Botswana and Mozambique (Arranz and McCartney, 2007: 1). The main tributaries of the Olifants River are the Wilge, Elands, Ga-Selati, Klein Olifants, Steelpoort, Blyde, Klaserie and Timbavati Rivers (Department of Water Affairs, 2013: 1). The OWMA can be divided into four sub-areas that are the Upper Olifants, Middle Olifants, Lower Olifants and Steelpoort (*Ibid*.).

The mean annual runoff of the OWMA is between 500mm and 800mm, with broad spatial and temporal variations (Van Koppen, 2008: 432). Spatial and temporal variations have led to the OWMA's water resources being highly developed to ensure water supply for its diverse water

users that include mines, industries, rural and urban settlements, eco-tourism, forestry and large scale agriculture (Van Koppen, 2008: 432). Consequently, the OWMA also has strong competition for water amongst its users (*Ibid*.). The dominant economic sectors in the OWMA are the agricultural and mining sectors (Department of Water Affairs, 2013: 1).

An important dimension of the implications of coal mining on water related to the geographical interconnection of coal and water. Coal mining operations in South Africa often intersect areas of strategic importance for the country's water resource sustainability (Howard, 2016: 9). The OWMA is home to parts or all of the Witbank, Highveld, Ermelo (formerly Eastern Transvaal), KaNgwane and South Rand coalfields (Water Research Commission, undated: 32). Indeed, the Upper Olifants has significant coal reserves (Department of Water Affairs, 2013: 1).

The Upper Olifants, which includes Delmas and partly intersects with the Witbank Coalfield; has a high concentration of coal mines. The Upper Olifants is crucial for the energy generation sector with about 38 active mines and seven coal fired power stations (Hallowes and Munnik, 2016: 138). Historically South Africa's coal fired power stations were built on its most significant coalfields (which as outlined above intersected with key areas in terms of water bodies) to support economic development through electricity supply (McCarthy and Pretorius, 2009: 56). Further, the OWMA is also home to South Africa's most strategic electricity generation area with seven of Eskom's 13 coal fired stations in the Upper Olifants sub-catchment (Hallowes and Munnik, 2016: 138). The consequent growth of mining in the OWMA is a partial driver for increased water demand putting pressure on available water resources in the catchment (National Water Resources Strategy, 2013: Annexure A, 8).

The Highveld; wherein the OWMA, Upper Olifants and Delmas are situated, has a diversity of water bodies such as seasonal wetlands, perennial and seasonal streams and pans (McCarthy and Pretorius, 2009: 60). The diverse water bodies function systemically with aquifers; in the dry season the aquifers replenished some streams allowing perennial flow and some water flows out from aquifers to form wetlands (*Ibid*.). The destruction of one component of these water resources negatively affects other elements of the system. Consequently it is critical that these water bodies are protected in totality to preserve the systemic sustainability of the water system. The operation of coal mines in areas with such water bodies opens these water bodies to water pollution due to the water use of coal mines.

1.7 Problem Statement

The continuous movement of water that means water is variable in time and space is noted in literature as the biophysical nature of water. The fugitive biophysical nature of water reflected through the hydrologic cycle connects humans together - including through water-borne effluents - as well as humans and non-humans across geographic boundaries, political jurisdictions, upstream and downstream communities of water users and different economic water uses. This means diverse humans and non-humans are connected by water in terms of variability with regards water availability and scarcity (water quantity and quality) (Bakker, 2012; Linton and Budds, 2014).

Thus water scarcity as a water problem in some literature is presented as a natural water problem. Accordingly, water scarcity as a natural water problem leads to the periodically variable biophysical nature of water that means naturally periodic and cyclical water scarcity (Linton, 2011; Mehta, 2003; Falkenmark, 2013). The biophysical nature of water produces water problems such as the natural periodic scarcity of water meaning water is inherently political (Linton and Budds, 2014: 171). In other words, natural water scarcity led to social conflicts and struggles over access, use and the benefits of water use (Prakash and Sama, 2006: 578).

This perspective on the influence of the biophysical nature of water on natural water scarcity and therefore water struggles; somewhat aligns to the modern water discursive framing of water. Herein, water is discursively framed in its ontology as nature that is independent from society (Linton and Budds, 2014: 171). The implication of this framing of water-society relations is that water as nature is not influenced by society. However, this study approaches water problems such as water scarcity, and their influence on water uses and therefore struggles, not simply as the natural scarcity of the periodically variable biophysical nature of water. Instead, this study, in line with some literature on water, approaches water problems such as water scarcity, and their influence on water uses and therefore struggles; as influenced by social dynamics.

Therefore, this study is concerned with water scarcity as a water problem that arose from, and is made absolute rather than periodic by, social dynamics, particularly; the social control of water through the water regulation (of water rights). This means the social control of water is informed by social power dynamics - often with the state key in this regard - that frame and

prioritise water and water use; for priority water uses - such as economic uses - and through social mechanisms such as water rights and regulation. This study aligns with arguments that water regulation is crucial to the emergence of water scarcity as a water problem for certain water uses and therefore water struggles (Boelens *et al*, 2018; Woodhouse and Muller, 2017; Boelens, 2015; Valdivia, 2015; Kjellen *et al*, 2015). Further, the pertinence of the social dimension of the control of water, as is the case in this study, is to not simply address water scarcity as a natural problem that only required technical attention (Roth *et al*, 2018: 43). Instead this study is in the vein of perspectives, such as Roth *et al* (2015: 457), that recognise struggles over water rights, and thus water regulation, are responses to the socially driven emergence of water scarcity for certain water uses.

The research focus, and thus debates, on the dynamics of water struggles are also discussed as water justice. Similarly this body of work also broadly circumvents the approach to water problems as natural and their solutions as technical (Joy *et al*, 2014: 955). Aligned to this are attempts to interrogate the outcomes of water regulation, such as water scarcity, beyond predominant assumptions of regulatory objectivity stemming from the influence of natural science and engineering in water regulation (Joy *et al*, 2014: 960). The outcome is the discussion of water problems such as water scarcity through the influence of water control mechanisms such as water regulation, and relatedly water rights (Perreault, 2014: 234). The centring of water regulation (and thus water rights) in the emergence of water problems such as water scarcity; spotlights the different ways water regulation, and by extension water rights, lead to water problems for certain water users.

Literature on water struggles broadly focuses on “three domains of justice struggle” in which social instruments of water control - water rights and regulation- expose water users to water problems such as water scarcity. These interconnected “three domains of justice struggle” are allocation, participation and recognition (Boelens *et al*, 2018: 6). The three elements of water control in literature on water struggles; relate to the social allocation of environmental benefits and burdens, participation in decision making and recognition of particular social groups (Perreault *et al*, 2018: 36). Allocation pertains to the allocation of, and thus access to, water and therefore the benefits of water use; participation relates to influence on water regulatory rule making and thus the regulatory practices that secure access to water; and recognition struggles are over the reflection of (the multiplicity of) diversity (e.g. interests, identities, belief systems, authorities structures, local norms, gender, uses, etc of water users) in regulation (Boelens, 2015: 295).

The “dynamically” intertwined elements of water struggle reflect the variable nature of water struggles (*Ibid*.). Furthermore, the elements of water struggles are reflective of, and dependent on, diverse forms and sites of power (Zwarteveen and Boelens, 2014: 144). Thus water struggles target, and contest for particular water outcomes, in relation to the elements of water control that give rise to water scarcity as a water problem for some water users. These water outcomes organise concepts such as equity, equality and fairness. The equality of water users within water regulation, and thus water rights, is both a normative outcome that water struggles seek to facilitate water access; as well as problematised as a mechanism for impeding water access by silencing the differentiation of water users and uses. Furthermore, the equal recognition, and thus participation, of water users is often not equal as some water users are shaped to fit water regulation and water rights (Boelens *et al*, 2010a: 6).

A popular trend in literature is the issue of equitable allocation, amongst different water users, from the perspective of the burdens of water use, such as pollution (Rodríguez-Labajos and Martínez-Alier, 2015: 538). Another theme of equity is the perspective of the inequitable sharing of water and thus the benefits thereof due to water being directed to specific water uses that fit certain narratives of development and economic growth (Roth *et al*, 2014: 948). Herein, notions of efficiency behind allocation and regulation mean those water uses considered inefficient are not recognised (Subramaniam, 2014: 395). Zwarteveen and Boelens (2014: 151) argue fairness to predominantly rest on the influence of the shaping of water rights, and therefore regulation, on water access. Fairness is an issue in water rights and regulation shaped by, and dependent on, diverse forms of authority such as national law or even localised norms (Boelens and Zwarteveen, 2005: 742).

In addition to the three elements of water control predominant in debates on water struggles; there is, in some literature, a fourth dimension to water struggles. This relates to water struggles for outcomes (of fairness, equity and equality) within water control - water regulation and water rights - that would impede the use of water control to ensure particular socionatural relations of water are socially predominant over other forms. Socionatural relations of water utilise varied forms of power to construct socially accepted truth and knowledge of water problems and solutions thereby driving the praxis of water access and use (Zwarteveen and Boelens, 2014; Boelens *et al*, 2018).

Another avenue on this topic is a focus on the tactics used by by marginalised water users, to attain fair, equal and equitable outcomes from water regulation through measures such as social protest, alliances and networks. These tactics are used on powerful social interests -

such as the state and big economic water users - for instance, to achieve water rights and regulatory reforms to attain greater equity and inclusion for water users (Hoogesteger *et al*, 2017: 2).

The centring of social dynamics in water scarcity as a water problem, and the repercussions thereof in terms of water scarcity for some water users and thus water struggles, is consistent with a discursive framing of water through the socionatural relations of water. In the Andean countries, the socionatural relations of water depend on socially produced discursive frames, that structure water truth and knowledge claims, to maintain social orders (social power structures) through the control and directing of society-water interrelations to the benefit of preferred water uses. Therefore water struggles focus on contesting the influence of socionatural discursive constructs on water truths and knowledge that in turn socially control water (Boelens, 2014: 235).

Teijlingen and Hoogenboom (2016: 388) argue socionatural discursive constructs set society-nature relations to facilitate, but also to contest, mining through the shaping of law and regulation of nature in Ecuador. Marston and Perreault (2017: 256) expanded on this in Bolivia in the form of territorialized complexes termed “resource regimes” that are a configuration of socionatural relations, the state, political economic institutions, social norms and knowledge geared towards the facilitation of certain forms of resource extraction and thus water use. Therefore, the preferred water use, and social facilitation thereof, is at the core of water struggles.

Consequently, extractives and in particular, coal mining water struggles in this study are contestations over the unequal allocation of water to specific water users. The unequal allocation of water - and thus extractives, and coal mining, based water struggles - is not the random outcome of nature but the purposeful social determination, through social mechanisms of water control, of the allocation of water (Boelens *et al*, 2018: 3).

Moreover; extractives, and coal mining, water struggles in this study are contestations over the just allocation and sharing of the benefits and burdens of water amongst water users. Social mechanisms for the control of water, such as water regulation, determine the allocation and sharing of the benefits and burdens of water. This means some quarters of society as water users are not treated fairly in the procedures of the social determination of the sharing of benefits and burdens of water leading to water struggles (Perreault *et al*, 2018: 36).

This study focuses on the outcome of the social determination, through water regulation, of the benefits of water use for coal mines in Delmas, South Africa; and on the exposure of the burdens of the water use of coal mines on agricultural water use. In other words, this study focuses on the role of the water regulation of the water use of coal mines (i.e. of the water rights of coal mines) on water scarcity as a water problem for agricultural water users and the influence thereof on coal mining water struggles in Delmas, South Africa.

As outlined in literature, specifically in South America; the emergence of water scarcity as a water problem is the issue of contestation behind extractives based water struggles. Consequently, as outlined in literature, the water regulation of the water use of extractives, plays a key role in the emergence of water scarcity, and thus extractives based water struggles. Hence, this study focuses on the role of water regulation in the emergence of water scarcity as a water problem behind coal mining water struggles in Delmas, South Africa. Therefore, in its focus on the nature of coal mining water struggles; this study focuses on the varied ways in which water regulation, through water scarcity, influences the coal mining water struggles.

The structuring of the study's research problem to focus on the role of the water regulation of coal mines in the emergence of water scarcity as a water problem, and therefore coal mining water struggles; is for a number of reasons. These reasons relate to a lack of focus in literature on the influence of water regulation on coal mining water struggles in South Africa. Part of the failure to focus on water regulation in coal mining water struggles stems from the preoccupation, in literature on water struggles, on water services. This means water struggles in South Africa are predominantly not focused on productive water uses such as coal mining, hence the lack of literature on coal mining water struggles. Woodhouse (2012: 848) blames this on the political currency in public debate - in post-Apartheid South Africa - of urbanised water struggles focusing on domestic water use in the form of water services. Thus there is a lack of focus on water struggles linked to productive water use.

The lack of literature on coal mining water struggles in South Africa can be seen through the prism of a view of an African state (such as South Africa) as weak, and thus dominated by mining corporations that exploit nature such as water to their own benefit. Consequently, biophysical changes to water and associated water problems are a result of the inability, and forced complicity, of the weak state to regulate the water use of extractives (Boelens *et al*, 2018; 111). Herein, the presumption of the weakness of the state, translates to a bias towards the assumption of the weakness, lack of, or poorly developed water regulation and water law (water rights). This means literature on water struggles, from the perspective of water

struggles in South Africa (and Africa generally), largely assumes extractives based water struggles are not as a result of purposeful water regulatory practices.

Hence, there is a lack of interrogation in literature of the role of the regulation of the water use of coal mines in coal mining water struggles. Moreover, literature ignores the influence of established water legislation and regulatory environment such as South Africa on coal mining water struggles. Connected to this is a focus in discourse on coal mining water struggles; on inadequate regulation of the impact of coal mines on the environment, including the water use of coal mines. The CER (2016: 32-33) outlines a number of mining regulatory shortcomings including inadequate environmental rehabilitation, failure to monitor and enforce environmental aspects of mining legislation, poor implementation of rehabilitation regulations meant to ensure polluting mining companies pay for mitigation.

Subsequently, the role of the state fails to garner much attention. Indeed, attention given to the state in literature is largely for its failure to adequately regulate the water use of coal mining. Moreover, the state also receives attention for the inadequacy of water regulation. Hence, the state tends to not be approached as a direct driver of water struggles. Instead attention on the role of the state tends to be on the poor implementation of water regulation and thus implicitly relates to the capacity of the state.

1.8 Research Questions

The research questions for this study are as follows:

1) What is the nature of coal mining water struggles in Delmas, South Africa and what is the role of water regulation in the nature of coal mining water struggles?

2) How does water regulation influence the nature of coal mining water struggles in Delmas?

1.9 Research Objectives

The research objectives of the study are the following:

1) To understand the role of water regulation of the water use of coal mines in water scarcity as the water problem behind the nature of coal mining water struggles due to in Delmas, South Africa.

2) To understand the mechanisms through which water regulation influences water scarcity as the nature of coal mining water struggles in Delmas, South Africa.

3) To examine the relevance of water grabbing as a theoretical framework for the understanding of coal mining water struggles stemming from the water regulation of coal mines in Delmas, South Africa.

1.10 Aims of the Study

The aim of this study is to examine water struggles related to the water use of coal mining in Delmas. The examination of such water struggles, for this study, particularly focuses on the water regulation of the water use of coal mining. This study specifically interrogates the influence of the water regulation of coal mines on water scarcity as a water problem. By focusing on the influence of water regulation of coal mines on water scarcity, this study focuses on understanding the influence of water regulation on coal mining water struggles.

The central role of the state in water regulation in South Africa means this study also implicitly interrogates the role of the state in water scarcity as a water problem. By extension this study implicitly also aims to understand the influence of the state - through the water regulation of coal mines - on coal mining water struggles.

The focus on the water regulation of the water use of coal mines means this study, on a deeper level, seeks to interrogate the socionatural relations of water that influence, and are influenced by, water regulation. The study implicitly aims to understand the contribution of socionatural relations of water to water scarcity as the issue of contestation behind coal mining water struggles in Delmas, South Africa.

At the core of the examination of the understanding of coal mining water struggles, this study aims to understand the nature of such water struggles. In understanding the nature of these water struggles, this study seeks to understand water scarcity as the issue of contestation behind water struggles. Further, this study aims to understand the varied mechanisms of the

formulation of water scarcity, through water regulation, as the issue of contestation behind water struggles.

Finally, this study also seeks to ascertain the relevance of water grabbing as a theoretical framework for the understanding of water struggles. The study also aims to deploy water grabbing on coal mining water struggles in Delmas, specifically to understand water scarcity as the issue of contestation in the nature of water struggles.

1.11 Significance of the Study

In contrast to the majority of existing discussion on water struggles in South Africa, this study focuses on coal mining water struggles. Accordingly, this study is to build knowledge on water struggles emanating from the water use of coal mining. There is a particular focus on the nature of coal mining water struggles. The nature of coal mining water struggles pertains to developing knowledge on water scarcity as the issue of contestation behind the nature of coal mining water struggles in Delmas, South Africa.

Further, this study also seeks to explore the mechanisms through which water regulation shapes water scarcity as the issue of contestation behind the nature of coal mining water struggles. This means the focus on influence of water regulation on water scarcity as the water problem behind the nature of coal mining water struggle translates to a focus on the mechanisms of coal mining water struggles.

The significance of this study, is also in the interrogation of the socionatural relations of water that shaped water regulatory practices that fostered water scarcity and thus coal mining water struggles. In particular, this meant the interrogation of the influence of the socionatural relations of water on the water regulation of the water use of coal mines. The interrogation of these socionatural relations of water set, through water regulation, will allow the study to reflect on the social power; that shapes the society-water interrelations and in turn influences water scarcity as the issue of contestation at the core of the nature of coal mining water struggles.

The significance of this study is that the focus on the role of water regulation indirectly means the interrogation of the role of the state in coal mining water struggles in South Africa. This means the significance of this study is also to contribute knowledge on the role of the state in

understanding the nature of coal mining water struggles. Consequently, the significance of the study's implicit focus on the state, through water regulation, is the implicit interrogation of the role of the state in socionatural relations of water. Specifically this focus relates to the interrogation of the role of the state in structuring society-water relations that influence water scarcity as the issue of contestation behind the nature of coal mining water struggles.

Water grabbing as the theoretical framework to be used by this study is also significant in the provision of an opportunity to develop knowledge on the utility of water grabbing as a framework for understanding the nature of coal mining water struggles. Moreover, this study is also significant in developing knowledge on the influence of the mechanisms on water scarcity as the issue of contestation at the core of the nature of coal mining water struggles.

Using water grabbing as a theoretical framework to understand the nature of coal mining water struggles, means this study uses water grabbing to analyse the socionatural relations of water. The significance of this study is in determining the usefulness of water grabbing as an analytical framework to understand the socionatural relations of water that drive water struggles. Water grabbing assesses the role of the state, through water regulation, in the socionatural relations of water that drove coal mining water struggles.

1.12 Chapter Outline

This study is made up of nine chapters. The first five chapters, in varying ways, provide a background of the study. The background to the study is in terms of the introduction of the study, literature review, context of water regulation in the study and South Africa, the relevance of the socionatural relations of water in the study and research methodology of the study. The thesis then has a two empirical chapters followed by a single interpretation chapter. The thesis is the closed off by a concluding chapter.

1.12.1 Chapter One

This chapter introduces the research study providing a conceptual outline of extractives and coal mining water struggles, through international literature on extractives based water struggles, as well as South African literature on extractives, and particularly coal mining water struggles. This chapter thus introduces the role of water regulation in water scarcity as the water problem at the nature of extractives, and coal mining, based water struggles. There

is also an introduction of the varied mechanisms through which water regulation influences water scarcity and thus extractives and coal mining water struggles. Moreover, a brief explanation is provided of the theoretical framework to be used to analyse the findings of the study. Lastly, this chapter also outlined the structure of the research study.

1.12.2 Chapter Two

There is a continuation of the review of literature delving in-depth into international and broader extractives based water struggles and coal mining water struggles in South Africa. Chapter Two unpacks water scarcity as the water problems. An in-depth discussion deals with the mechanisms through which water regulation influences water scarcity and thus contributes to extractives, and specifically coal mining, based water struggles. The significance of socionatural relations of water in relation to water regulation of extractives and coal mines is explored to show the influences of socionatural relations of water regulation and the emergence of water scarcity as the issue of contestation behind extractives and coal mining based water struggles.

1.12.3 Chapter Three

Chapter three follows on chapters two by focusing on water grabbing and to connection thereof with socionatural relations of water. Debates on water grabbing as a theoretical framework are/is provided. A discussion is provided on the relevance of water grabbing as a theoretical framework for the interpretation of the influence of the socionatural relations of water, through water regulation, on water scarcity and thus coal mining water struggles.

1.12.4 Chapter Four

Chapter four outlines literature on water regulation in South Africa. This literature contextualises water regulation for this study by explaining the structure and design of water regulation in South Africa. Further, this chapter outlines the water regulation of extractives in South Africa.

1.12.5 Chapter Five

Chapter five contains an in-depth discussion of the research design of the research project. This chapter provides an explanation for the selection of the research design over other possible research designs. An outline is also provided of the research methodology of the study. The outlining of the research methodology includes an explanation for the various elements of a research methodology including the targeted key informants as data sources, sampling strategy, data collection methods and data analysis. A discussion of the site selection criteria is also be contained in this chapter.

1.12.6 Chapter Six

For the sake of clarity, with the each empirical chapter corresponding to the two research questions, the findings are presented in two chapters. Chapter Six is the first chapter focusing on the presentation of the findings of the study addressing research question one. Chapter six outlines findings on the role of water regulation on water scarcity as the water problem at the core of the nature of coal mining water struggles. This chapter argues, based on the findings, regulatory practices are key to the normalisation of the potential of future water scarcity for agricultural water users. This normalisation of water scarcity is at the core of the nature of coal mining water struggles.

1.12.7 Chapter Seven

Chapter seven is the second chapter that dealt with the presentation of the empirical findings of the study. Chapter seven focuses on the presentation of findings on the mechanisms through which water regulation influences coal mining water struggles. Chapter seven presents findings on how the mechanisms of water regulation influence the normalisation of the potential of future water scarcity as water problem in turn influencing the nature of coal mining water struggles. Given the role of water regulation in the normalisation of water scarcity; these findings determine water regulation as at the core of the nature of coal mining water struggles.

1.12.8 Chapter Eight

Chapter eight dealt with the interpretation of the empirical findings in chapters seven and eight. Chapter eight argues the mechanisms of water regulation's were in practice the water grabbing of the state authority as water regulation for repurposing and dysfunction to order the water use of coal mines in Delmas. Coal-centric socionatural relations of water flow through water regulation to order the water use of coal mines thereby influencing the normalisation of the potential of future water scarcity and coal mining water struggles. The water grabbing of the state authority as water regulation is deft swinging between the legal and extra-legal in the unfair, unequal and inequitable ordering of the water use of coal mines to the detriment of water availability for coal mines.

1.12.9 Chapter Nine

Chapter Nine provides the conclusion of the study. This chapter encapsulates the outcomes of the study relative to the research questions and aims of the study. Chapter nine concludes the normalisation of the potential of future water scarcity, as a result of the ordering of the water use of coal mines, is at the core of the nature of coal mining water struggles. In other words, the normalisation of water scarcity through unfair, unequal and inequitable water regulatory practices is the issue of contestation behind coal mining water struggles. Coal-centric socionatural relations of water are central in shaping unfair, unequal and inequitable water regulatory practices leading to coal mining water struggles.

2. Literature Review of Extractives Based Water Struggles

2.1 Introduction

The pollution and damage of water bodies due to the water use of extractives, in many parts of the world, is well documented. The same can be said of water scarcity as a resultant water problem that characterised water struggles due to the water use of extractives in different parts of the world. Some of academic debates on extractives based water struggles are concerned with examining the role of water regulation on water scarcity as a water problem. By extension this focus in literature also illuminates the influence, on water scarcity and therefore extractives based water struggles; of the water regulation of extractive water uses.

This chapter delves, in detail, into prevailing discourses on the role of water regulation in extractives based water struggles. This exploration of literature on the topic begins with outlining a conceptual framework that explains key concepts relevant to the study and literature. The chapter unfurls debates on the influence of water regulation on, the more general, extractives based water struggles. In so doing, the discussion outlines diverse mechanisms through which water regulation shapes generic extractives based water struggles.

The focus of the study follows is on the influence of water regulation on the character of the water problem at the core of the nature of coal mining water struggles in Delmas, South Africa. In line with this focus there is also an exploration of discourse on the role of water regulation on coal mining water struggles in South Africa.

2.2 Conceptual Framework

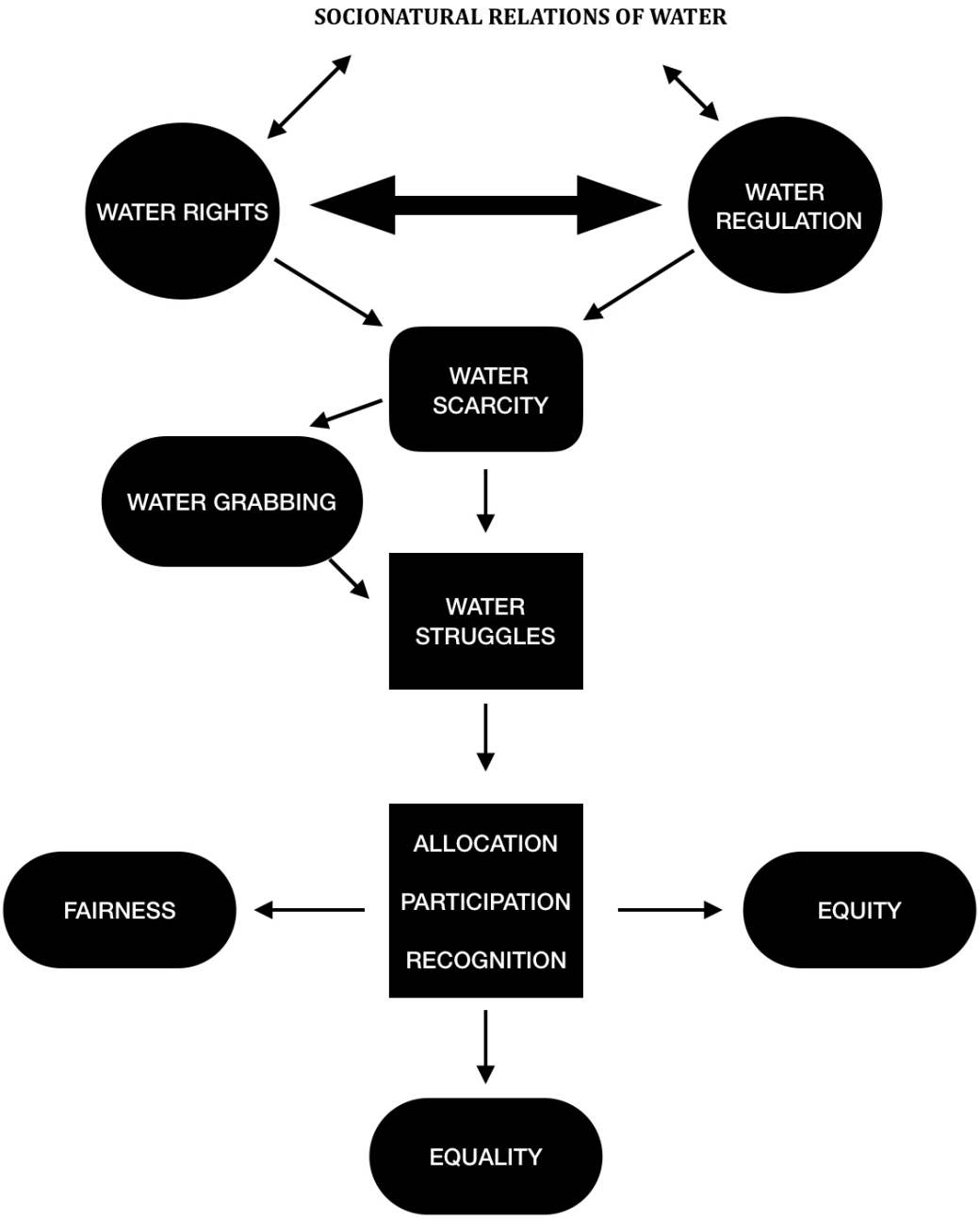


Figure 2.1 Conceptual Framework

The conceptual framework serves two purposes in this chapter (and going forwards). Firstly, the conceptual framework provides conceptual clarity on key concepts in the study's argument. The concepts are explained below. Secondly, as the figure alludes the conceptual framework also explains conceptual interconnections and their relevance to coal mining water struggles. Following on the explanation of the concepts a brief explanation of their interconnections is provided.

The above figure also illustrates the role of water grabbing as a theoretical framework in this study. Water grabbing is deployed to interpret the empirical findings on the conceptual relationships behind coal mining water struggles. Water grabbing is explained in detail in chapter four.

2.2.1 Water Rights

Water rights are termed an "umbrella concept" due to the varied constructs of water rights (Von Benda-Beckmann *et al*, 1997: 224). Therefore definitions of water rights vary. This variation is evident in the typologies of water rights that illustrate the diversity of water rights. Meinzen-Dick and Nkoya (2007: 16-17) outlines water rights as public, private and collective. These water rights vary on the authority of decision making on the allocation of water rights as well as the claim authority in terms of who holds, and thus benefits from, water rights (Meinzen-Dick and Nkoya, 2007: 16-17). Public water rights are vested in, and allocated by, the state through use licenses; collective water rights are held collectively by the community and typically allocated by the community to community members, and private property rights are vested in legal individuals (*Ibid*.). The diversity of forms of water rights notwithstanding, water rights - as with property rights in general - can be distilled into three facets. The first relates to water rights holders, the second pertains to the construct of water as an object of value and lastly the construct of rights and obligations in reference to the object of value (Roth *et al*, 2015: 462).

Water rights are socially embedded in social influences such as history, culture, social power dynamics, and normative frames (Zwarteveen and Boelens, 2014: 151). In other words, water rights structure social relations but are also a result of the social relations amongst people (with or without water rights) (Perreault *et al*, 2018: 38).

Moreover, water rights are complex. This complexity is borne of the multi-layered form of water rights (*Ibid*.). This multi-layered form is captured in various ways in discourse. Some literature speaks of the bundle of rights. The bundle of rights is a conglomerate of rights split between access and withdrawal on the one hand, and regulatory rules and decision making to control water uses and users, on the other hand (Meinzen-Dick and Pradhan, 2005: 240). Other literature engages the complexity and contradictions of water rights through the echelon of rights analysis. The echelon of rights analysis also reflects different layers of water

rights: 1) access and use; 2) construct of regulatory rules, obligations, allocation rules; 3) legitimate authority for the construct of rules, enforcement of rules and rights, and 4) discursive constructs that construct, order, legitimise and uphold water control orders (Boelens *et al*, 2010: 18). The fourth part of the echelon of rights analysis highlights the significant if hidden influence of discursive constructs in the construct and practice of water rights. Another level of complexity is reflected through the bundle of rights facilitating water being held and used by different rights holders (Meinzen-Dick and Nkoya, 2007: 15).

Water rights in this thesis should be understood as the layered and socially embedded structuring of relations between water users (including water rights holders and those without), water as an object of value and authority structure that allocates and enforces water rights claims. The social dimension of water rights is also invisible in the way of discursive constructs that frame important elements of, or that influence, water rights such as knowledge, the ontology of water, the cultural underpinnings of water, etc. These discursive constructs are often the results of powerful social interests that seek to discursively control water through the construct of water rights.

Water rights are based on and structure the interrelation of different forms of authority such as the authority to set the mechanisms for the allocation of, and thus access to, water for water rights holders; the authority of a water rights holder to claim water; the authority to develop rules on allocation and enforce water use. Water rights are inherently constructed as a regulatory framework of rules on allocation and water use that are enforceable, and also include obligations and restrictions on how water could be used by water users that hold claims of authority on water rights. This meant water regulation and water rights were intertwined in their construct and praxis.

2.2.2 Water Regulation

The above definitions of water rights indicate the inherent interconnection of water rights and water regulation. Indeed, some definitions of water rights, particularly those that emphasise complexity, pointed to water regulation as an inherent part of water rights. The bundle of rights conceptualises water regulation as an inseparable dimension of water rights (Meinzen-Dick and Pradhan, 2005: 240-241). As a dimension of water rights, water regulation is the "rights" or claim authority to engage in decision making that set and implement rules and thereby control water use and users (*Ibid*.). Water regulation includes rules on the allocation

of water on the one end (Boelens and Vos, 2012: 16). On the other end water regulatory rules set and/or deal with the specificities of water rights in relation to terms, limitations and obligations of water use (Boelens and Zwarteveen, 2005: 742).

Social power is integral to regulatory rules. The setting of regulatory rules is intrinsically an exercise, and thus reflection of, social power dynamics (Zwarteveen and Boelens, 2014: 144). For instance, water regulation is an expression of power in the structuring of the way people interacted with water (Boelens and Zwarteveen, 2005: 737). Indeed, the social power dynamics behind water regulation are also expressed in the idea of activated and materialised water rights. Herein, the construct of water rights, or reference rights, is argued as heavily dependent on the construct of regulatory rules, activated water rights, that operationalise reference rights; and the translation of reference rights in practice through rules (Roth *et al*, 2015: 463).

Regulatory rules do not materialise spontaneously but are the result of discursive constructs that frame, through the mediation of social power dynamics, and structure the praxis of water regulation (Boelens, 2015a: 6). Discursive constructs inform regulatory rules in terms of the construct of rules, regulatory organisations, ordering of regulatory rules, user participation in regulatory function and decision making, the use of water knowledge in regulatory processes, etc (Boelens, 2010: 161-162). Discursive constructs, and thus water rights and water regulation, are products of, and informed by, socionatural relations of water. At the core of socionatural relations of water is that society and water interrelated by influencing, making and remaking each other.

The biophysical nature of water as a fugitive and variable form of nature influences water rights to also be fluid and flexible (Meinzen-Dick and Nkoya, 2007: 12-13). Water rights are also shaped by the ecological context of water, and indeed society (Zwarteveen and Boelens, 2014: 151). Given the intrinsic interconnection of water rights and regulation; water rights and regulation were thus the outcome of the influence of water on society. Society also influenced, water as nature; for instance, through mechanisms of water control and allocation (such as water rights and water regulation) (Menga and Swygendouw, 2018: 3). Discursive constructs underlay the socionatural relations of water that structure the interrelation of nature and society (Boelens, 2015a: 16). Discursive constructs control, influence, standardise and normalise aspects of water such as concepts, objects, users, uses, water problems, water solutions, etc (*Ibid*.).

The society-water interrelation and mutual (re)creation is fuelled by, and reinforces, social power (Menga and Swygendouw, 2018: 1). Thus discursive constructs, as the key intermediaries in society-water interrelations, are the outcome of social power dynamics that in turn control water and thus water use to reinforce water use interests of powerful social interests. Thus discursive constructs, as socionatural relations of water, influence water regulation to determine the allocation and praxis of access to, and use of, water.

For this study water regulation is a set of regulatory rules that are an integral part of water rights. These rules are imbued of social power in their construct but also in their practice as they mean the practical achievement and experience of reference water rights. As a social construct, water rights reflect broader social influences and power dynamics through discursive constructs that make up water rights, and also, affect the praxis of water rights. These discursive constructs are integral to socionatural relations of water that shape water, through water regulation constructed through socionatural relations of water, and are shaped by water. Intrinsic to these socionatural relations of water, and accordingly water regulation, is social power as the discursive constructs therein are a product social power.

2.2.3 Water Scarcity

Water scarcity for water users and uses is a natural phenomenon resultant from periodic, cyclical variability of water (Treffner *et al*, 2010: 313). However, the understanding of water scarcity as the scarcity of natural water supply is a limited outlook on water scarcity. Instead, water scarcity is not just a natural occurrence but the result of social interventions of water control such as water rights and the regulation thereof.

The hegemonic discursive framing of water and aspects of water facilitate and inform water control mechanisms that in turn determine access to and use of water (Linton, 2010: 69). The ontological framing of water - its definition and meaning - translates to practical, physical access and use of water as well as the converse in terms of the “manufactured scarcity” of water (*Ibid*.). This results in water control mechanisms - such as water rights and water regulation - that “manufactured scarcity” of water for some water users and uses (Swatuk, 2017: 3). Similarly, Jairath (2010: 215) argues “absolute water scarcity” is a hegemonic understanding of water scarcity as not simply natural, periodic and cyclical but rather a universal water scarcity resultant, but also in the service, of supply-side focused water regulation.

Water scarcity for the poorest and most vulnerable in society - a result of social power dynamics - is also in terms of access to poor quality water that inhibit water uses (Kulindwa and Lein, 2008: 3). Once more, this is an outcome of the water control mechanisms rather than a lack of naturally available water (*Ibid*.).

Water problems such as water scarcity is the result of water control mechanisms such as water rights and water regulation. These water problems relate to the transformation of the biophysical nature of water creating problems in water use for the water users. These transformations are social, particularly in the focus of this study, as outcomes of social water uses facilitated through water regulation. Other water users' access to, and use of, water is accordingly affected by social users that biophysically transform water. Water scarcity as a water problem should thus be viewed as not just the biophysical transformation of water that affects other water uses but also the water regulation of water uses that inhibit other water users access and use due to their water use.

2.2.4 Water Struggles

Water struggles revolve around three broad, and sometimes overlapping, layers of water struggles that mirror layers of water control in water regulation. These three layers of water struggles, also encapsulated in water regulation; are allocation, recognition and participation. The allocation of water, and thus access to water, is a popular aspect of water struggles in literature. The allocation of water centres on water rights and the regulatory rules thereof that provide legitimate authority to claim access to water in terms of control over water, storage and transportation, water infrastructure and the practical use of water (Von Benda-Beckmann *et al*, 1997: 1).

Water rights as a water control mechanism, facilitate access and use of water, and thus transform water in quantity, quality, flows, etc thereby affecting access to and use of water for other water users and uses (Roth *et al*, 2018: 43). Water rights as authority claims to access and use water are contextual, historical and cultural (Perreault *et al*, 2018: 38). This indicates that the allocation and use of water and the transformation thereof with attendant water use problems for other water users is socially driven. Water struggles are a result of the manner in which water rights, and regulatory rules of allocation, led to water scarcity for some water users (Roth *et al*, 2018: 43).

Water rights are interlinked with regulatory rules that detail the restrictions, obligations, sanctions, etc that accompany the authority claim to access and use water (Perreault *et al*, 2018). These regulatory rules are key to the praxis of access to, and thus exclusion, from water for some water users and uses (Boelens, 2015a: 8). In other words, water struggles stemmed from the procedural influence of water regulation in the inequitable access and use of water (Zwarteveen and Boelens, 2014: 147).

Water struggles can be viewed as emanating from the lack of participation in regulatory decision making and implementation of rules and processes that fail to consider the water use interests of excluded water users (Hoogesteger *et al*, 2017: 2). Water struggles emanating from water regulation could be understood as the lack of equal consideration (i.e. participation) of water users in regulatory enforcement leading to unfair water regulation and inequitable access to water (Gerlack and Ingram, 2018: 77).

Some water struggles are around water regulatory rules centred on the the lack of recognition of a range of dynamics in the construct and exercise of water regulation; that affect access to, and use of, water for water users (Zwarteveen and Boelens, 2014: 144). The outcome is the disappearing of critical factors, such as social power, culture, knowledge, gender, forms of uses, economy, etc; in the construct and exercise of regulatory rules so that unfair and inequitable access to water due to regulatory decision making is normalised (*Ibid*.).

Zwarteveen and Boelens (2014: 149) note the co-constitutive interrelations of society and nature as the base of the socionatural relations of water. The interrelations of society and water are glued together by politics, water knowledge, water institutions (such as water rights and regulation), infrastructure, discourses that shape water problems and solutions, etc (Zwarteveen and Boelens, 2014: 149). The interrelation behind the socionatural relations of water is representative of historic and ongoing struggles over society and nature (*Ibid*.). Struggles over socionatural relations of water could be understood as struggles over the existence of particular forms of "water control communities" and their forms of interrelation with water, and vice versa (Boelens *et al*, 2018: 22).

Water struggles as struggles over socionatural relations of water are composite and often interconnected struggles over allocation, "socio-ecological integrity" (the ecological protection of territories) and struggles over the organisation, control and definition of socionatural systems (cultural and representativity) (*Ibid*.). The varied and manifold dimensions of

interrelation mean struggles over socionatural relations of water represent many points of struggles including political, economic, ecological, the law, the form of property rights, etc (Crow, 2014: 259).

In this study, water struggles can be considered as layered in a manner that mirrors water regulation. The layers of water struggles relate to allocation, recognition and participation. Allocation pertains to the construct and regulatory rules of authority that frame access and use, and exclusion for water users. The practice of allocation of water leads to the exclusion of water users from access to water rights and the authority to claim and use water. The exclusion of water users from the allocation of water rights can be based on the unfair and unequal function of the authority of allocation that structurally inequitably deprives water rights to certain water users. Sometimes, allocation can be impeded as a function meaning other water users can circumvent fair equal allocation processes to unfairly appropriate water. The dynamics of water struggles stem from contestations of both the unfair, unequal and inequitable function and dysfunction (as in not functioning at all or not functioning as intended) of water allocation.

Recognition relates to the omission or under-representation of social identifiers, factors, contexts and dynamics of water users in regulatory rules that determine access and use of water for water users. The lack of inclusion of the markers of water users unfairly and unequal affect the procedural regulation of their water rights authority claims. The outcome is often inequitable water use for water users as they are not fairly and equally dealt with in regulatory processes and decision making. This unfair, unequal and inequitable function of water regulation due to non-recognition (or inadequate recognition) of water uses and users was often at the heart of water struggles.

Participation pertains to the facilitation of the participation of water users in regulatory rules and processes that shape access to and use of water for water users. Without adequate regulatory rules for the fair and equal participation of water users in regulatory processes, some water users were unable to influence regulatory processes and decisions whilst others were able to do so. This led to inequitable access to and use of water that benefitted some users whilst crippling others. This inequitable water use was key to water struggles. Moreover, in the context of this study, participation also includes the facilitation of the regulatory authority to enforce water rights. The inability of the regulatory authority to enforce regulatory rules for the enjoyment of water rights, means the unfair and unequal exclusion of rights holders from the ability to equitably enjoy their claim authority to water use.

On a deeper level, this study also notes water struggles as fundamentally informed by the construct of water regulation. Discursive constructs that underlay socionatural relations of water in turn influence the construct of water regulation. So through the discursive framing of water regulation and thus the function thereof, the praxis of water regulation is shaped to unfairly, unequally and inequitably order and exclude water uses exposing some water users to water scarcity. Water scarcity as an outcome of this ordering and exclusion due to the construct of water regulation is central to water struggles. Indeed, even when water users have a claim authority to use water this can be limited in praxis through the unfair, unequal and inequitable construct of water regulation affecting the water regulation of that water use. The resultant water problem of scarcity fosters struggles over access to, and use of, water.

Intrinsic to water struggles is the power of water regulation to shape the praxis of water availability and scarcity. This power is not just due to the authority of regulatory rules of water rights but also through the ability to unfairly, unequally and inequitable control and redirect the function of the regulatory authority or to impede its function. Thus water struggles can be about the power dynamics behind the unfair and unequal function and/or dysfunction of water regulation. Further, power also relates to the unfair, unequal and inequitable construct of the layers of water regulation in terms of allocation, recognition and participation determining the practice of water regulation and thus water availability and scarcity. Water struggles contest the power and use thereof; behind the unfair, unequal and inequitable function and/or dysfunction of water regulation.

2.2.5 Fairness, Equity and Equality in Water Struggles

As outlined above; water struggles centre around three broad, and overlapping, layers of struggles. The three layers of struggle in allocation, recognition and participation; broadly mirror water rights and regulation. Water struggles centred on these layers of water struggles, revolve around the influence in practice of three principles - fairness, equity and equality. In particular, water struggles centre on the role of the three principles in the allocation, recognition and participation layers of water rights and regulation.

Understandings of fairness in water control mechanisms such as water rights and regulation in the facilitation of access of water is not universal but rather diverse (Boelens *et al*, 2018: 2). Crow (2014: 249) outlined fairness as “deliberative fairness" for “equitable or comparable”

access and use of water amongst water users. Further, the experience of fairness, more particularly the lack thereof, in water rights and water regulation, is the outcome of social power (Roth *et al*, 2018: 52).

Equity is part of distributive justice discourse that focuses on the distribution of rewards or outputs to society (Neal, *et al*, 2014: 3-4). At the heart of this literature are concerns over equitable distribution of outputs to society (*Ibid*.). Equity is usually considered a key element of the just allocation of water to water users through water rights (Neal *et al*, 2014: 3). However, the notion of equity is context and relational specific and thus diverse in space, time and location (Roth *et al*, 2014: 947). Perreault (2017: 43) argues equity in water regulation is about "just, impartial and fair" water regulatory practice. Equity relates to the "fairness", "social justice" and "acceptability" of the construct and practice of regulatory rules, and rules that influence the allocation of "material or "immaterial resources" (Perreault, 2017: 43). However, it is difficult to conceive of equity in historical intersectional struggles over access to water; in the context of water uses with unequal water use needs (Perreault, 2017: 43-44).

At the core of equality is the idea that prospective water users are equal and indeed have an equal opportunity to access water from a regulatory authority (Achterhuis *et al*, 2010: 49). The regulatory authority utilises equal rules, in other words universal, that apply to all water users; however, in praxis universal water regulatory rules actually operate in unequal ways to the benefit of powerful water users (*Ibid*.). Moreover, equality meant a universalism in the application of water regulation that in effect is the centralisation of authority leading to top-down (and thus the ability to control and determine) decision making (Gerlack and Ingram, 2018: 77). Further, equality universalised regulatory rules and processes thereby ignoring differences in the application thereof; especially in relation to water users whose water uses are considered under them (Boelens, 2015a: 17).

For the purposes of this study, the three principles of fairness, equality and equity should be understood as follows. Fairness in this study is context specific and thus flexible. Fairness is the balance and comparable consideration of water users and uses in regulatory processes. Fairness ideally underpins the regulatory authority as power in the exercise of authority in the allocation and enforcement of water use.

Equity speaks to a concern with the equitable allocation of water to water users. Equity does not mean all water users must receive the same amount of water but is considered from a context and relational basis as meaning the allocation of water to one water user does not

impair the water use of another water user. The exercise of the regulatory authority in facilitating the equitable allocation of water must be objective and balanced.

Equality places a premium on the equal and impartial treatment of water users in regulatory processes. Equality means regulatory decisions are outcomes of rules and processes that assess water users equally. However, there is also a need to accept that equality in reality complex as water users are not the same nor are their uses and thus universalism in decision making can be damaging to water use interests. This means equality should accept differences in its practical implementation in a regulatory authority but do so not with a view of ensuring balance rather than bias.

2.2.6 Conceptual Interconnections of the Conceptual Framework

The concepts of figure 2.1 explained above are further explained in terms of their interconnection. As stated above, the socionatural relations of water inform and are informed by water regulation. That is to say, water regulation is discursively constructed by a variety of interrelated social discursive constructs such as water rights/regulation, water knowledge frames, the ontology of water, religion, and so forth. Through these constructs society influences water through water regulation. However, water also influences these society, and thus socionatural relations of water, through the water use.

The socionatural relations of water shape the construct of water regulation and water rights. The function and praxis of water regulation and water rights is moulded by socionatural relations of water by influencing the authority of water rights and regulation. This means the socionatural relations of water are able to control the function and praxis of water regulation to reflect the influence of the discursive constructs behind socionatural relations of water.

The influence of the socionatural relations of water is on water regulation and water rights as concepts that are integrally interrelated. As explained earlier water rights in this thesis inherently constitute the regulatory rules and processes that give practical meaning to the allocation and water use dimensions of water rights. Regulatory rules are critical to the enforcement authority's ability to enforce allocation and the claim authority of water use. Therefore the function and/or dysfunction of the regulatory authority is crucial in the ability of water users to utilise their water rights and thus access and use water. In other words,

water users with water rights could still be exposed to water scarcity depending on the function and/or dysfunction of the regulatory authority in materialising their water rights in actual water use. Some water users due to exclusion from water rights do not even have the claim authority for legitimise legal water use thereby meaning they are exposed to water scarcity.

The outcomes of water scarcity due to regulatory processes is central to water struggles. In particular, the function and/or dysfunction of the regulatory authority, as influenced by socionatural relations of water, is sometimes unfair, unequal and inequitable in its function and/or dysfunction. So water struggles are often a response to, and a contest of, the lack of fairness, equality and equity in the processes and decisions of water regulation. This lack of fairness, equality and equity is in terms of the three layers of water struggles - allocation, recognition and participation. The dearth of fairness, equality and equity practically leads to the inequitable access and use of water. The water regulation of water allocation and use can consequently be viewed as an arena and target of power that bends the function of water regulation to particular water use outcomes that benefit particular water users.

This study seeks to deploy water grabbing as a means of interpreting the way power operates to control, redirect and curtail the function of water regulation. Consequently, water grabbing targets the regulatory authority so it functions unfairly, unequally and inequitably. For this reason, water grabbing can be a useful framework to explain water struggles. This will be explained further in the following chapter.

2.3 The Role of Water Regulation in Extractives Based Water Struggles

In academic discussions, water regulation is at once treated as a tool for the facilitation of, and a threat, to the water use of extractives. Discourses on the role of water regulation in extractives based water struggles, in literature, took two broad forms. The first broadly relates to the utility of water regulation to the facilitation of the water use of extractives. The second broadly focuses on the undermining of the water regulation of extractives.

Both speak to the ordering of the water use of coal mines above the sustainability of water bodies and the consideration of other water users. The outcomes of the lack of consideration of the impacts of the water use of extractives on water bodies and other water users is central to the water scarcity as a water problem behind extractives based water struggles.

2.3.1 The Influence of the Construct of Water Rights on Water Regulation and Extractives Based Water Struggles

Some academic debates focus on the influence of the form of water rights on the shape and practice of the regulation of the water use of extractives. The influence of water rights on water regulation is often anchored on discursive constructs. An example of a discursive construct key to the discursive framing of water rights is the ontology of water. The ontology of water reflects preferred values of water (Boelens, 2015a: 96). The practical consequence, was to create water control - i.e. water rights regimes - that prioritises particular preferred water uses. For instance, the socionatural construct of the ontology of water frames water control, i.e. water rights, through water as an economic good (Bakker, 2013: 256). Herein, the discursive frame of water profoundly impacts the rights and regulatory regime designed to control water. The ontology of water, utilises social power to ensconce preferred discursive constructs of water truths or knowledge regimes, at the core of structuring water orders as society-water interrelations (Boelens, 2015a: 92-96). The question of what is water, at the core of the ontology of water, carries profound implications for who should control water, who should use water, what uses should water be utilised for, and so on. Thus the ontology of water is a powerful means, and reflection of power, that shapes water regulation and thus orders water use.

Flowing from the ontology of water, is the discursive construct of efficiency, that tends to put a premium on the water use of those water users considered high value economic water users (Roth *et al*, 2018: 44). Efficiency as a discursive construct is strongly interlinked to water scarcity in that a scarce resource has to be utilised efficiently (Boelens, 2005: 3). Indeed, water scarcity as a discursive construct is key in the shaping of water rights - particularly the drive towards formal water rights. This is part of the effort to control and ensure the best use of water as an economic good - meaning as something fundamentally scarce (Mehta, 2010: 15). The construct of water as an economic good - to the benefit of global capital - excludes other meanings of water. This translates to contestations over the framing of water rights in a manner that primarily considers water for the benefit of use for capital accumulation (Bakker, 2013: 256). Further, the state played a key role in the social power dynamics that come with the discursive constructs that influence water rights. Bakker (2005: 544) argues, through the ontology of water, the state is key in the facilitation of capital thereby requiring the

reconfiguration of the role of the state (vis-a-vis the regulation of water rights) to support capital aligned water uses.

Mirroring the above socially driven discursive constructs that shape water rights; Zwarteveen and Boelens (2017: 16) argue water rights are socially embedded, i.e. historical and cultural, as well as ecological. This approach argues locally contextual norms, water control practices and social power relations are integral to water rights (Zwarteveen and Boelens, 2017: 16).

The traditional legalistic explanation of water rights, according to Van Koppen (2007: 55), is that at their essence they are the legal authority for a water user to use water, and thus have legal recourse to the protection of that water use. This perspective on water rights emphasises water rights as "clear and enforceable" on the part of both water regulators and users (Zwarteveen and Boelens, 2017: 16). The specificity of water rights shapes, and hinges on, regulatory rules integral to water rights. According to Perreault *et al*, (2018: 38) water rights inherently carry rules on water use that practically guide and control water use, by determining for instance; how water could be used, by whom, for how long, in what quantities and the effects of water use on water quality.

The diverse approaches to water rights aside, water rights are key in shaping water regulatory rules. The concept of property relations as layers of social organisation illustrates the influence of water rights on water regulatory rules. Water rights are categorised as reference rights or "rights on paper" (i.e. emanating from water law) that provide general principles, rules and discursive constructs on water allocation and therefore social relations of water rights holders (Boelens and Zwarteveen, 2005: 742). Activated rights or "rights in action" on the other hand were the "transformation of reference rights into operational rules and procedures for water distribution" (Roth *et al*, 2015: 463).

Chile's Water Code of 1981 provides an illustration of the effect of the construct of water rights on regulatory rules to the benefit of powerful water use interests such as mining corporations (Van Koppen, 2007: 57). The introduction of the Water Code of 1981 meant small scale agricultural water users, with longstanding water rights, lost their water rights to sophisticated water users, such as mines, that manoeuvred the new procedures for water rights registration to register water rights (*Ibid*.). Herein, extractives based water struggles centred on unfair and unequal participation in regulatory processes that informed decision making on the allocation of water rights.

Boelens *et al* (2007: 99-100) argues, in the context of Chile, the construct of water rights also meant the construct of supporting regulatory rules that facilitate the water uses of powerful water users such as mines. Accordingly, knowledge of regulatory rules by sophisticated and well resourced water users such as mines; is key to determining and thus ensuring water availability and avoiding water scarcity. The resultant water scarcity, and in particular the undermining of participation in regulatory processes, is at the core of extractives based water struggles. Once more, extractives based water struggles focused on inequitable access to and use of water wherein powerful mining companies could unfairly and unequally participate in regulatory rules that framed allocation decision making.

The case of Chile also illustrates regulatory rules are constructed to facilitate access to water rights for mines as preferred water users. An example of this is the water regulatory rule - predicated to support high value economic water uses such as mining - that "unused rights" could be lost, and in practice were indeed lost, to water users (such as mines) that requested these water rights (Boelens *et al*, 2007: 105). Consequently, regulatory rules determine the allocation of water rights, and thus access to water, for extractives as a preferred water use sector even as that undermines the water rights and access to water of non-extractive water users. This is the inequitable transfer of authority claims to water as water rights from one water user to another; specifically mines as more powerful and high value economic water users.

In the case of Peru, the water use of the Yanacocha gold mine was claimed, by the mine, to be within regulatory rules on the acquisition of water and other permits as an environmental impact assessments (EIAs) was conducted and there was the holding of public meetings to discuss the EIA (Sosa and Zwarteveen, 2017: 167). However, superficial compliance with regulatory rules, such as public participation in EIAs, did not translate to the prevention of water pollution and damage (*Ibid*.). This points to the inadequate construct of water rights and the regulation thereof meaning even when there is compliance this did not translate to practical prevention of pollution. Water struggles emanated from contestations of the inadequacy of water regulation in protecting water bodies and other uses.

2.3.2 The Influence of Discursive Constructs on the Construct of Water Rights and Therefore Water Regulation and Extractives Based Water Struggles

As briefly stated in the preceding section, discursive constructs were pivotal in the construct of water rights and thus water regulation. The influence of discursive constructs on water rights, requires a closer assessment of the role of discursive constructs in the water regulation of the water rights. The discursive constructs that frame water rights, and thus water regulation, are of critical importance to experiences of water availability and scarcity and thus extractives based water struggles.

One such discursive construct is water scarcity. The utility of water scarcity is the discursive framing of water scarcity as a water problem (Boelens, 2017: 28). Thereby water scarcity also informs solutions to water scarcity that shapes the allocation of water and the practical experiences of water scarcity (Boelens, 2017: 4). A key means for addressing water scarcity, and thus the praxis of water scarcity; flowed through the construct and practice of water rights and water regulation (Boelens, 2017: 31). Therefore the practical experience of water scarcity for some water users is due to the construct and function of water rights and the regulation thereof.

In Chile, mining corporations and indigenous people use the discursive construct of water scarcity to angle for the protection of, and access, to water; in anticipation of water use changes or impediments to access to water (Babidge, 2016: 86). The construct and addressing of water scarcity features in the rationale of the discursive construct of privatised, free market oriented water rights in Chile; in the form of a water allocation mechanism and regulatory rules that (re)create water scarcity for poor water users (Babidge, 2016: 99). Budds and Hinojosa (2012: 131) point out indigenous water users utilise discursive constructs of water scarcity to rationalise preferences for the use of customary water rights. Mining companies use the discursive construct of water scarcity in tandem with efficiency (in the economic value of benefits and technically in terms of water use) to argue for the prioritisation of mining in the allocation of water as a scarce resource (Budds and Hinojosa, 2012: 131). Water struggles can be viewed in this sense as the contestation of unfair allocation rules that are predicated on avoiding water scarcity whilst (re)creating water scarcity.

Water scarcity is also presented as a supply side water problem wherein infrastructure represents supply side interventions as a response (Oberkircher, 2011: 1278). Accordingly, solutions to water scarcity are predominantly infrastructural, resulting in selective exposure

to water scarcity for some water users (Isaacman and Musemwa, 2021: 12). Technological intervention by society on nature to harness, store, and distribute water to limit water scarcity is critical in the facilitation of water use by water users (Boelens, 2014: 235). However, water infrastructure such as dams can have significant negative repercussions on marginalised groups' access to water, leading to water scarcity for certain social groups (Bencala and Dabelko, 2008: 27). Water infrastructure, and indeed technological interventions in general, are linked to, and outcomes of, water knowledge. Roth (2005: 67) argues engineering interventions in the form of infrastructure did not materialise spontaneously but was the means of water control that flowed from discourses, knowledge, rules, etc.

The very discursive frame of water as a scarce and thus economic good calls for the deployment of specialised, expert and often global scientific knowledge as a solution (Boelens *et al*, 2018: 14). Further, water knowledge claims are legitimised, and thus ordered, through scientific knowledge, for instance, hydrological science (Linton and Budds, 2014: 171). Water knowledge had a significant influence on the praxis of the facilitation of the water use of extractives through the regulation of the water rights. Consequently, water knowledge is sometimes at the centre of the control, and solutions, of water scarcity due to the water regulation of water use that, however, led to water scarcity and thus extractives based water struggles.

For example, science informs regulatory rules through environmental regulatory standards that regulate water use for polluting industries such as mining (Himley, 2014: 1072). In Peru, Li (2009: 218-223) argues the facilitation of the largest gold mine in the country, is dependent on the use of water knowledge in regulatory practices. This is particularly in the form of the EIA that gave the illusion of regulatory accountability to the state and communities by the mine (Li, 2009: 218-223). Instead knowledge, in the form of EIAs, is used in water regulation to facilitate mining through the control of water knowledge that determine water pollution (Li, 2009: 219). Critical to this is the collection and analysis of information, that produces water knowledge on water pollution, and in turn informs mitigating regulatory decision-making and actions (*Ibid*.). The EIA as an accountability mechanism actually empowers the mining corporation by producing knowledge that contradicts or obfuscates the impacts of mining related pollution on water (Li, 2009: 219). Consequently, extractives based water struggles in Peru centre on the credibility, and thus trustworthiness, of scientific knowledge in regulatory rules and processes and the effect thereof within communities affected by the water use of extractives.

The case of Peru illustrates that water knowledge can be utilised to exclude water users from effective participation and thus influence on regulatory decision making. This stems from a failure to recognise (or purposeful ignoring thereof), in the framing and use of water knowledge in water regulation, that other water users often lack the resources to acquire skills to engage in the predominant frame of water knowledge and thus influence regulatory decision making. Boelens (2014: 235) viewed "water truth and knowledge claims" as integral to socionatural relations' normalisation of the society-water interrelations and the power dynamics that underpinned those relations. Though water truth and knowledge claims are often presented as neutral, instead they are socially produced discursive frames that worked to maintain social orders through directing society-water interactions (Boelens, 2014: 235).

Contestations over water knowledge were sometimes about norms, culture and knowledge frames that fundamentally contradicted the predominant water knowledge in water regulation. Diverse knowledge frames led to water users holding divergent and conflicting understandings of nature. For instance, indigenous cosmological knowledge views nature such as mountain aquifers as sentient and sacred life-giving beings (Li, 2013: 400). This perspective differs from scientific knowledge that supports the extraction of gold - through technology that facilitates mining in difficult physical geographies - such as mountains even at the risk of pollution of water (Li, 2013: 400).

Another discursive construct that influences the construct of water rights, and thus water regulation, is the discursive ordering of water uses through the placing of a hegemonic ontology of water in shaping the function of water rights and regulation that determine what is water, what water can be used for, who can use water and how water can be used (Boelens, 2017: 31). The ontological ordering of water flows from the representation of water scarcity that fits Mehta's (2003: 5066-5067) argument that the construct of water scarcity as universal and thus absolute instead of periodic and cyclical; is due to human interventions. An element of this discursive universalisation of water scarcity flows through the ordering of certain uses of water through the ontological framing of water.

A much favoured ontology of water, in international, regional and national water policies and thus water rights and regulation; is the discursive framing of water as an economic good (Bakker, 2013: 256). This ontological framing of water means two interrelated things - water is valued for its economic uses and is also scarce (Boelens *et al*, 2018: 14). Water as an economic good discursively essentialises the economic rationale of water control ordering water use primarily for economic water uses deemed efficient in their economic benefits

(Achterhuis *et al*, 2010: 51). Further, in some cases; water rights and regulatory rules are structured to facilitate the treatment of water as an economic good even in the form of water trade (*Ibid*.).

A further example is the popular ontological binary debate of the meaning of water – is water a public good or a commodity? – the settling of that ontological question means divergent approaches to allocation, use and regulation (Clarke-Sather, 2012: 99). The determination of water as a commodity means the facilitation of the circulation of capital by establishing and utilising market principles to commodify things such as water and pollution; through the expansion of private water property, water markets and water trade (Mascarenhas, 2007: 568). The shift towards the market regulation of water is part of the broader insertion of capital into ever expanding spheres of social and socionatural spaces and relations in the interest of aiding capital accumulation (Roberts, 2008: 536).

In some contexts of extractives based water struggles, the ontology of water operating through water regulation is at the core of contestations over water. At the heart of these water struggles is the extractivist political economy's treatment of water as a commodity; to be privately owned, extracted and traded for profit to facilitate the allocation of water to extractives (Fabricant and Hicks, 2013: 132).

Water struggles over the ontology of water via the socionatural relations of water can sometimes be framed as contestations over culture. In the Andes, Boelens (2014: 234-235) speaks to this in stating water is intimately linked to the production of identity (and thus socionatural constructs) and the politics of identification are critical to attaining compliance and legitimacy for rules, rights and governance based water resource control systems. These culture-based contestations over the ontology of water sometimes emerged as struggles centred on modern versus indigenous ontologies of water (Yates, Harris and Wilson, 2017: 798).

In Peru, the regulatory facilitation of the expansion of mining leads to an attendant increased demand and competition for, as well as pollution of, water over extended space and time (Budds and Hinojosa, 2012: 120). Mining has consequently influenced the ecological context of water (and thus the biophysical character), its socionatural meaning and uses (as an increasingly scarce resource coveted by a dominant economic activity) and therefore the politics behind the regulation of water (Budds and Hinojosa, 2012: 120).

2.3.3 Access to Water Rights as Access and Control of Water Regulatory Procedures and Influence thereof on Extractives Based Water Struggles

Literature on water struggles also focuses on the practical implications of access and control of water rights, on access to regulatory processes for water uses. An element of this focus in literature is on the authority, provided by water rights, for water users to participate in, and thus influence, regulatory rules and processes. According to Boelens (2015b: 1462) water rights are "authorised demands" for water users to use some water from a water body. The authorised water uses are within a framework of "privileges, restrictions, obligations and penalties" (*Ibid*.).

Water rights distribute not only the authority to use water but also the authority for water users to participate in, and influence, regulatory processes. In other words, water rights also distribute the right to participate in the practical application of regulatory rules (Boelens, 2015b: 1462). This means water rights provide the authority to engage in the praxis of "privileges, restrictions, obligations and penalties".

Water rights, based on the backing of water law, tended to place an emphasis on fairness in the form of universal and objective procedures for the allocation of water rights for aspirant water rights holders (Zwarteveen and Boelens, 2014: 146). Indeed, the same universality and objectivity applied to regulatory rules (*Ibid*.). However; this meant a lack of recognition of the social context of aspirant rights holders that in turn curtailed access to water rights (Schlosberg, 2004: 518-519).

In actuality, distribution is influenced by (positive and negative) recognition in the allocation of water to water users meaning a bias in favour and bias against water users (Zwarteveen and Boelens, 2014: 146). Attendant participation in regulatory processes, as a form of recognition, for some water users; is impeded by inequitable access to water rights (Schlosberg, 2004: 519). Part of the focus in literature on water struggles is on the levels of participation, and thus influence, of rights holders with diverse interests (including in terms of water uses); in regulatory processes (Van Koppen *et al*, 2007: 8-9).

Water struggles over participation is a feature of literature on extractives based water struggles. This is not only for the influence of authoritative legitimacy that water rights provides for water uses but also in the provision of authoritative legitimacy for participation in regulatory processes. Thus access to water rights facilitates participation by water users in

regulatory processes, and thus the opportunity to influence, regulatory decision making. The exclusion, or limitation of, participation and influence; in regulatory processes is the exclusion, or limitation, of water rights holders' ability to participate in, and/or influence, the activation of water rights. The outcome thereof, for water users that could not influence the activation of water rights, is the likely undermining of their water uses through exposure to water problems such as water scarcity.

Using the example of water struggles over the water use of a gold mine in Cerro de San Pedro, Mexico; Stoltenborg and Boelens (2017: 256-257), outline the limiting effect of the vagueness of regulations for the participation of water rights holders in regulatory decision making. This often led to resource intensive legal battles over regulatory decisions, even at an international arbitration level, between community level water rights holders and a mining corporation that overshadowed their financial resources (Stoltenborg and Boelens, 2017: 257). The vagueness of regulatory rules in praxis enabled regulatory decision making discretion for regulators. Thus extractives based water struggles are also over the interpretation of the meaning of regulatory rules that inform regulatory decision making. Further, regulatory scales are created wherein arbitration and decision making is internationalised in jurisdiction provisions of the North American Treaty (NAFTA). Consequently, extractives based water struggles are over the use of water regulatory scales to limit the effective participation and influence of local community water rights holders. In this context, extractives based water struggles are over the inability of rights holders to utilise regulatory processes, and the state, to protect their water rights. Further, extractives based water struggles focus on the Mexican state's failure to ensure regulatory process and decision making is impartial and fair; and indeed, the significant influence of the gold mine in determining fora for regulatory arbitration (Stoltenborg and Boelens, 2017: 257-258).

In the Ancash Region of Peru, mining for precious metals flourished in the context of a state-centric water rights and regulatory environment that fails to recognise *campesino* communities as water rights holders in law and regulatory praxis (Patrick and Bharadwaj, 2017: 153). The outcome of state-centric and centralised water rights and regulatory processes is the inaccessibility of water regulatory decision making fora and exclusion of *campesino* communities therein (*Ibid*.). Thus the state, in the case of Peru, functions not to facilitate impartial water regulation that encourages the participation of water rights holders in influencing the meaning of rules, the processes of regulation and thus regulatory decision making. Instead, the state structures regulatory processes to function for the benefit of high value economic users such as extractives, at the exclusion and cost of other water users.

2.3.4 The Influence of Ordering of Water Rights on Water Regulation and Extractives Based Water Struggles

A significant element of debates on water struggles explicitly and implicitly relates to mechanisms that order water rights and thereby order water regulation and use. Ordering also occurs through water regulation thereby influencing control of water rights and water use. Consequently, ordering is an expression of social power, that shapes water use to the benefit of certain water users.

The ordering of water rights, and thus water regulation, emerged through the interaction of disparate national-local frameworks of water rights, and thus regulation. Centralised constructs of water rights are introduced through the state, often through legislation, to replace prevailing local water rights and attendant regulatory rules (Potkanski and Adams, 1998: 95). Indeed, such initiatives often lead to contestations over the implications of changes in the distribution of local water with negative implications for access to water for local water rights holders (*Ibid*.). The introduction of new forms of socionatural ordering in localities, including water control frameworks; often mean the prioritised ordering of external concerns and interests (Lopez *et al*, 2019: 203). Thus water struggles are about the failure to recognise local concerns and interests on water use and control, such as water rights, even in circumstances wherein national state intervention is encouraged by local water users (Lopez *et al*, 2019: 207).

Another perspective to the ordering of water rights, and regulation, pertains to centralised water control seeking to provide standardised order to the "unruliness" of the diverse, dynamic, interconnected and contradictory local water rights and regulation (Boelens, 2009: 310). The motivation for this is partly to smooth over contradictions between national and local water rights, and regulatory norms, by bringing under national control; local water rights and regulation (*Ibid*.). The incorporation of local water rights and water regulation into national orders means adverse incorporation into a hierarchy of water rights and regulatory rules (Roth *et al*, 2015: 457). This carries implications in the allocation of water rights and participation in regulatory processes lubricated by social power dynamics that mean the undermining of the authority to legitimately use water for some (*Ibid*.).

The introduction of national, universal and often state backed water rights and regulation into jurisdictions with existing localised and diverse forms of water rights and regulation creates complexity for access to water and thus water users. The introduction of national orders of

water rights and regulation does not destroy local water rights and regulation but actually layers over them. This complexity often means the strengthening of the national interests in water use over those of local water users. Thus formally and informally, national water rights and regulatory orders; impressed their water use priorities and water users over local water use priorities and water users. This meant the lack of recognition and participation of local water users, in regulatory decision making meaning unfair and unequal regulatory practices that lead to water inequity.

Part of the ordering of water uses emanates from global consensus building driven by policy, regulatory, economic and expert elites. Such is the case with the Four Dublin Principles of the Water and Environment Conference of 1992:

1. Principle 1: "Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment";
2. Principle 2: "Water development and management should be based on a participatory approach, involving users, planners and policymakers at all levels";
3. Principle 3: "Women play a central part in the provision, management and safeguarding of water";
4. Principle 4: "Water has an economic value in all its competing uses and should be recognised as an economic good" (Corpuz, 2006: 26).

Of these principles, principles one and four, are crucial to the framing, and thus ordering, of water uses. Both principles embedded the idea of water scarcity as a water problem ad conversely ordered efficient, economic water uses.

Water scarcity is a common thread that has taken root in understandings of water in general, and in the regulation of water (Linton, 2010: 214). On the opposite side of the coin of the prevalent discourse of water scarcity, is the discourse of efficiency (Hemson, 2008: 34). Efficiency is a demand side response to the prevailing water problem of water scarcity, that means the prioritisation of efficiency in water use to ensure the highest returns out of scarce water (Linton, 2010: 215). Efficiency, thus depends on a universalised and normalised scarcity of water (Mehta, 2010: 24). A further dimension of efficiency as a mechanism of ordering of water use, relates to development and economic growth; from the discursive perspective of modern water. Modern water ontologically frames water as a resource to be exploited for development (Linton and Budds, 2014: 171).

These principles, and indeed the ordering of the value of water in economic terms; diffused through IWRM into national policy and legislation influencing water rights and water regulation in the Global South (Mehta *et al*, 2014: 529). The diffusion of IWRM, and thus ordering, of the economic value of water above other values of water is through the influence of international think tanks, donors and financial institutions (Swatuk, 2005: 873). Efficiency in water use and water scarcity behind the economic ordering of water use also frames reforms around water rights and regulation (Molle, 2008: 135). These reforms often shape water rights, and thus regulation; around universalistic, individualised, state-vested, modernist and an economic growth and development bias (Boelens, 2010: 166-167).

Another perspective on water as an economic good is the idea that water should reflect its economic value. Accordingly, water should be allocated to water uses that paid for the value of water so uses that most require water receive allocations and utilise that water efficiently (Savenije and Van Der Zaag, 2002: 98). The implication of water as an economic good; is the framing, and thus economic ordering of water use, through WULs or water rights tradeable in a market (Savenije and Van Der Zaag, 2002: 100). These forms of water rights, and the attendant regulation, ontologically essentialised water to its economic value overlooking other ontological understandings of water. This further means the ordering of water according to the highest economic value water meaning non-economic or even lower value economic uses are considered less efficient economic uses of water as a scarce resource.

This translated to the allocation of water rights, and regulatory mechanisms for the allocation of water rights; that provides water based on economic benefits as the priority water use consideration. Consequently, water uses that are viewed to be outside of water rights and the water regulatory framework's economic ordering of water uses are not treated fairly nor equally leading to inequitable water allocation. Marginalised water users are not recognised nor provided equal participation to influence regulatory decision making and thus access to water.

The varied mechanisms of the ontological framing of water in economic terms, in praxis, often facilitate the water use of extractives as a high value economic water use. The consequence thereof is often the threat of water scarcity for non-extractive users dependent on the same water bodies; thereby driving extractives based water struggles. Key to these extractives based water struggles are contestations against varied forms of the ontological ordering of water as an economic value.

In America, the Standing Rock Sioux Native Americans contested the construction of the Dakota Access Pipeline that is to transport 500 000 barrels/day of oil through the Missouri River (Bonelli *et al*, 2017: 82). Central to resistance against the pipeline is rejection of the conception of water as a resource - that could be quantified, engineered and thus exploited - as opposed to water as an ancestor in line with indigenous beliefs (*Ibid*.). The implication of the ontological divergence is a lack of recognition of the Sioux's ontological view of water in regulatory decision making. Further, this also meant a lack of meaningful participation in regulatory processes for the Sioux that could reflect decision making that recognised their ontological view of water.

In the Andes of South America, the lack of recognition of certain ontologies and thus ordering of water use; took on modernist versus pre-modern frames. The ontological ordering of water use, and the influence thereof on the allocation of water, is according to the language of development as opposed to ontologies of water that supposedly impeded development. Modernist ontologies of water, centred on development and economic growth, hegemonically ordered water use thereby marginalising indigenous ontologies of water and thus water use (Yates *et al*; 2017: 799). Consequently, ontologies are intrinsically political due to their cultural, historical and material production of reality (*Ibid*.). Though focusing on land, in the case of small-scale indigenous gold mining in Peru, Hirsch (2017: 260) argues competing yet dynamic interrelations of ontologies underlay contestations over the use of natural resources for the purposes of mining.

Indeed, mining conflicts in Ecuador revolve around the use of indigenous cosmology like *Pachamama* (Mother Earth) to contest Eurocentric concepts of human-nature relations that order water use to the benefit of extractives (Velasquez, 2017: 157). This led to contestation over the ordering of economic water use, specifically extractives water use, in the allocation of water. The other side of these contestations is the unfair distribution of the burdens of the water use of extractives to non-extractive water users.

In Mexico; the water rights of high value economic water users, such as silver and gold mining corporations, are prioritised even in contravention of water law and regulations designed to protect water bodies such as aquifers and rivers from over-abstraction and degradation (Stoltenborg and Boelens, 2016: 453). The ordering of water use in terms of economic water uses also entailed a diminished regulatory role for the state (Holifield, 2007: 203). Thus the ordering of water use in favour of economic water users on the one hand allocates water rights to extractives but on the other hand limits the regulation of the water use of extractives

thereby failing to recognise the water rights and thus uses of non-extractive water users affected by the water use of the former.

The influence of the ordering of water use on the distribution of water also emerged in the shaping of water rights. With regards Bolivia, Fabricant and Hicks (2013: 131-132) argue market based regulation is an extension of resource regulation focused on continuing colonial era extraction of resources to the benefit of Europe and North America. This extractivist political economy is developed to the extent that even water is treated as a commodity to be privately owned, extracted and traded for profit (Fabricant and Hicks, 2013: 132).

Further, in some circumstances the state plays a crucial role in the ordering of water use. In Ecuador, the role of the state in controlling and distributing water is contested as local communities view state control of the allocation of water rights to be to the benefit of mining rather than local communities (Velasquez, 2017: 155). Indeed, the state cooperates with extractives such as in Mexico, to issue water rights – even through threats, and actual use, of violence – to the benefit of politically and economically powerful interests (Stoltenborg and Boelens, 2016: 452).

2.3.5 The Influence of the Land-Water Regulatory Nexus on Water Regulation and Extractives Based Water Struggles

Literature on water notes the biophysical nature of water means water is related to its ecological context that influences discourses on water that in turn shape "responses to water", including water control (Bakker, 2012: 617). The relational nature of water is also approached in the relations between water and society wherein water and society mutually transformed each other (Linton, 2010: 28). The relational interconnection of land and water is also based on the practical use of land and/or water. Access to, and use of, land and water, is often critical to economic activities (Baumgatner, 2013: 180). This is particularly as most uses of land required access to water for effective use (Woodhouse and Ganho, 2011: 1).

The ecological and social relationality of water is expressed through water rights and thus regulation. The ecological context of water is expressed in water rights, and thus regulation, through the interconnection of water rights and regulation with other property rights and regulatory frameworks of nature. A form of the interconnection of water rights, and regulation, is with land rights and land regulation. Land tenure and water rights are property

rights that gave rights holders the security to possess, invest in and use land and water as natural resources (Hodgson, 2004: 7). Historically in many societies, water and land rights are interconnected reflecting the use of one resource as a property right impacts, and is dependent on, the use of the other as a property right (Hodgson, 2004: 47).

For instance, access to water rights is sometimes dependent on access to land rights (Mehta *et al*, 2012: 201). Indeed, some constructs of land rights mean inherent access to water rights for particular forms of water (e.g. groundwater or non-flowing water) that is connected to the land (Iyer, 2010: 149). Consequently, the ability to enjoy, manoeuvre and negotiate access to water, through regulatory rules, is limited or facilitated by the ability to access land through land rights and regulation (Mehta *et al*, 2012: 202).

Some literature approaches the relatedness of water from the perspective of the relational complexity of water. Accordingly, IWRM attempts to reflect the complex social and natural interconnections of water through regulatory interconnections with other regulatory frameworks over other forms of nature such as land (Neal *et al*, 2014: 3). Part of the interconnection of water regulatory frameworks, and thus layer of complexity, with land regulation is in the recognition of the influence of water use on "land degradation" (Neal *et al*, 2014: 9-10).

Utlising the case of Yanacocha gold mine in Peru, Sosa and Zwarteveen (2017: 163), outlines how the mine purchased land as a means to enter into the locality of Combayo. From this territorial entrenchment, in proximity to agricultural water users, the gold mine engaged in water use that polluted water bodies (and thus agricultural canals) and instituted water infrastructure projects (e.g. a dam) that negatively affects the flow of water bodies (Sosa and Zwarteveen, 2017: 165). In this instance, the interconnectedness of land and water rights is exploited by the gold mine to physically enter the area as a first step to acquiring water rights and establishing extractive water use. The land allocation failed to adequately consider the implications of the location of the gold mine and engagement in water use for the equitable and fair access to water for local farmers. Indeed, water allocation failed to recognise the water rights, and thus water use, concerns of farmers due to the impacts of the water use of extractives.

In the context of Mexico; land, mining and water rights relating to law reform was championed to create transferrable water rights, facilitated by a water regulatory framework, to facilitate international mining investments (Stoltenborg and Boelens, 2016: 449). This was achieved

through the ordering of water rights to exploit legal pluralism to undermine poor, rural Mexicans' collective land and water rights for agricultural use to the benefit of mining as a land use (and consequently as a water use) (Stoltenborg and Boelens, 2016: 449-450).

Further, under NAFTA investors such as mining companies' property rights are rooted in international law structured to supersede national law (Stoltenborg and Boelens, 2016: 450). This means in circumstances of contestation on land and water rights and use, mining companies could seek legal relief in international legal avenues that are difficult for local water users to access, participate in and thus influence.Therefore the resultant extractives based water struggles are about the failure in regulation to recognise and protect the collective water rights of agricultural water users. The ontological ordering of the water rights and thus water use, in Mexico, of extractives is through the unfair structure of land and water rights that complicated and thereby undermined participation for local, poor farmers in land-water regulatory decision making.

These extractives based water struggle in mining areas involving indigenous people, as is the case in Ecuador, contested the very idea of water through indigenous ontologies of water (Valesquez, 2017: 2-3). Through alliances with other groupings, such as peasants, indigenous people contested not only the state and mining corporations' ontology of water, and thus allocation of water, but also their understanding of development and how water should be used to facilitate development (*Ibid*.).

Property rights regimes, and their structuring of land-water regulatory regimes, are nestled in a hidden cultural setting that recognises particular predominant ontologies of water over others. These translated to practices and decisions in the allocation of land that in turn influence water rights and water regulation and thus access to water. This meant certain water users failed to be recognised in the allocation of water rights and regulation of the allocation of water rights. The consequence is the inability to participate in, and influence, regulatory decision making on interconnected forms of nature - in particular land rights, and regulation, and water rights, and water regulation.

2.3.6 The Influence of the Undermining of Water Regulation on Extractives Based Water Struggles

Water rights and therefore access to, and use of, water in praxis, is dependent on regulatory rules and processes. The lack of access to water, and thus water scarcity, for some water users

is linked to the practice of the regulation of water rights. This is in the form of the undermining of water regulation to facilitate access to, and use of water, for priority water uses whilst undermining access to, and use of, water for other water users. The undermining of water regulation pertains specifically to the undermining of the function of regulatory rules crucial to the allocation of, and thus access to, water rights. The undermining of water regulation impeded some water users from access to water rights and the ability to engage in authorised water use protected by enforceability.

Roth *et al* (2015: 462), approaches property relations as "layers of social organisation" incorporating discursive notions of property, legal framework of water control and regulation and everyday social practices and negotiations that drive social experiences of property. Water regulatory rules determine the practical reality of water rights - i.e. concretized water rights - amongst water rights holders (Roth *et al,* 2015: 462). Thus regulatory rules determined the reality of access to, and use of, water in everyday experience of water rights holders. The complexity of the biophysical nature of water means, the practical realisation of authorised water rights, often requires monitoring of water quantity, quality and other dynamics that influence and affect water use (Zwarteveen and Boelens, 2017: 16). The regulation of an allocated claim to water is not only about enabling the enjoyment of the claim of the allocated user but also about the limitation of the impacts of authorised water use to protect water bodies and other water users. The undermining of regulatory enforcement processes therefore undermined other water users.

Part of the undermining of regulatory rules and processes is also through legislative shortcomings in the framing of water regulation. Water regulatory gaps, for instance in the form of exemptions in rules that target polluting water users, undermined the form and function of water regulation (Mariola, 2011: 232). These shortcomings in water law undermined the effectiveness of the water regulation of water pollution due to the water use of water rights holders. Sometimes the shortcomings in the construct and practical function of water regulation is in the practical unsuitability of even best practice for industrial effluent standards for regulatory enforcement processes did not necessarily equate to the control of the water pollution of polluting industries such as mining (Lucas and Djati, 2007: 322-323).

The effectiveness of water regulation also depended on the earnestness of the regulatory enforcement of water pollution (*Ibid*.). The lack of earnest regulatory enforcement of water pollution is due to the decrease in prioritisation of water related environmental issues by public officials (Lucas and Djati, 2007: 323). The lack of robust enforcement of authorised

water use leads to extra-legal water use activities, as unauthorised uses, by extractives that influence the pollution and damage of water bodies. This lack of earnestness in enforcement is also in terms of due the design of regulatory rules that are not implemented or unimplementable. For instance, in the case of Peru, mines engaged in the illegal dumping of mine waste that polluted water bodies (Patrick and Bharadwaj, 2016: 474). This likely points to regulatory rules that have been put in place even as there is a lack of capacity to implement them.

The lack of water regulation, that facilitates water scarcity and the nature of extractives based water struggles, is in the context of the economic ordering of extractive water use. For instance, in Mexico; the water rights of high value economic water users, such as silver and gold mining corporations, are prioritised even in contravention of water law and regulations designed to protect water bodies (Stoltenborg and Boelens, 2016: 453). This left water bodies such as aquifers and rivers exposed to over-abstraction and pollution (*Ibid*.). Key to the prioritisation of mining as an economic activity are politics that undermine water regulation (Budds and Hinojosa, 2012: 120). The undermining of water regulation persists even as mining devastates the ecological context of water leading to the pollution of water as an increasingly scarce nature (*Ibid*.). This means water regulation is structurally undermined to ensure it did not prevent nor limit prioritised water uses such as mining.

The importance of an economic activity, such as mining, to a country's political economy influences the legal context of water regulation (Perreault, 2014: 240). This in turn shapes the ability, or willingness, of the regulatory authority to regulate water pollution for polluting economic water uses. For instance, Perreault (2014: 233-234) argues Bolivia's mining dominates the political economy and influences water rights, and water regulation, spurring water pollution and thereby inducing water scarcity.

In Bolivia small-scale mining operations known as *cooperativistas* operate with little to no practical regulation and pose serious environmental risk (Marston and Perreault, 2017: 253). This is partly due to the collective power of such *cooperativistas* as an important voting bloc for the ruling party (Marston and Perreault, 2017: 254). Hence, water regulation of *cooperativistas* is undermined to benefit their water use even at the cost of water scarcity and thus extractives based water struggles. This is due to the lucrative nature of polluting water uses and thus the significant political influence of industries such as mining (Mascarenhas, 2007: 567-568). Public officials are consequently demotivated from rigorous enforcement of water regulation (Mascarenhas, 2007: 567-568). This reflects the power dynamics, in this case

in the form of the economic power of water uses, embedded in water regulation leading to a disproportionate distribution of environmental burdens such as water pollution (Sanchez *et al*, 2017: 347). These environmental burdens are usually carried by marginalised groups such as the poor and ethnic minorities (*Ibid*.).

The construct of of gaps and shortcomings in the construct of water regulatory rules in the allocation, and indeed regulation of the rules of water rights, points to a lack of recognition of water use needs, and thus water rights, of non-extractive water users. The facilitation of extra-legal water use for extractives undermines equality, equity and fairness in terms of the allocation, and enjoyment, of water rights for non-extractives water users. The facilitation of extra-legal water use leads to water scarcity for non-extractives water users and thereby extractives based water struggles.

The failure of the enforcement of regulatory rules of the water rights of extractives, undermines the protection of water bodies from water pollution and damage linked to the water use of extractives. The pollution of affected non-extractives rights holders, points to the inability of such rights holders to participate and thus influence the practice of water regulatory rules and processes. The pollution and water scarcity that resulted from the extra-legal water use of extractives is key to extractives based water scarcity and struggles.

The undermining of regulatory rules also occurs through the non-compliant use of water by water users. This relates to extra-legal water use that exposes other water users to water scarcity and thus led to water struggles. Extra-legal water trading of water rights, not backed by regulatory rules, from agricultural to mining water users undermined water equity amongst water users in Peru. Gold mining benefitted from the undermining of regulatory rules and water rights whilst agriculture lost water use (Vela-Almeida *et al*, 2017: 103).

Gaps in the framing of water regulation, and the function thereof, is also highlighted in regulatory rules that facilitate the allocation of water. The regulatory rules that are instituted in the allocation of water rights can have gaps that benefit the water use of specific water users (Srinivasan and Kulkarni, 2014: 174). The allocation of water can hide regulatory practices of inequitable allocation that in turn negatively affect access to water for some water users, leading to water scarcity and thus water struggles. These water struggles centre on the unfairness of regulatory practices that ordered allocation for certain water uses (Crow, 2014: 249).

An example of this is in Chile. The reform of water rights and regulation in the Pinochet years ushered in a water rights and regulatory regime that favoured the allocation of water rights to mining corporations to the detriment of other water rights holders and users (Cornejo and Niewöhner, 2021: 1-2). Communities contested the water use (and thus water rights) of mining corporations (Cornejo and Niewöhner, 2021: 1). A key part of these water struggles focused on water regulatory framework that unfairly allocated water rights that recognised (and prioritised) the economic activity of mining companies over non-extractive water users.

Water struggles centre on regulatory rules that determine the allocation of water rights of mining operations. Of concern to non-extractive water users is the manner in which regulatory rules frame water knowledge and the ordering, and use, of "expert" water knowledge to argue that extractives would not damage water bodies in the long run (Cornejo and Niewöhner, 2021: 7). Non-extractive water users utilised water knowledge frames outside the legally predominant forms of knowledge in the water regulatory rules of the authorisation of water rights to illustrate the issuing of water rights to extractives posed a risk to water bodies (*Ibid*.).

2.4 Coal Mining Water Struggles in South Africa

Water scarcity casts a long shadow in South Africa's water context. South Africa is considered water scarce with uneven distribution of water and exposure to changes in climate (Blignaut and van Heerden, 2009: 415). Moreover, the country has high levels of surface and groundwater use with most of its water catchments in deficit (water demand exceeds available water) necessitating inter-basin transfers (*Ibid*.). Most of South Africa's water bodies have already been developed with only two catchments with sizeable water availability that is largely under-utilised (*Ibid*.). Therefore water scarcity is presented as a serious obstacle to economic development in South Africa (Blignaut and van Heerden, 2009: 416).

The notion of water scarcity (and the significant capital investment needed for infrastructural development and maintenance) facilitated the discursive construct of water as an economic good (preceding the Dublin Principles) in South Africa from the 1970s; whose allocation had to be premised on "economic viability" in the interests of economic development (Van Koppen, 2008: 435). This water scarcity is utilised as the motivation for the prioritisation of water uses, such as coal mining, to ensure maximum benefits from water as a scarce resource.

However, water scarcity for productive water uses created fertile ground for conflict amongst water users and uses over limited water resources (Van Koppen, 2008: 432).

The limited focus on coal mining water struggles in academic debates identifies the water use of coal mining as prioritised in praxis. Despite its role in polluting water resources, mining has historically (alongside the agricultural sector) been one of South Africa's top water using sectors and this included coal mining (Howard, 2016: 8). Further, coal mining operations in South Africa often intersect with areas of strategic importance for the country's water resource sustainability (Howard, 2016: 9). This means the water use of coal mining is prioritised even as a polluting water use that could potentially pollute important water bodies. Coal mining has also expanded into rural areas that tend to be water stressed leading to communities and farmers competing with mining for water (*Ibid*.). In other words, the expansion of the water use of coal mines is facilitated even in water scarce areas.

The water use of coal mining is facilitated even in a broader context of water scarcity in South Africa. The context of South Africa's status as a water scarce country coupled with exposure to climate change as evidenced in the major drought experienced in 2015-2016 increased the potential for water struggles (*Ibid*.). This means the water use of coal mining is enabled even as this water use had a polluting outcome in the context of water scarcity.

Pollution by coal mines as a prioritised water use, and the resultant water scarcity, is the basis for coal mining water struggles in South Africa. The competition for water and highly developed and utilised nature of the OWMA (and its sub-catchments including the Upper Olifants) can be seen in the pollution in the Olifants River that is considered one of the most polluted rivers in South Africa (CER, 2016: 2). Given the two dominant economic sectors in the OWMA (and its sub-catchments) is mining and agriculture, this competition focuses on these two economic sectors (Department of Water Affairs, 2013: 1). The resultant water scarcity and water struggles tend to centre around coal mining and agriculture.

The role of water regulation in this regard is, however, not well interrogated in research on coal mining water struggles in South Africa. Literature fails to outline the ways the prioritisation of the water use of coal mining occurs in praxis and leads to water scarcity and thus coal mining water struggles. This also means the role of the state in coal mining water struggles is not well understood.

2.4.1 The Influence of Water Pollution and Damage to Water Bodies on Coal Mining Water Struggles in South Africa

The Highveld; wherein the OWMA, Upper Olifants and Delmas fall, has a diversity of water bodies such as seasonal wetlands, perennial and seasonal streams and pans (McCarthy and Pretorius, 2009: 60). The diverse water bodies function systemically with aquifers; in the dry season the aquifers replenish some streams allowing perennial flow and some water flows from aquifers to form wetlands (*Ibid*.). The water use of coal mining impacts the ecological context of water bodies thereby facilitating water scarcity and thus coal mining water struggles. Changes in the ecology (such as soil and geology in general) affects water run-off and recharge of surface water (for instance, recharging of wetlands through surface water run-off and seasonal recharging of surface water through groundwater associated with wetlands and pans).

Coal mining; through blasting and removal of "overburden" for opencast mining and through undermining and sinking of the sandstone layer in underground mining negatively affects the ecological context that sustains groundwater and surface water (Hallowes and Munnik, 2016: 98). This negatively affects water quantity undermining water availability for other land uses such as agriculture (CER, 2016: 7). Moreover, decreased water quantity leads to subsidence and thus ingress of water wherein water collects in the subsided land and water bodies in higher lying areas dried out (CER, 2016: 7).

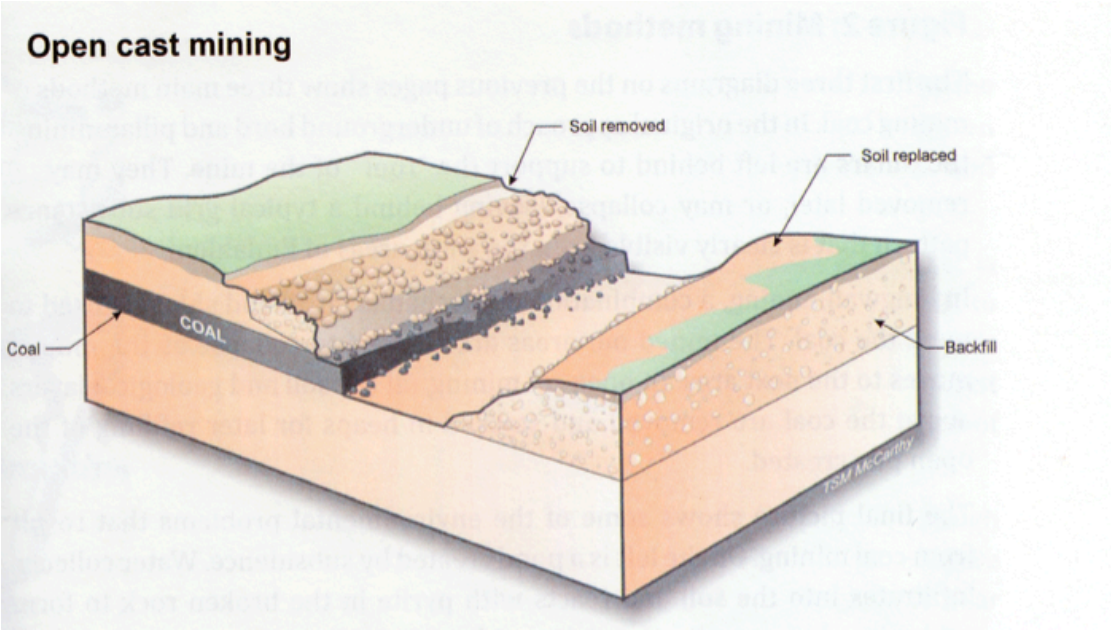


Figure 2.2 Opencast Mining Ecological Impacts

Hallowes and Munnik, 2016: 101

Opencast mining, as illustrated in the above figure involves the scraping off of, and stockpiling, of soil cover; blasting and stockpiling of rocks and extraction of the coal that lay below the rocks (McCarthy and Pretorius, 2009: 57). As coal is extracted, the stockpiled rock is returned to the pit followed by the stockpiled soil, and finally the land is landscaped and planted with grass (McCarthy and Pretorius, 2009: 57).

The removal of topsoil associated with coal mining negatively impacts agricultural land use as the soil became acidic (as its exposed to AMD) and sterile (CER, 2016: 7). The movement of wet soil and heavy machinery causes compaction that smothers organic material and prevents roots from penetrating deeply in soil (*Ibid*.). Poor backfilling in opencast mining over time leads to subsidence as the overburden used to fill the pit compacts, sinks and collapses (*Ibid*.). McCarthy and Pretorius (2009: 60) explain opencast mining disturbs the structure of aquifers by creating additional voids in the rocks that formed aquifers.

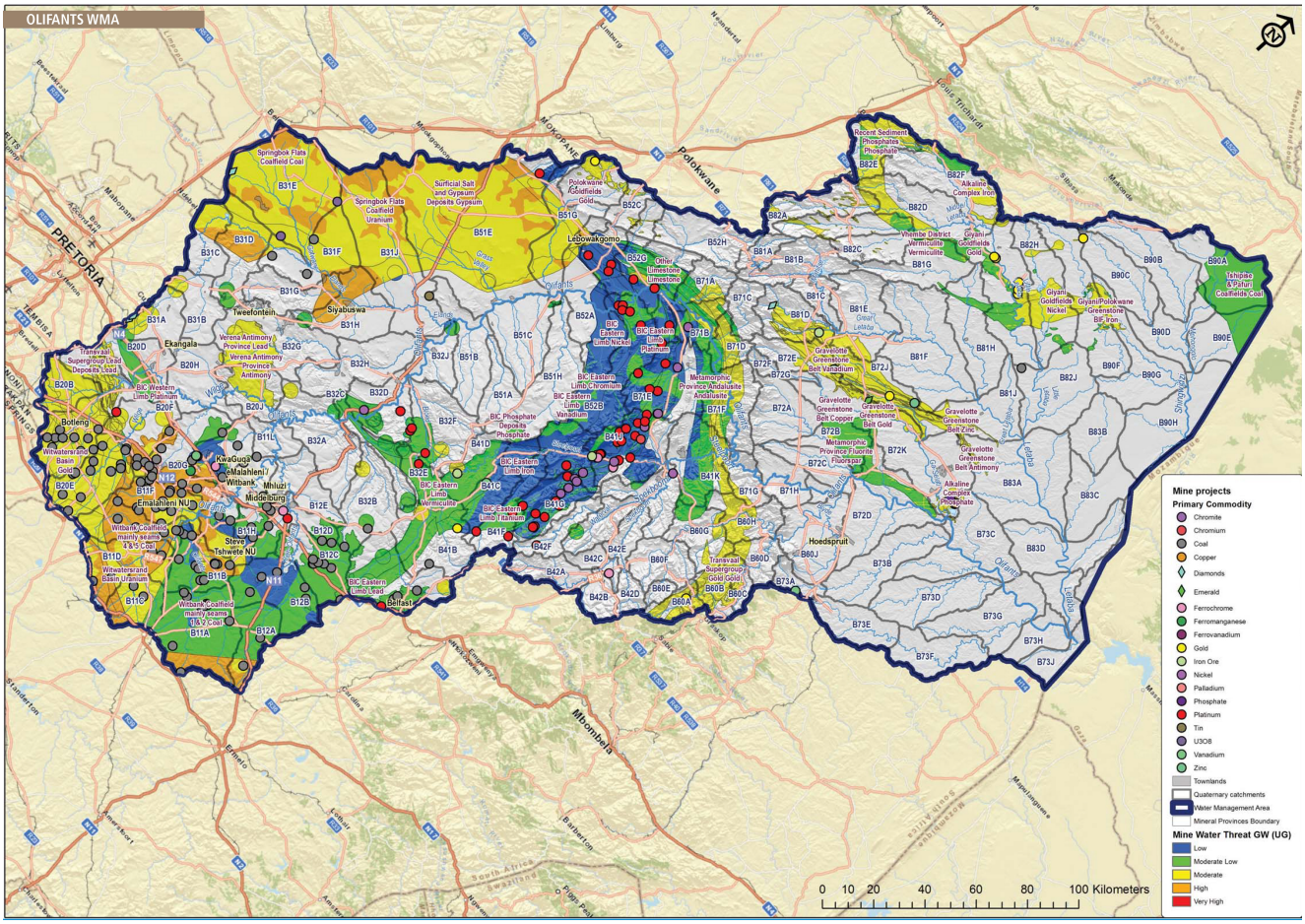


Figure 2.3 Map of Groundwater Vulnerability due to Opencast Mining

SA Mine Water Atlas, 2016: 37

The above map, outlined the impacts of opencast mining on groundwater, illustrates opencast mining presents high risks to groundwater in the Delmas area (marked as Botleng in the map). Further, dolomitic (a soft rock) aquifers – such as the Botleng Aquifer – that hold freshwater quality water are particularly vulnerable to mining (Water Research Commission, Undated: 33). This vulnerability in the Upper Olifants connects to the vulnerability to mining of geological features such as dykes (*Ibid*.). These geological features are crucial to the formation and function of water bodies such as wetlands and pans that are critical elements of the holistic water system, including surface water.

Physical ecological damage to water bodies couples with AMD that pollutes rainwater run-off flows into the damaged aquifer or remnant of an aquifer and decants into surface water through the lowest level of the bedrock rim (Hallowes and Munnik, 2016: 98). This is particularly the case once mining stops and water is no longer pumped out of the mining void. These physical impacts on the ecological context of water tend to directly influence water availability in terms of water quantity. However, coal mining's impacts are strongest in changes to the quality of water due to pollution. AMD is central to water pollution linked to coal mining.

AMD begins when ore rock, containing pyrites (commonly known as "fool's gold"); is broken in the process of coal mining (e.g. through blasting of rocks in opencast mining or digging in underground mining). Iron sulphates in the pyrites come into contact, and react, with oxygen and water to form acidic water also known as AMD (Hallowes and Munnik, 2016: 98). The acidic water dissolves iron and heavy metals in the rock (as well as coal) exposed by subsidence (*Ibid*.). Thus AMD has high concentrations of heavy metals (CER, 2016: 4). When AMD is treated with or naturally exposed to alkaline substances (for instance in the rocks), the acid and alkaline form salts leading to high levels of salinity in the water (Hallowes and Munnik, 2016: 98). AMD also leads to a high concentration of total dissolved solids (TDS) (McCarthy and Pretorius, 2009: 61).

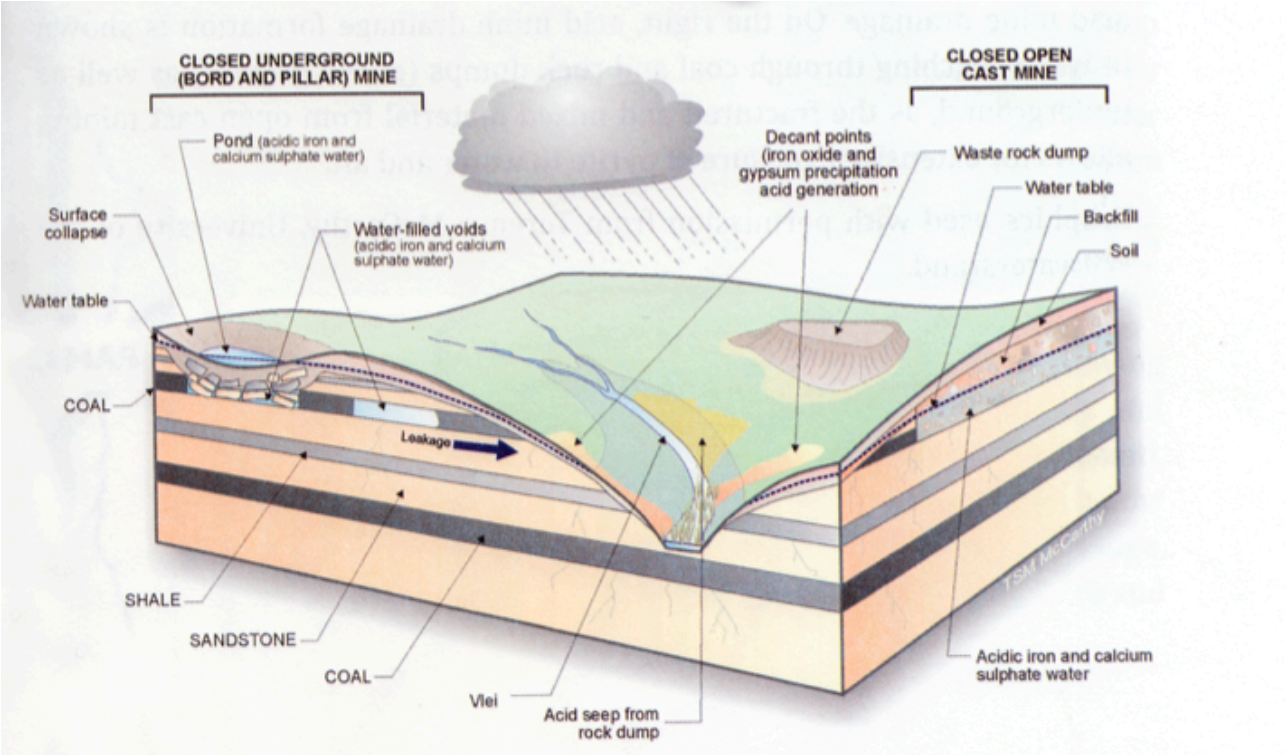


Figure 2.4 Ecological Impacts of Coal Mining
Hallowes and Munnik, 2016: 101

As the above figure illustrates, AMD seeps into the water table (and groundwater) decanting at geological openings - that recharge surface water with polluted AMD water - including pans and wetlands. The figure also illustrates that AMD also occurs on the surface when pyrites in rock and coal dumps reacts with oxygen and rainwater. AMD also leaches into the soil and enters aquifers (CER, 2016: 4). AMD not only changes the natural dynamics of groundwater (by changing water quality) but also the natural interrelation between groundwater and surface water (as groundwater polluted surface water and vice versa) (McCarthy, 2011: 3).

The effects of AMD are mostly felt about 10 years after mining when the decanting of AMD water commences (McCarthy, 2011: 3). This is because once mining operations cease dewatering also stops leading to an exacerbation of AMD, filling of the mine void (in the case of underground mining) and decanting of AMD. South Africa is vulnerable to AMD due to its extractive political economy that leads to a high number of derelict and ownerless mines – by 2008 there were 5906 derelict and ownerless mines (CER, 2016: 4).

Water quality has deteriorated in many of the key dams of the Olifants River. The Witbank Dam has been recorded as indicating progressively increasing concentrations of sulphate over time (Hobbs, Oelofse and Rascher, 2011: 421). The Middleburg and Witbank Dams have high salinity and sulphate concentrations (McCarthy, 2011: 5).

The low pH acidic nature of AMD water dissolves and increases the presence of a range of metals in the water, such as; aluminium, beryllium, cadmium, copper, cobalt, chromium, mercury, manganese, nickel, lead, vanadium and zinc (Colvin *et al*, 2011: 44). Metal related AMD impacts includes the discolouration of water that can take on a yellow, turquoise or rusty colour (colloquially referred to as "yellow boy" or "iron boy" by the mining industry) (CER, 2016: 4). This discolouration is caused by the precipitation of ferric hydroxide and oxyhydroxide complexes causing water bodies to form a yellow or rusty coating that can smother aquatic flora and fauna and even impede stream flow when it hardens to a crust (Colvin *et al*, 2011: 45). This precipitation of iron also expends dissolved oxygen in the water leading to a lack of oxygen in the water (resulting in asphyxiation of aquatic fauna and flora and deterioration of water quality partly due to a lack of natural self-purification) (*Ibid*.).

AMD affects the ecological context of water by sterilising soil and destroying fauna and flora – for instance, there are mass die-offs of fish, crocodiles and terrapins in the Loskop Dam of the Olifants River (CER, 2016: 4). The destruction of aquatic life limits natural self-purification of water leading to decreased water quality (Van Der Burgh *et al*, 2012: 27).

The water scarcity implications of AMD relating to water quality are extensive. The use of AMD pollutes water that has high concentrations of metals (e.g. zinc, arsenic, copper and aluminium) in irrigating crops leads to high concentrations of metals in plant tissue (Colvin *et al*, 2011: 46). The consumption, as food, of plants with high metal concentrations can lead to health repercussions for humans and animals (*Ibid*.). Animals that drink polluted water or eat feed contaminated by AMD water develop high metal concentrations in their tissue or milk (further exposing humans to risk if those animals are part of the food chain) (*Ibid*.). AMD could be carried far downstream (as much as 18 kms from the source of the pollution) meaning the impact on animals and plants is spatially extensive (Van Der Burgh *et al*, 2012: 27). So even though water is available, polluted water is risky to use leading to water scarcity. The impact of AMD on animals and plants means coal mining related water pollution led to significant water scarcity implications for the agricultural sector. This is specifically the scarcity of water suitable for agricultural water use.

Aluminium often contains contaminated AMD water (particularly below a pH of 5) limiting the growth of crops through cell damage and impeding nutrient uptake (Van Der Burgh *et al*, 2012: 29). The aluminium in AMD leads to significant losses in crop yields (*Ibid*.). Furthermore, the soil degradation associated with mining methods as well as water pollution (soil sterilisation) leads to the loss of arable land (CER, 2016: 7-8). Soil salinisation (due to the high sulphate content and high salinity of AMD) is difficult to reverse (Colvin *et al*, 2011: 45-46). Land loss is within the 46.6% of South Africa's high potential soil that falls within the Mpumalanga Province (CER, 2016: 8). This means the water use of coal mining induces water pollution that results in South Africa losing some of its best agricultural land.

In addition; the dependence of the agricultural sector on water bodies (for irrigation), such as the Olifants River, that are exposed to AMD related water pollution leads to the potential cancellation of farmers' export contracts (CER, 2016: 8). Thus water scarcity induced by AMD undermines agriculture's water use and threatens the sustainability of agriculture in a key agricultural production area of South Africa. The impacts of coal mining on water quality in particular and their ramifications on agricultural water use (a use sensitive to water quality) feed water struggles between the two water uses. The water scarcity and resultant water struggles related to AMD is exacerbated by the limitations of the state in introducing countermeasures against AMD.

2.5.2 The Influence of the Land-Water Regulatory Nexus on Water Scarcity and Coal Mining Water Struggles in South Africa

There are two main stems on this form of water struggles. On the one hand, land use changes in favour of coal mining affects the ecological context and physical characteristics of water bodies. On the other hand, land use changes influence water use changes. The resultant water use changes also affects the ecological context and physical characteristics of water bodies. Colvin *et al* (2013: 22) identifies mining as taking up limited land use in comparison to other land uses such as plantations (though there is potential for an upshot in mining land use). However, the Centre for Environmental Rights (CER) (2016: VIII) in a later study put 61, 3% of Mpumalanga's surface area under prospecting and mining right applications. This indicates subsequent land use changes predominantly favour the mining sector in the province (CER, 2016: X).

These land use changes result in contestations over land. Current mining land use in the Mpumalanga Province, home of much of the OWMA and Upper Olifants, leads to losses in agricultural land and production in agricultural and mining hubs such as Delmas resulting in lower agricultural outputs for key products such as maize and soya beans (Van Den Burgh *et al*, 2012: 5). Future mining will lead to an intensification of this trend of loss of agricultural land and production (*Ibid*.). This trend is not just about struggles over, and loss of, land to the mining sector but also the long term degradation of soil (*Ibid*.). Soil on land used for mining is degraded through sterilisation due to acidification, the removal of wet soil and the movement of mine machinery causing compaction so roots of plants fail to penetrate the soil deep enough to access water and the soil is not aerated (CER, 2016: 7).

The land-water regulatory nexus in coal mining water struggles, specifically focuses on mining regulation's influence on land use. Coal mining land use directly impacts water quality in the prospecting, mining and post-mining phases particularly where there is poor regulation in line with mining legislation (Van Der Burgh *et al*, 2012: 27). The facilitation of the land use of mining through mining regulation also has water quantity related water scarcity implications. The growth of mining in the OWMA is a partial driver for increased water demand putting pressure on available water in the catchment (National Water Resources Strategy, 2013: Annexure A, 8).

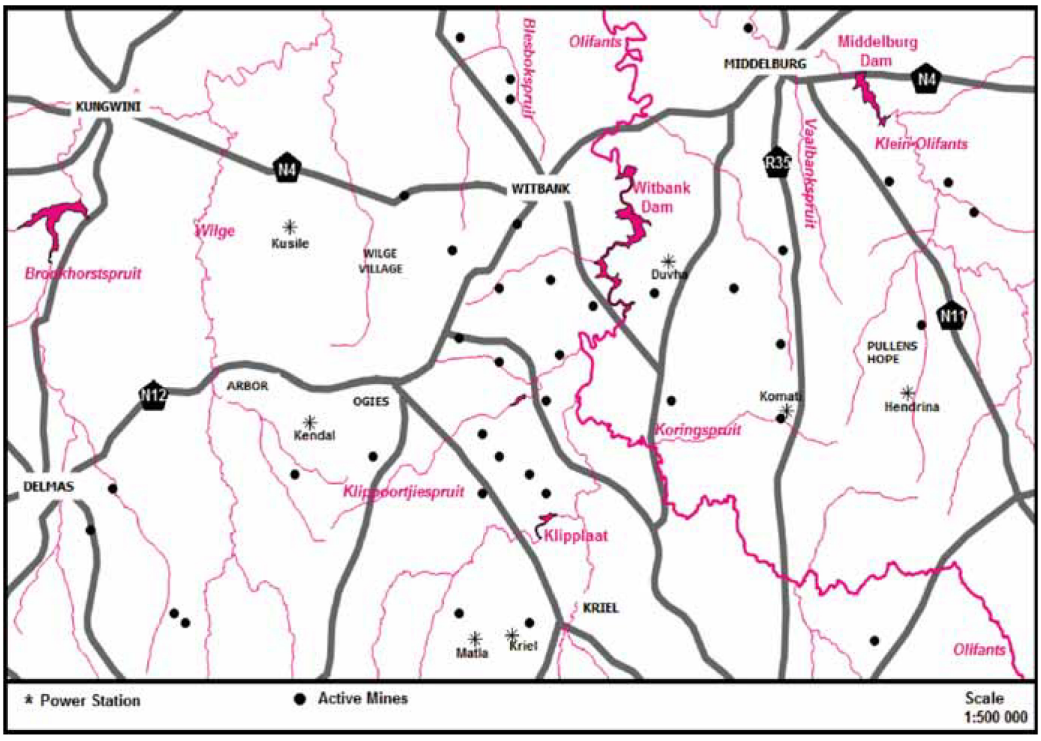


Figure 2.5 Map of Power Stations and Coal Mines in the Upper Olifants

Hallowes and Munnik, 2016: 138

The Upper Olifants, as illustrated in the map above, includes Delmas and partly overlaps with the Witbank Coalfield; has a high concentration of coal mines. The Upper Olifants is crucial for the energy generation sector with about 38 active mines and seven coal fired power stations (Hallowes and Munnik, 2016: 138). McCarthy (2011: 6-7) notes that the authorisation for mines determines the location of coal mines and consequently the impact of the water use of coal mining on water bodies. This is especially relevant as coalfields spatially overlay some areas critical to, or with, important water bodies (Colvin *et al*, 2011: 71). The upsurge in mining and prospecting authorisations poses a threat to water quality and water availability and heightens water struggles amongst water users (*Ibid*.).

Part of the dynamics of mining licensing on land use relates to failures in mining regulatory enforcement. The CER (2016: 32-33) outlines a number of mining regulatory shortcomings including inadequate environmental rehabilitation, failure to monitor and enforce environmental aspects of mining legislation, poor implementation of rehabilitation regulations to ensure mining companies that pollute pay for their pollution. In other words, the state is central to the facilitation of land use changes through the licensing of mines. However, mining regulatory measures meant to limit or mitigate the pollution of water bodies fail to be enforced. The state determines which economic interests are prioritised in their water use even as certain water uses such as coal mining have negative impacts for other water users. Thus the state is at the centre of water struggles even though water struggles might seem to only be amongst water users.

2.6 Conclusion

This chapter explains existing literature on extractives based water struggles. In so doing, the chapter outlines the interconnection of water rights and water regulation illustrating the interrogation of the role of water regulation in coal mining water struggles is inextricably linked to water rights. The chapter further delves into the diverse ways water regulation, in tandem with water rights, influences water scarcity for some water users. The consequent extractives based water struggles, in various international contexts, are indicated to revolve around varied layers of water regulation in the form of allocation, participation and recognition.

In particular, literature on water struggles illustrates that contestations over allocation, participation and recognition are further about the (lack of) fairness, equity and equality in the praxis of water regulation in extractives based water struggles. This means powerful water users, often in step with the state as the regulatory authority; in various ways controls, utilises and circumvents water regulation to enable their water uses. However, this is to the detriment of other non-extractive water users whose water uses are exposed to water scarcity.

Powerful water users - often with the complicity of the state - are able to impose particular forms of socionatural relations of water that sustain their water uses and desired water use benefits. Extractives based water struggles, on a broader level, are thus about water users contesting these hegemonic socionatural relations of water that socially produce water scarcity for their water uses through water regulation.

3. Water Grabbing as Theoretical Framework for the Interpretation of Coal Mining Water Struggles

3.1 Introduction

Chapter Two outlines socionatural relations of water often shape the function and practice of the water regulation of water rights. Water regulation is thus a conduit for the flow, through water, of the interests and priorities of powerful social actors in shaping society. This control of water through regulation also means society is shaped and influenced by water, not just as nature but also through efforts to control water. The resultant shape and practice of water regulation is often key to water struggles over the forms of society-water interrelations and particularly their practical outcomes in terms of water availability and scarcity for users.

The deployment of water grabbing is specifically for the interpretation of the findings in relation to the socionatural relations of water behind the water regulation of the water rights of coal mines in Delmas. Water grabbing is to assist provide meaning to answer the study's research questions on the nature of the water problem behind coal mining water struggles and the mechanisms through which water regulation influences coal mining water struggles in Delmas. The use of water grabbing is due to the assumption that on a deeper level; the study's interrogation of the role of the water regulation of the water use of coal mines in coal mining water struggles means the interrogation of the socionatural relations of water that shaped and control the function of water regulation and likely led to coal mining water struggles.

3.2 What is Water Grabbing?

The central aim of water grabbing is the control of the benefits of water use, what Veldwisch *et al* (2018: 61) refer to as value grabbing. Water grabbing can be broadly understood as value grabbing - the control of the benefits of water. Value grabbing as water grabbing targets the benefits of water in two ways. Value grabbing, according to Mehta *et al* (2012: 197); manifests as the explicit targeting of the benefits of water. Value grabbing sometimes targets water itself (Mehta *et al*, 2012: 197). In the latter value grabbing explicitly targets water but implicitly targets the benefits of the use of that water.

In other words, value grabbing as the fundamental form of water grabbing is the imposition of water use patterns and priorities to control the benefits of water valued by certain water users. In short, this is the imposition of certain society-water interrelations (i.e. socionatural relations of water) and their values of priority water uses in line with their prioritisation of the benefits of water use. As outlined in Chapter Two, the imposition of the water use needs of certain socionatural relations of water, in line with the priorities of powerful water users, is often behind water struggles.

3.2.1 Control Grabbing

Veldwisch *et al* (2018: 61) argues value grabbing utilises control grabbing mechanisms to control the benefits of water outside of the enclosures frame (that is popular in water grabbing literature). In other words, control grabbing utilises water control to target the benefits of water instead of the physical alienation of water users from water. For instance, control grabbing involves the apprehension of authoritative decision making processes that determine how, why and by whom water is to be used in the present and future (Franco *et al*, 2014: 3). Water regulation, as the means for regulatory decision making on water, is central to this form of water grabbing.

Part of the control grabbing as a form of value grabbing is the ability of powerful water users to control and thus shape the praxis of the ontology of water regulation. For instance, powerful water users determine the priority ontology of water and therefore the preferred water uses and benefits of water use thereby framing the praxis of water regulation (Franco *et al*, 2014: 20). Related to the above form of control grabbing is the control grabbing of water rights and therefore regulatory processes (Mehta *et al*, 2012: 197). "Control grabbing" in this instance is the "capture" of the power to control water resources in terms of their use and sharing of their benefits (Mehta *et al*, 2012: 195). Implicitly, the ability to control water rights as property rights means the ability to participate in, and thus control, water regulatory decision making.

The control grabbing of water regulation in the above partly relates to the capture of processes of authority. Control grabbing includes the control of the power to shape regulatory authority processes to control water regulatory decision making and thus the benefits of water use for certain social groups (Franco *et al*, 2013: 1655). *C*ontrol grabbing also involves the use of the power to influence the dominance of interpretations of law and policy in order

to control water (*Ibid*.). A related approach is the exploitation of legal complexity and opaqueness to control water for particular uses leaving other water users exposed to water scarcity (*Ibid*.).

Therefore central to control grabbing is control over water regulatory decision making. This occurs in a variety of ways that include control over water rights, water regulatory authority, the shaping of water regulatory practice and interpretations of regulations and so on. At the core of water grabbing - through control grabbing - is the use of water regulation to facilitate hegemonic socionatural relations of water that determine and allocate the benefits of water use unfairly and inequitably to powerful water use interests. This control and deployment of water regulation is often behind water struggles over the lack of equal treatment of water users and inequitable and unfair access to water.

3.2.2 Extra-legal Water Grabbing

As stated, value grabbing also entailed the control grabbing of water. Thus control grabbing as a form of water grabbing also includes the physical and direct control of water. In this case water itself is the target of water grabbing in order to control water's beneficial uses (Mehta *et al*, 2012: 197). An example is the extra-legal use of force to appropriate (then later legitmise the appropriation of) nature (Warner *et al*, 2013: 225). This is in line with the physical enclosure understanding of water grabbing. Powerful water users physically and forcefully alienate other users from water to impose their own understandings of water use, appropriate users, use priorities, and so on.

This means apart from the legal and regulatory control of water, water grabbing also uses extra-legal means to control water and its benefits (Mehta *et al*, 2012: 195). Extra-legal water grabbing occurred through the physical appropriation of water without any legal basis - often undermining the water rights of existing water users (Mehta *et al*, 2012: 197). Extra-legal approaches to water grabbing involve coercion in the form, and/or threat, of physical violence (Mehta *et al*, 2012: 198). Hertzog *et al* (2012: 312) outlines that investors use physical force to protect their water uses even when they are not in compliance with the law. Coercion also includes social protests and the physical impediment of water use or access to the benefits of water (Sosa and Zwarteveen, 2012: 367-368).

Extra-legal approaches to water grabbing also took the form of the violation of the law and regulations to appropriate water to the detriment of less powerful water users (Franco *et al*, 2013: 1655). The violation of the law and regulations relative to water is linked to another extra-legal method of water grabbing - the undermining of processes of accountability integral to democracy (*Ibid*.). A more expansive outlook on coercion includes legal threats by powerful actors against vulnerable and weaker water users (Sosa and Zwarteveen, 2012: 368).

3.2.3 Beyond the Legal-Extra-Legal Dichotomy

The use of the law and regulatory processes to achieve water grabbing indicates that dichotomous legal-illegal approaches to water grabbing are inadequate (Franco *et al*, 2013: 1655). The simplistic isolation of illegality (and thus focus on the formal) fails to address the power dynamics, historical and institutional contexts, legal pluralism, and politics that often drive the use of the state, its laws and regulatory processes to achieve water grabbing (*Ibid*.).

The grabbing of water occurs through the navigation, by powerful actors; of the fluidity, complexity and (sometimes) opacity between the legal and illegal and formal and informal in relation to water rights and regulatory regimes (Franco *et al*, 2014: 5). Thus water grabbing also exploits the linkages and fissures between the legal and illegal (which can also be viewed as the formal and informal).

This means the legal and extra-legal forms of water grabbing are often mutually dependent reinforcing each other to control water in the exploitation of (purposeful) complexity of water regulation. The complexity of water regulation provide water regulatory officials with the discretion to interpret water regulation in their decision making. This discretion in the praxis of water regulation is exploited by water grabbing. Thus extra-legal approaches to water grabbing are not simply about coercive violence and force. The presupposition that extra-legality operate outside of water regulation and thus water law misses the complexities of water grabbing.

The extra-legal grabbing of water involving coercive water grabbing is not dichotomous with legal control grabbing. The extra-legal appropriation of water should instead be seen as a mechanism that works in tandem with the legal. Thus the value grabbing of the benefits of water is not legal or extra-legal in a binary manner. Instead, water regulation is a tactical arena for the forwarding of the value grabbing agenda of powerful water use interests functioning

through tactical options such as the undermining of water regulation, control of water regulation and coercion. Therefore water grabbing offers a deft outlook on the interconnection of the legal and extra-legal in the hegemonisation of particular socionatural relations of water through water regulation. In consequence, water grabbing offered insight into the legal and extra-legal interconnection of water struggles over water and the benefits of water use.

3.2.4 The Power Dynamics of Water Grabbing

Water grabbing occurs when powerful social actors control water and/or use water for their own benefits (Mehta *et al*, 2012: 197). Control of water or the redirection of the use of water to secure the benefits thereof; means the exposure of other water users to water scarcity (*Ibid*.). Thus powerful water users are able to set and direct particular socionatural relations of water according to their own preferred water uses. This means the exposure to water scarcity of other water uses whose benefits are not valued as important in line with the hegemonic socionatural relations of water. The consequence thereof are water struggles over the unfair and inequitable access to water.

For instance, the use of power in water grabbing also entails the exploitation of uses that are outside legal authorisation as "powerful actors (social groups, corporations and/or interests) are able to take control of, or reallocate to their own benefit, water resources at the expense of previous (un)registered local users or the ecosystems on which those users' livelihoods are based" (Franco *et al*, 2014: 3). Thus water grabbing not only limits other water users' access to water but also negatively impacts their access to the benefits of water use (Franco *et al*, 2014: 3). Moreover, the control of water by, and/or preferred water uses of, powerful social actors exposes other water users to the burdens of such control and use of water (*Ibid*.).

Another example therefore of the use of power in water grabbing is the exposure of some water users to the burdens of the water use of priority water uses. This means the unfair and inequitable sharing of the burdens of water problems, a matter that drives water struggles. These water struggles are over predominant socionatural relations of water that inequitably shared burdens of water problems.

The hegemonisation of certain benefits of water and thus associated water uses, in socionatural relations of water, is dependent on power. This power determines who accesses water (and the quality thereof) and who does not according to which water uses are to receive water (and the quality thereof) and which are not. The exclusion of other water uses and ideas of the value of the benefits of water and its uses is at the core of water struggles.

3.3 The Utility of Water Grabbing in Providing Meaning to Socionatural Relations of Water

Considering the debates on water struggles, and the role of socionatural relations of water therein, some elements of socionatural relations of water likely influence, in some form, the praxis of water regulation to the benefit of the water use of coal mines. In other words, the water use of coal mines is likely based on socionatural relations of water that facilitate, through the water regulation of coal mines, the water use of coal mines.

This chapter provides a backdrop on the varied elements of the socionatural relations of water that influence water regulation to support certain water users over others. In particular, this chapter outlines the treatment of these elements of socionatural relations of water in discussions of water grabbing.

3.3.1 Water Grabbing: The Relationship Between Capital and Water

A common thread running through literature on water grabbing relates to the influence of capital on water control. In this instance, society-water interrelations in the form of capital-water interrelations affect, directly and indirectly, the praxis of water regulation leading to water availability for some water users and water scarcity for others. The interrelation of capital and water - as water grabbing - is approached in some literature in historical terms. Water grabbing is argued as integral to practices of the historical dispossession of natural resources such as the enclosure of natural resources.

Enclosure is a necessary condition for the early development of capitalism as a mode of production predicated on forced separation – thereby necessitating violence to overcome resistance – of non-capitalist statas of society from the means of social reproduction (De Angelis, 2001: 3). The enclosure of nature basically entails the use of force to appropriate,

then later legitmise through the law and regulatory processes; the appropriation of nature (Warner *et al*, 2013: 225).

Another perspective in understanding the relationship between capital and water, and its facilitation of water grabbing, is through the role of capital in framing of water regulation. In this perspective, capital is not the problem, but rather a solution to the challenge of poor state regulation of water resulting in water scarcity. Emerging from this outlook is what Bakker (2015: 448) refers to as the neoliberalisation of nature that incorporates the "liberal environmentalism" argument that economic growth, environmental sustainability, market economy and liberal world order are compatible. Instead of being blamed for undermining environmental protection and conservation; market principles by the end of the 20th century are viewed as compatible with economic growth (Bakker, 2015: 448).

This shift is globally driven by the introduction of market principles in the regulation of nature – through legal and policy reform (Bakker, 2015: 449). This approach to the regulation of nature facilitates capital accumulation but fails to be the purported solution for environmental protection (Bakker, 2015: 450). This means the unfair sharing of the burden of water pollution as an outcome of the facilitation of water use for high value economic water uses.

The predominance of the influence of capitalism leads to the logic of economics framing water regulation as a question of allocation (Luks, 2010: 97). Accordingly, "environmental problems" are viewed as market failures to value and measure water "in economic terms, in other words, in Euros and dollars." (Luks, 2010: 97).

In this logic, the inefficient regulatory allocation of water and thus scarcity is an outcome of market failure that could be rectified through markets, and science and technology (*Ibid*.). This rectification includes the internalisation of social costs and thus external effects thereby valuing nature adequately for market processes to indicate scarcity of natural resources (*Ibid*.). However, the implication is that those that could not afford water would not be allocated water meaning water scarcity for some water users, and thus water struggles. This market based approach also recognises that unsustainable economic development ignores, and thus, devastates natural resources (including water) thereby threatening social and economic sustainability (Keulertz, 2013: 246). In response there has been a focus on efficient allocation and use of scarce natural resources such as water (*Ibid*.).

Herein, the discursive twin notions of scarcity and efficiency frame efficient water uses as the ones that should have access to water. This amounts to water scarcity, and thus water grabbing, for some water users. Another form of influence of capital on water regulation is in terms of water rights. This influence on water regulation relates to the prioritisation of particular forms of water property rights. Freehold property rights are prioritised forms of property rights including commodification and privatisation of natural resources such as water. The prioritisation of these property rights leads to processes such as the conversion of other forms of property rights (such as collective and state rights) to private property rights and thus the undermining (through exposure to water scarcity) of water uses not aligned with the interests of preferred forms of capital accumulation (Arrighi *et al*, 2010: 411). This translates to water grabbing through the failure to recognise the claim authority to use water held in other forms of water rights. The consequence of this is water scarcity for some water users and thus water struggles over the unfair framing and ordering of water rights to not recognise other forms of water rights.

3.3.2 Water Grabbing: The Influence of the Notion of the Scarcity of Water on Water Regulation

Water scarcity and water availability are an integral, though sometimes implicit, dichotomous theme in water grabbing literature. Water scarcity, real and imagined, motivated powerful social groups to engage in water grabbing to secure water availability for their water uses. Lankford (2010: 197) outline the construct of water scarcity as important to the practical implications of the responses deployed to address water scarcity. The discursive construct of water scarcity, plays a critical role in the praxis of water regulation.

Thus the discursive constructs that give meaning to water scarcity are of critical importance as they influence the framing of solutions to water scarcity (Lankford, 2010: 197). A fundamental characteristic of the construct of water scarcity – with profound impacts on water regulation and in turn water grabbing – is the normalisation of water scarcity. The construct of "absolute water scarcity" has gained global orthodoxy and been normalised with significant impact on national policies and regulatory processes focused on expanding water supply through interventions such as dam construction (Jairath, 2010: 215). Accordingly, the contribution to water scarcity of underlying water supply patterns as supported by water infrastructure, policy and regulation (in the present and past); are ignored (Jairath, 2010: 218). This means the use of social power by powerful social interests to benefit their preferred water uses through water regulation was in effect hidden.

The utility of the problematisation of water scarcity is the enabling context for the formalisation of water property rights. Formal water property rights are put forward as a solution for water scarcity. The discursive construct of water scarcity as a water problem frames the purported solutions thereto only to (re)produce and intensify water scarcity. Moreover, formal water property rights influence water regulation. The formalisation of water rights – through private property rights regimes – is viewed by some as a means of effectively allocating, regulating and protecting water as a form of nature constructed as absolutely scarce (Mehta, 2010: 15). However, the private ownership of natural resources (such as water) through property rights can be reflective, and to the benefit of, existing power and class structures (Prudham, 2015: 432).

The formalisation of water rights can be viewed as an effort to control water ostensibly to address its scarcity but in praxis facilitate water grabbing. For instance, IWRM espouses equity seemingly to address water scarcity (as well as the scarcity of its benefits); however, water use licensing as a core IWRM principle can lead to water regulation that facilitates water grabbing (and thus water scarcity) (Franco *et al*, 2014: 25). The institution of property rights can be a tool for enclosure of natural resources and their benefits thus determining who has access to them (Prudham, 2015: 431).

Further, the introduction of water use licensing into a context of existing water rights can actually serve to make water rights more complex and opaque (at least for some water users). This complexity as an outcome of legal pluralism can lead to non-registered water users becoming "invisible" to the law and struggling to assert their water rights (Franco, Mehta and Veldwisch, 2013: 1655). This legal complexity and opacity can aid water grabbing as powerful actors can manipulation regulatory processes and the administration of the law.

The International Conference on Water and the Environment held in 1992 in Dublin pronounced that water is finite, key to a range of uses – sustaining life, development and the environment – and consequently an economic good (Franco *et al*, 2013: 1662). Water as an economic good is controversial as some scholars argue it enables the commodification, privatisation and market regulation of water (in the allocation of water in a manner biased towards particular economic activities); and consequently, potential resource capture (*Ibid*.).

3.3.3 The Utility of Water Grabbing in Providing Meaning to the Influence of the Ontology of Water on Water Regulation

The ontology of water is a key form of the influence of socionatural relations of water on water struggles. The ontological framing of water determines what is water, the uses of water, the users of water and how water is used. Therefore understanding the influence of the ontology of water in water grabbing is useful for this study.

Social power dynamics that underpinned the socionatural relations of water, through the ontology of water; are thus key in formulating, and determining, the functioning of water regulation. Yates *et al* (2017: 798-799) makes this point stating hegemonic ontologies of water influence material experiences of water, for instance, through water regulation. In some circumstances culture produces the material reality of water (Yates *et al*, 2017: 799). The cultural production of the material reality of water is predicated on the hegemonic status of certain cultures over others in their influence over the ontology of water (*Ibid*.). The hegemonic culture thus determines water use and the manner of the regulation of such water uses.

The influence of social power dynamics over the ontology of water, and more broadly the socionatural relations of water, also emerges through the economy. For instance, in literature the neoliberalisation of nature utilises the economic power of capital, in relation to the interconnection between capital and water, to discursively construct the ontology of water. The neoliberalisation of water uses the discursive framing of water as an economic good to determine the priority uses of water (Bakker, 2013: 256). The ontological influence of capital on water consequently influences water regulation. This is evident in debates over the discursive framing of water rights as a commons, indigenous water rights or private property (Bakker, 2013: 256). In framing water rights, the ontology of water also frames water regulation as the rules and procedures through which water rights function.

The far end of the continuum of the socionatural relations of water as the neoliberalisation of water is the commodification of water. In the neoliberalisation of nature, capital interacted with water to produce socionatural relations of water structured to facilitate capital circulation (Ioris 2013: 914-915). Thus the ontological formulation of water as a commodity that is an input for the economy is central to these socionatural relations of water (*Ibid*.). The ontological positioning of water as a public good or a commodity shapes its uses and therefore allocation (Clarke-Sather, 2012: 99). The discursive predominance of market principles of

commodification, privatisation and commercialisation led to market oriented regulation of water focuses on economic growth and efficiency gains (in water use) (Ioris, 2013: 915).

Consequently, water use becomes dependent on water users' economic means to pay for water as well as the economic value of water uses (Roberts, 2008: 546). Consequently, the economic-centric ontological framing of water effectively leads to water scarcity for water users whose water uses are not considered economically important. This points to the reduction of water to its economic value overlooking other social values and meanings (Roberts, 2008: 536-537). The praxis of the economic meaning of water is in the intensification of market oriented regulation to overcome the perceived failure of the state to adequately regulate water (Roberts, 2008: 536-537). Thus capital as a form of social power, functioning for particular social interests, crafts hegemonic ontological constructs of water that practically shape regulatory institutions and processes. This directly impacts water scarcity for water users that fall outside water uses associated with predominant economic interests.

From the perspective of water grabbing, the economic context of countries or localities is sometimes important in leading to the water grabbing of water and its benefits. The impetus for economic growth and development in the context of developing countries fosters the prioritisation of the use of water resources in support of economic growth (Wagle *et al*, 2012: 412). The attraction of global capital and thus foreign investors often features prominently in the rationale of such economic growth and reform agendas (Hertzog *et al*, 2012: 310). Consequently, international donor and financial institutions can seek to influence economic reforms to expedite inward investment (Hertzog *et al*, 2012: 309). In accordance with such initiatives and economic growth visions, water use and regulation can undergo significant changes geared towards the water use of particular prioritised water users.

Accordingly, water reforms can also entail the introduction of market principles for the regulation of water including water allocation as a means of ensuring efficient water use – i.e. water is mostly used by high value economic sectors (Wagle *et al*, 2012: 415). These reforms implicitly shape the ontology of water, and thus water regulation, to prioritise economic water uses but more importantly, high value economic water uses. This is the control grabbing of authority processes of water regulation in favour of high value economic water uses. Water sector reforms support economic growth and reform through technical interventions (such as dam infrastructure development) to ensure supply side availability of water for high value economic water users (Wagle *et al*, 2012: 412). In other words, water knowledge and

technical expertise is mobilised for technical solutions to water problems for the benefit of water uses of high value economic water users. This means the control grabbing of the technical expertise of water regulation to ensure value grabbing for high value economic water users.

State-capital or public-private interests coalesced into alliances that control grabbed through the infiltration of control processes of authority in relation to water rights and regulation (Franco *et al*, 2013: 1655). Crucial to the control grabbing of regulatory processes of authority are asymmetries in power, wealth and access to information that influence the ability of water users to control water to the detriment of other users (Williams *et al*, 2012: 244). Further, the complexity of the natural resource rights regime and regulatory framework can have implications for some water users' ability to participate in an informed manner in regulatory processes in order to secure their water availability and prevent water scarcity (Williams *et al*, 2012: 244). Thus control grabbing can occur by making regulatory institutions unnecessarily complex impeding the full participation of less knowledgeable and informed water users. Further, economically powerful water users have resources to acquire knowledge to manoeuvre, and thus control grab, water regulation.

3.3.4 The Utility of Water Grabbing in Providing Meaning to the Use of Water Knowledge to Influence Water Regulation

The praxis of the interrelation of water and society is underpinned by discursive constructs of human and nature interrelations (Boelens, 2014: 235). These socially produced discursive constructs in turn socially produce, and entrench; knowledge claims on water that informed truths on water (*Ibid*.). These water knowledge claims and water truths socially structure normality and everyday practice regarding water-society relations and the social power relations that underpin them (*Ibid.*).

The discursive frame of science influences the construct of water knowledge that supports the technical control of the biophysical nature of water. Water knowledge in the form of engineering expertise influences the development of technology such as pumps and reservoirs to distribute and store water (Carse, 2012: 547). This engineering expertise facilitates the use of water in locations where water users need it and without interruptions due to variations in the hydrologic cycle and biophysical characteristics of water (*Ibid*.). One form of this is in the use of technology by society to harness, store and distribute water to overcome natural periodic water scarcity thereby facilitating water use (Boelens, 2014: 235). Infrastructure thus

represents supply side interventions in response to periodic natural water scarcity, in other words, the biophysical nature of water (Oberkircher, 2011: 1278).

However, water infrastructure is the product of social processes. According to Carse (2012: 543) technology in the form of infrastructure spans geographic, social and economic confines that make it intrinsically political and thereby interconnected to society. The ongoing operation and maintenance of infrastructure as technologies is dependent on social processes, meaning infrastructure is socio-technical in nature as it is composed of both technical and social aspects (Carse, 2012: 543). Moreover, infrastructure is socially contextualised - in its conceptualisation, development, operation and failure – in the communities that it is located within or in proximity to (*Ibid*.).

Water knowledge as the lynchpin of socio-technical control of water is fundamental to the social power dynamics behind the socio-technical control of water through water regulation. Boelens (2014: 235) notes water infrastructure as technology controls water interconnected with social institutions, laws and rules and discursive frames that regulate water use, often in line with power dynamics. This meant water infrastructure could be developed to benefit particular water users whilst exposing others to water scarcity. Thus according to literature, water infrastructure had winners and losers in terms of who benefits from water infrastructure. Water infrastructure such as dams has potentially significant negative repercussions on marginalised groups' water availability, leading to water scarcity for certain social groups and their consequent displacement (Bencala and Dabelko, 2008: 27).

Water knowledge is a product of social power developed by powerful social interests to serve their water use needs and social interests (Mehta *et al*, 2012: 199). Water knowledge is developed as a solution to water problems such as water scarcity and other interrelated forms of scarcity (e.g. energy and food scarcity) (*Ibid*.). However, water knowledge functions to facilitate water grabbing in its deployment as a solution to these water and social scarcities (*Ibid*.). Water infrastructure is an area in which social power controls and deploys water knowledge to control water availability for water uses linked to particular social power interests. Social power facilitates the control and use of water knowledge in control grabbing through the discursive construct of water waste or inefficiency if not developed and used - through water infrastructure - to serve economic water uses (Mehta *et al*, 2012: 199).

The economy-centric discursive construct of efficiency/waste implicitly functions in tandem with water scarcity as a water problem to problematise unused or inefficiently used water. Water knowledge in the form of the technical expertise to develop, operate and maintain water infrastructure is positioned as a solution to the discursive constructs of efficiency and water scarcity as a water problem.

The discursive construct of efficiency along with water scarcity informs water knowledge that ontologically prioritises economic water uses that structure infrastructure-capital interrelations that in turn shape water infrastructure. These interrelations between capital and water knowledge in the form of the discursive construct of efficiency facilitate the positing of the involvement of capital in water infrastructure in the provision of private sector capital for water infrastructure development and maintenance (Houdret, 2012: 285).

These infrastructure-capital interrelations, that are indeed water knowledge and capital interrelations; function, through water infrastructure and thereby the regulation thereof, to drive control grabbing by determining which water uses benefit from water infrastructure (Houdret, 2012: 285). For instance, the involvement of capital in infrastructure, through PPPs, led to higher water infrastructure use costs for users meaning those water users that could not afford those costs are exposed to water scarcity (Houdret, 2012: 285). The private sector, and thus capital, are positioned as key to water infrastructure as a solution to water problems. This positioning of private sector is part of water sector reforms in support of economic reforms in terms of socio-technical interventions (such as dam infrastructure development) to ensure the supply side availability of water for high value economic water users (Wagle *et al*, 2012: 412).

The influence of capital on water knowledge and therefore water infrastructure and the regulation thereof notwithstanding; the state plays a critical role in controlling water infrastructure and the water knowledge that informs water infrastructure. The state traditionally - for instance, through the state hydraulic mission associated with modern water - been central in the construction of large-scale water infrastructure to control water (Islar, 2012: 381).

The role of the state in water infrastructure is also informed by discursive construct of non-water forms of scarcity. Water knowledge discursively constructs water scarcity to inform infrastructure. Further, water knowledge informs the role of the state in water infrastructure through the discursive construct of water scarcity through the interconnection of composite

constructs of scarcity as non-water scarcity and water scarcity. The state, in response to non-water forms of scarcity such as energy scarcity, ceded control of water infrastructure development and operation to the private sector (Islar, 2012: 381). Reforms in the energy sector, to prevent energy scarcity, led to water reforms that affect water regulation in terms of the involvement of the private sector in water infrastructure (*Ibid*.). This meant the discursive construct of non-water forms of scarcity, such as energy scarcity, affect the ontology of water and thereby the use of water knowledge through water infrastructure to control water and ensure its availability for certain water uses. Conversely, this means the discursive construct of other forms of scarcity influences control grabbing of water trough the water regulation of water infrastructure thereby leading to water scarcity for other water uses.

Apart from its connection to, and influence on, water infrastructure; water knowledge plays a role in control grabbing and structuring water users' engagement with water regulation. Water users familiar with, or with the means to acquire, water knowledge are able to use that water knowledge to participate in and therefore influence water regulatory processes. The lack of water knowledge amongst water users with regards regulatory processes also undermines the ability of water users, especially poor or economically weaker water users, to acquire the water rights to formalise and thus protect their water uses (Bordignon *et al*, 2016: 97). This points to the use of water regulation in control grabbing by alienating water users from regulatory processes due to a lack of knowledge of regulatory processes.

Control grabbing also meant the isolation of water users - representing water uses and social interests counter to predominant water uses and social interests - with technical knowledge from policy and legislation making processes that frame the praxis of water regulation (Williams *et al*, 2012: 255). This means predominant social interests are able to control the shaping of water regulation and its praxis in order to control the benefit of water use for certain water users. Alternatively, powerful water users tried to get consent for their water uses through fora that lacked the necessary water knowledge to understand the technical impacts on water availability for other water users of the decisions that are taken (Williams *et al*, 2012: 255). This meant the powerful water users utilise shortcomings in the water regulatory processes to control the benefits of water use for themselves.

Furthermore, powerful social groups with the knowledge and ability to manoeuvre within regulatory institutions that hold authority can thus influence decision making to control water (Hertzog *et al*, 2012: 309). Indeed, organisations representing powerful actors and interests

can also control decision making institutions by lobbying for legislative changes that favour them in water allocation (*Ibid*.). In so doing powerful social groups can ensure water availability for their water uses whilst less powerful water uses are exposed to greater water scarcity.

3.3.5 The Utility of Water Grabbing in Providing Meaning to the Influence of the Nexus of Socionatures on Water Regulation

Considering the relational biophysical nature of water, other socionatural relations also influence the socionatural relations of water. This meant the interrelations of society with other forms of nature and with water shape the socionatural relations of water that influence, and are influenced by, water regulation. The connection of water as a socionature to other socionatural relations, as its ecological context, makes the holistic regulation of water complex (Edelenbos and Teisman, 2011: 8). The complexity associated with the regulatory nexus of water has practical ramifications in the fragmentation of control over water related issues and related institutional fragmentation of water regulation (Edelenbos and Teisman, 2011: 8-9).

Fragmentation also reflects social power dynamics of water users that influenced the structure of water regulation to accentuate fragmentation and thereby weaken water regulatory control and decision making. The consequence is that regulatory decisions over the regulation of other forms of relational nature could affect water regulatory decision making in a manner that affects access to water. Thus control grabbing could emanate from other regulatory spheres that were relational to water regulation through the relational biophysical nature of water.

Moreover, the economic use and thus prioritisation, of particular forms of nature; and the interrelation of those forms of nature with water significantly influences the social power dynamics that underlay socionatural relations of water. In other words, the economic value of nature and the role of water in the exploitation of that nature heavily influenced the social power dynamics behind the socionatural relations of water and thus water regulation. For instance, the minerals targeted by mining influence the ecological context of water, the socionatural meaning of water and its uses as a nature coveted by a prioritised economic activity (Budds and Hinojosa, 2012: 120). The economic context, and interrelation with water, of other forms of nature with high economic value drive the social power dynamics that influence water regulation and water scarcity (*Ibid*.). Water grabbing facilitates control of the benefits of water in order to control the exploitation of raw materials. Global demand for raw

materials such as coal pushed globalised mining interests to develop mining operations presenting threats of the overuse and pollution of water (Franco *et al*, 2012: 10).

The state can play a leading role in control grabbing by explicitly favouring mining as an economic activity. Consequently, the facilitation of the mining industry as an economic activity includes the control grabbing of water by mining companies (Sosa and Zwarteveen, 2012: 360-361). Indeed, mining companies utilise the land-water regulatory nexus to engage in control grabbing initially through the acquisition of land in order to legally alienate non-mining water users from using and thus benefitting from the use of water (Sosa and Zwarteveen, 2012: 365-366). Thus global mining capital targets the benefits of water use in order to control and economically exploit minerals as nature. The pursuit of the control of water is driven even with the risk of the overuse and pollution of water for non-mining water uses.

The potential usefulness of water grabbing in relation to the influence of other socionatural relations on the socionatural relations of water, and thus water regulation and water scarcity; pertains to the value grabbing of water to benefit from other forms of nature. The value grabbing of water to exploit the benefits of other forms of nature largely speaks to the economic value of such forms of nature. For example, in the context of land based investments (that played out as land grabbing), land lease agreements for land investments also authorised the development of water infrastructure such as dams (Bossio *et al,* 2012: 231). Thus in pursuit of the exploitation of, and benefits associated with, land use; lease agreements are structured to facilitate the water infrastructure necessary for the exploitation of such the land uses (Bossio *et al,* 2012: 231).

The exploitation of land uses through water infrastructure ostensibly occurs through water regulation and thus in line with water law. Water infrastructure development, according to water regulation and law, requires permits to authorise the building of water infrastructure (Bossio *et al*, 2012: 231). However, the poor enforcement of this water regulation enables water grabbing through the building of unregulated water infrastructure in order to exploit the benefits of land through control grabbing of water use (Bossio *et al*, 2012: 231). In addition, land based investments can change in their uses of land and thus water over time thereby requiring continuous regulation to ensure water use is in line with water availability (and will not lead to poor water quality) (Williams *et al*, 2012: 255). Control grabbing in this instance means the use of regulatory authority to authorise water use for a particular land use whilst exploiting the lack of regulatory capacity to enforce authorised water uses. Another

form of control grabbing of the benefits of water to exploit land as another form of nature involves the inadequate analysis of the implications of land based investments on water use in terms of water quantity and quality (Williams *et al*, 2012: 243). This implied shortcomings in water regulation.

Control grabbing of the benefits of water use in terms of land use also occur in the context of the land-water nexus of property rights and regulation. Land rights and regulation affect water rights and the regulation thereof – particularly as land was contextual to water – thus impacting water use (Williams *et al*, 2012: 257). Thus control of the framing and regulation of land rights also influence water rights and regulation (*Ibid*.). Therefore the framing of land-water regulation nexus can function to control water for particular land uses and to the detriment of other land uses. On a practical level, the land-water property rights and regulatory nexus can lead to an increase in land use (Hertzog *et al*, 2012: 306-309). Resultant increases in land use mean increases in water demand that influence investments in water infrastructure such as irrigation systems (*Ibid*.). Therefore the land-water regulatory nexus can facilitate control grabbing through water infrastructure that potentially favours the water use of particular land uses over those other land uses. Further, land and water rights can be explicitly interlinked so that ownership or use rights of one resource (water) are dependent on ownership or use rights of the other resource (land) (Hertzog *et al*, 2012: 307). Thus water grabbing can emerge as an indirect outcome of the control grabbing of land rights and regulation to facilitate particular land uses. Control grabbing of land regulation can also be driven by the need to secure water rights that are legally connected to land rights.

3.4 Conclusion

The interlinked elements of the socionatural relations of water, for instance discursive constructs such as the ontology of water, are outlined in relation to their connection to water grabbing. This is to highlight the relevance of water grabbing as a theoretical framework to be utilised in the interpretation of the findings of the study in the forthcoming interpretative chapter.

Social power is shown as an important theme in water grabbing. This is relevant for the interpretation of the socionatural relations of water that likely shape and direct the praxis of water regulation of the water use of coal mines that influences water scarcity and thus coal mining water struggles. Social power is likely critical in the use of water regulation to impose

socionatural relations of water that facilitate the water use of coal mines leading to the water scarcity as the water problem behind coal mining water struggles.

This chapter argues the suitability of water grabbing in the interpretation of the socionatural relations of water lay in the mutual centrality of water scarcity (and by implication water struggles). Both water grabbing and the socionatural relations of water deal with water scarcity for some water users as an outcome of the securing of water availability for other water users.

4. Water Regulation in South Africa

4.1 Introduction

Chapter four provides a contextual outline of water regulation in South Africa. This context provides conceptual clarity for the forthcoming discussion of the findings by clarifying water regulation and water rights in South Africa. By clarifying water regulation and water rights, this chapter also illustrates the interconnection of water regulation and water rights in South Africa. Moreover, this chapter explains the function of water regulation in South Africa by providing an outline of water use licensing as water rights and attendant water regulation as the licensing process, what is termed the licensing decision making framework and water regulatory enforcement.

4.2 The Impetus for the Reform of Water Rights in South Africa

Apartheid South Africa functioned according to racial discrimination based on the law that affected access and use of water (van Koppen and Jha, 2005: 196). Consequently, water rights in South Africa were a target of, and have been greatly influenced by, post-apartheid reform (Thompson, 2006: 1). This reform process was to replace racially discriminatory water, and associated, law of the colonial and apartheid era (Steyn, 2002: 4). The post-apartheid Constitution of the Republic of South Africa (hereafter the Constitution) is the legal initiator of this reform process. Section 24 of the Constitution of the Republic of South Africa states under subsection (a) that everyone has a right to an environment that is not harmful to their health or wellbeing. Subsection (b) of section 24 continues that everyone has a right to an environment that is protected for the benefit of present and future generations.

In meeting the above section (b) further enjoins the use of reasonable legislation and other measures to (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) ensure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. The Constitution also approaches natural resources, including water, as a property under section 25. Section 25 (4) (a) of the Constitution states there should be reforms to the property regimes of natural resources to achieve equitable access to natural resources (including water). The state is enjoined, according to section 25 (8), to develop legislation to attain, amongst others, water reform.

The legislative fulcrum of water reform in relation to all forms of water in its natural state in the hydrological cycle, as envisioned in the Constitution, is the NWA (Steyn, 2002: 3). The NWA is concerned with integrated water resource management whilst the Water Services Act (Act 108 of 1997) focuses on domestic water and sanitation services (Steyn, 2002: 3-4). The NWA is developed to deal with the legal problem of water regulation in the context of the reform of apartheid water law. One aspect of the legal problem of water the new law deals with is water rights.

4.3 Water Rights in South Africa

The NWA grouped water rights into four classifications. These four groupings of water rights serve different functions and are for different forms of water uses and users. Schedule One water uses are those that utilise small quantities of water for domestic water uses, food gardening and livestock watering; and are thus exempt from water use licensing (Anderson *et al*, 2007: 169). Small scale water uses by groups of people in a particular water body and specific area that also use water for similar purposes did so under General Authorisations (*Ibid*.). General Authorisations are gazetted under Government Notices 398 and 399 of 26 March 2004 generally authorising specific water uses (*Ibid*.).

The remaining two forms of water rights require WULs that are for specific water use with water use licensing conditions (Movik, 2014: 190-191). One form of these water rights are Existing Lawful Uses (ELUs) related to water uses for lawful water rights attained at least two years prior to the introduction of the NWA (Movik, 2014: 191). ELUs were temporarily excluded from licensing requirements but were required to convert such water rights to WULs (*Ibid*.). The other form of water rights that requires licensing are licensed water uses. Licensed water uses are those applied for, and authorised, by the state through the DWS; for large volume uses by commercial water users (Anderson *et al*, 2007: 169).

The NWA significantly reformed water rights in South Africa in the post-apartheid era by introducing administrative use rights as water use licensing. A seemingly new feature of water rights under the NWA is the central role of the state in water use licensing. However, a brief inspection of the history of water rights in South Africa indicates that the central role of the state is not novel. Historically the state has played a central role in the development and allocation of water rights. Administrative use rights under the NWA are thus the latest

iteration of the predominant role of the state in the development and allocation of water rights.

The allocation of water use rights, with the central role for the state; historically coexisted with water rights that treated water as private property. Therefore historically water rights in South Africa were a hybrid of public allocation of water use rights and private ownership of water as private property (Movik and de Jong, 2011: 69). The historically hybrid character of water rights in South Africa is carried over with the introduction of administrative use rights in the NWA as licenses were use rights and private property (Tewari, 2009: 694).

In the colonial era, the Roman-Dutch common law principle of *dominus fluminis* entrusted the state with the authority to control water bodies as a custodian for all people (Piernaar and Van Der Schyff, 2007: 182). The Roman legal tradition used the concept of *res extra commercium* to nature, such as air and running water in its natural form in a stream, that was owned by all people instead of being privately owned (*Ibid.*). *Dominus fluminis* applied to perennial water that was *res publicae,* in other words in the public sphere (Movik and de Jong, 2011: 69). This means the state held in trust for the public, water that could not be privately owned. The state then issued water use rights for such water to water users (Van Der Walt, 2011: 41).

However, the authority of the state under *dominus fluminis* was not omnipotent as it related only to navigable and running water bodies (Piernaar and Van Der Schyff, 2007: 182). Seasonal water on the other hand that was *res privatae* was considered not to be perennial, running and navigable (Movik and de Jong, 2011: 69). Such water could be privately owned within privately owned landed property (Pienaar and Van Der Schyff, 2007: 182). Thus the ontological distinction between public and private water stemmed from Roman law and was carried over into Roman-Dutch and respectively influenced the development of use of water rights in South Africa (*Ibid*.).

The ontological distinction of public and private water also influenced the British legal tradition that threaded through South Africa water rights. This legal tradition replaced the principle of *dominus fluminis* preferring instead riparian water rights (Tewari, 2009: 698). Riparian water rights meant land owners adjacent to water bodies had rights to use such water (Movik, 2012: 19). Riparian rights effectively bundled together land and water property rights (Piernaar and Van Der Schyff, 2007: 182). The NWA abolished riparian water rights (Hodgson, 2004: 44). In so doing the NWA eradicated a key feature of the preceding Water Act

(Act 54 of 1956). Furthermore, though the NWA reinforced the principle of *dominus fluminis* that had operated in tandem with riparian rights in the Water Act (Act 54 of 1956) (Tewari, 2009: 710).

4.4 Water Use Licensing

In the period in which the NWA was introduced, IWRM greatly influenced thinking behind water regulation. One form of this influence was in the emphasis on "holistic and integrated management" which required bureaucratic centralisation (Movik, 2009: 1). Thereby there was a preference for state dominated administrative use rights such as licensing in the construct of water rights (*Ibid*.). At the core of administrative use rights is the concept of public trusteeship. The public trusteeship doctrine designates water a national resource of the people of South Africa held in the custody of the state on behalf of the people of South Africa (Anderson *et al*, 2007: 167). The state did not own water (Thompson, 2006: 279).

The state has the "overall responsibility and, importantly, the authority to ensure that all the water in the country is managed for the benefit of all persons" (Thompson, 2006: 279). In other words, the state is enjoined to use water in the public interest and in consideration of the needs of the environment (Anderson *et al*, 2007: 167). The state is obligated to exercise its water use licensing authority when water uses want to, or engage in, water uses defined and listed in section 21 of the NWA as the:

(a) abstracting water from a watercourse,
(b) storing water;
(c) impeding or diverting the flow of a watercourse;
(d) engaging in streamflow reduction activities;
(e) engaging in a controlled activity;
(f) discharging waste or water containing waste;
(g) disposing of water in a manner that may negatively impact a watercourse;
(h) disposing of water heated from or used in industrial or power generation processes;
(i) altering the bed, banks, course or characteristics of a watercourse;
(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or safety of people;
and (k) using water for recreational purposes.

Thompson (2006: 428-431) clarifies that this section of the NWA controls, through licensing, any water use that took water from a watercourse, stores water, discharges wastewater, and impedes or diverts the flow of a watercourse. However, some forms of water use, such as domestic use, are exempted from licensing.

The introduction of administrative use rights in terms of water use licensing shapes water regulation. Administrative water use rights, according to section 26 (1) (c) of the NWA, requires the registration of all water uses under the DWS. Accordingly, the Water Use Registration Regulations (1999), issued after the commencement of the NWA; stipulates that all water uses under section 21 of the Act has to be registered with the DWS. The Water Use Registration Regulations (1999) enjoined the state to verify the lawfulness of the registered water uses based on the supplied information and an investigation should one be necessary. Water uses are registered within administrative systems such as the Water Authorisation and Registration Management System (WARMS) that the DWS uses to monitor WULs (Movik and de Jong, 2011: 73). WARMS enables the DWS to track water use in all WMAs, manage water billing for water users, manage reserve determination for water bodies to inform the DWS of water available for allocation (*Ibid*.).

The Water Use Registration Regulations (1999) further state a failure to register water use by water users means that water use is illegal. Thus any water use that is not exempt from water licensing that is not registered is illegal. This means the NWA, through the Water Use Registration Regulations (1999), put the state in the control of determining illegal water use just by a failure to register a water use. Further, the NWA, through the Water Use Registration Regulations (1999), authorised the state to investigate whether registered water uses were illegal. In other words, the state is authorised to determine the compliance of water uses with the NWA. The rules of water use registration as outlined in the Water Use Registration Regulations (1999) is one form of compliance that framed legality/illegality of water use.

4.4.1 Water Use Licensing Application Process

Administrative water use rights also shape water regulation, specifically licensing, through rules on licensing (application) process, licensing decision making and public participation in the licensing processes. The Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017) are crucial in this regard. The Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals

(2017) set the rules for the application process. A few of the key rules of the aforementioned regulations are highlighted.

Section 3 (a) of the application process enjoins an applicant to make an application to the responsible authority (i.e. the DWS). In turn the responsible authority must, according to section 3 (b) and (c) respectively maintain a register and records of, decisions, with regards applications. Section 4 continues the DWS should utilise a national electronic system to register records of applications then the records of section 3 (a) and decisions of section 3 (b) must be kept within that system. Further, section 5 of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017) outlines the application process, assessment and decision should be within 300 days of the application.

The application process for a WUL as outlined in section 5 (1) begins with a pre-application meeting. The responsible authority is tasked, according to section 5 (2), with providing the prospective applicant with clarity on the application process and requirements (in terms of technical information).

Section 6 (3) states that an application for a WUL must contain documents outlined in Annexure B of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017). The relevant information in terms of documents in Annexure B for mines included technical information in terms of Integrated Water and Wastewater Management Plan (IWWMP), civil design report, geohydrological report and mine closure and rehabilitation plan, public participation report and wetland delineation report. The process of water use licensing applications require technical studies that make the process technically, and time, intensive. Another feature of the water use licensing application process is that it is layered. This partly explains the lengthy timelines for the issuing of WULs.

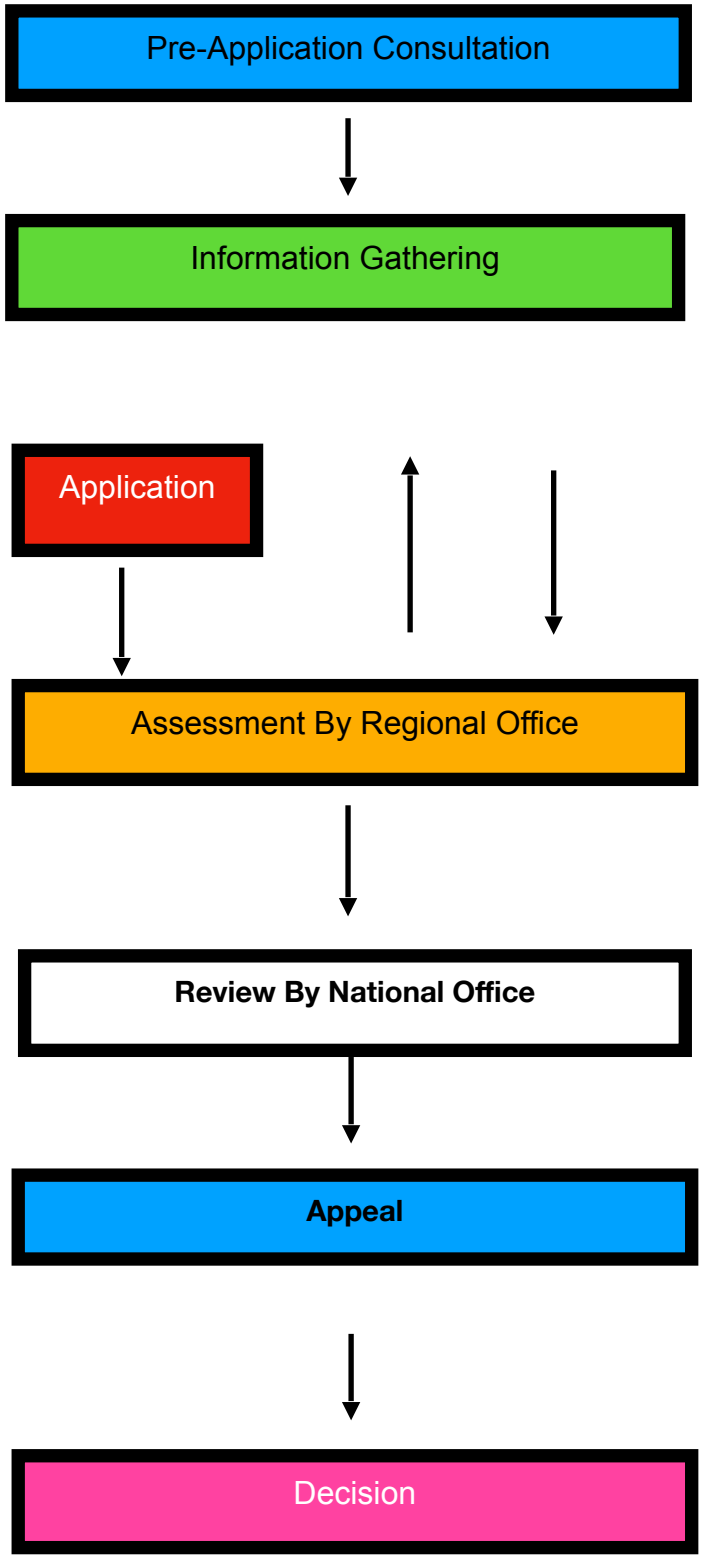


Figure 4.1 Visual Outline of the Water Use Licensing Application Process

Adapted from Movik and de Jong, 2011: 74

4.4.2 Internal Processing of Water Use Licensing Applications

Section 8 of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017) stipulates under subsection (a) that the DWS must assess whether the application is fully completed and has the required documents. Subsection (b) highlights that the evaluation of the application is also to ascertain whether minimum information requirements are met.

According to Section 9, within 10 days of the submission of the application the DWS should issue an acceptance or rejection letter for the application. The rejection letter must provide adequate reasons for the decision taken. Within 5 days of the acceptance of an application, according to section 10 of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017), should a site visit be necessary one should be arranged with the applicant. Following the site inspection, the DWS will, according to section 10 (3); inform the applicant within 5 days of the site visit through a letter of the information required for a technical report on the WUL application. Failure to set up, and of the applicant to avail themselves for, a site visit will result in the rejection of the application.

The applicant is enjoined by section 11 (1) to develop a technical report on the WUL application within 105 days of being informed of the required technical information. Failure to provide such technical information including any technical reports required by the DWS will result in the applicant and interested parties being informed in writing of the rejection of the application.

The technical report of the WUL application will, based on section 12 (1), be subjected to an evaluation. Section 12 (2) commits the DWS, within 10 days of its submission to: (a) accept the technical report on the license application if it meets the requirements set out in the Regulations and (b) reject the application if the technical report fails to meet the requirements of these Regulations. Section 12 (4) outlined that a technical evaluation should commence and be completed within 139 days should the technical report be deemed to meet the requirements of the Regulations. Section 12 (5) states that the DWS may request the views of other state departments in the process of the technical evaluation.

Table 4.1 Technical Report Contents to Meet Information Requirements

Number	Report Designation	Purpose of Report
1	Technical Report for Water and Wastewater Treatment Works	Water uses for water and wastewater treatment works
2	Agriculture Business Plan	Agricultural water uses
3	Stream Flow Reduction Activity Business Plan	Stream flow reduction activity
4	Integrated Water and Wastewater Management Plan	Water uses for mining and industrial operations
5	Geohydrological Report	Specialist study for groundwater
6	Wetland Delineation Report	Report on wetlands and watercourses
7	Mine Closure and Rehabilitation Report	Plan for closure and rehabilitation of a mine
8	Public Participation Report	Consultation of interested and affected parties
9	Civil Design	Minimum information requirements

Annexure D of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017)

4.4.3 Water Use Licensing Decision Making

Section 13 outlines that a license application should be decided upon within 144 days from the date of acceptance by the DWS of the technical report on the water use application. Section 13 further states that the decision on the approval of a WUL will be based on the water use application process outlined below in Annexure A of the Regulations:

Table 4.2 Water Use License Application Approval Process

Regulation	Steps in Approval of Water Use License Applications	Maximum Days Allocated	Cumulative Days	Responsible
0	Pre-application enquiry	0	0	Applicant/ Responsible Authority
1	Application submitted	1	1	Applicant
2	Responsible authority acknowledges receipt of the application	10	11	Responsible Authority

Regulation	Steps in Approval of Water Use License Applications	Maximum Days Allocated	Cumulative Days	Responsible
3	Applicant confirms arrangements for site inspection with an allocated case officer	5	16	Applicant
4	Site inspection to confirm water uses, determine information requirements and the need for public participation	20	36	Applicant/ Responsible Authority
5	Confirm requirements for water use license application technical report based on site visit and meeting	5	41	Responsible Authority
6	Compilation, consultation and submission of water use license application technical report by applicant	105	146	Applicant
7	Reject/Accept water use license application technical report	10	156	Responsible Authority
8	Assessment	139	295	Responsible Authority/ Applicant
9	Decision and communication to applicant	5	300	Responsible Authority

Annexure A of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017)

The approval of the water use license application enjoined the applicant to acquire security for the duration of the license in line with section 14 of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017). According to Annexure E of the Regulations, the responsible authority (i.e. the DWS) is to utilise the surety, for the duration, and five years after the duration of, the license; to address the effects of non-compliance with license and other provisions of the NWA.

Licensing decision making was broadly based on what this study refers to as a licensing decision making framework. The licensing decision making framework guides decision on the allocation of licenses. One dimension of the framework is the regulatory mandate that provides a broad outline of how the water regulatory authority, including licensing authority, should function. In the NWA what is referred to here as the regulatory mandate is stated therein as the purpose of the NWA, in other words the purpose of the authority on which government as the custodian of water resources acts. Section 2 of the NWA states that government as the custodian of water should "ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of

all persons…". Section 2 of the National Water Act carried a more exhaustive list of these principles that guided water use. Section 2 provides an exhaustive list of the purposes behind the regulatory mandate:

(a) meeting the basic human needs of present and future generations;
(b) promoting equitable access to water;
(c) redressing the results of past gender and racial discrimination;
(d) promoting efficient, sustainable and beneficial use of water in the public interest;
(e) facilitating social and economic development;
(f) providing for growing demand for water use;
(g) protecting aquatic and associated ecosystems and their biological diversity;
(h) reducing and preventing pollution and degradation of water resources;
(i) meeting international obligations;
(j) promoting dam safety;
(k) managing floods and droughts.

Amongst the purposes of the NWA that framed the regulatory mandate some speak to water use. Implicitly, these purposes provide an ontological basis for the framing of water as an economic good. Other purposes, however, outline the need for equity and redressing past imbalances in water use, protecting water and associated ecological context and addressing and preventing pollution; thereby speaking to other forms of water uses meaning the framing of water use is not exclusive to economic water use. These purposes and the regulatory mandate they shape inform the regulation of water use, including licensing decision making.

Furthermore, the function of licensing decision making is guided by considerations set out in section 27 (1) of the NWA. These considerations include:

(a) existing lawful water uses;
(b) the need to redress the results of past racial and gender discrimination;
(c) efficient and beneficial water use in the public interest;
(d) the socio-economic impact - (i) of water use(s) if authorised and (ii) the failure to authorise water use(s)
(e) any catchment management strategy applicable to the relevant water resource
(f) the likely effect of the water use to be authorised on the water resource and other water users;
(g) the class and the resource quality objectives of the water resource;

(h) investments made and to be made by the water user in respect of the water use in question;

(i)the strategic importance of the water use to be authorised;

(j)the quality of the water in the resource to be required for the Reserve and for meeting international obligations;

(k) the probable duration of any undertaking for which a water use is to be required.

Strategic water uses were viewed as critical for the country's economic development. Strategic water use as economically slanted in the two water uses of inter basin transfer and electricity generation (National Water Strategy, 2013: 9). Beneficial use in the public interest was concerned with the equitable allocation of water (National Water Strategy, 2013: 45). Licensing decision making is, amongst others, based on economic considerations. Economically slanted considerations include socio-economic benefits of a water use, the strategic importance of a water use, the efficient use of water and also the internal economic considerations of a water use applicant.

The National Water Strategy (2013: 47), on the basis of the considerations in section 27 (1), detailed four water use priorities that effectively rank water use. These water use priorities assist decision making for licensing. The four water use priorities in the National Water Strategy (2013: 47) are as follows:

Table 4.3 Water Use Priorities

Water Use Priorities	
Water Use Priority	**Description**
Priority One	The highest priority in water use is for the Reserve in terms of quantity for basic human needs and quality to sustain aquatic ecosystems
Priority Two	The second highest priority in water use is for meeting international commitments with other riparian states
Priority Three	The third highest priority in water use is for poverty eradication, the support and development of livelihoods for the poor and the attainment of racial and gender equity

Water Use Priorities	
Priority Four	The fourth highest priority is for meeting strategically important economic water uses which are inter-WMA water transfers and water availability for electricity generation
Priority Five	The fifth highest priority for water use is for economic water use with licensing based on the value of water per sector, potential for encouraging economic growth and employment and efficiency of water use

National Water Strategy, 2013: 47

Thus economic considerations are crucial to licensing decision making. This is due to the prioritisation given, directly and indirectly, to economic water uses in priorities three, four and five. Implicit in these priorities, particularly priorities four and five, is the ontology of water as an economic good to be used for economic activities. Accordingly, licensing decision making is based on the economic returns associated with economic water uses.

The purposes and considerations set in the NWA that guide licensing decision making are in the context of water scarcity. In reference to water scarcity, the preamble of the NWA stated "Recognising that water is scarce and unevenly distributed natural resource that occurs in many different forms which are all forms of a unitary, inter-dependent cycle…".

As captured in the preceding table, the National Water Strategy set water use priorities, based on the above mentioned purposes and considerations. These water use priorities are also based on the rationale of water scarcity. The National Water Strategy (2013: 8-9) viewed water scarcity as the major water problem facing and limiting the social and economic development of the country; the risk of which is exacerbated by inefficient water use. Therefore, water scarcity informed the legal construct of water rights in the form of water use licensing in the National Water Act (Act 36 of 1998). Moreover, water scarcity informed the practice of water use licensing in the National Water Strategy.

4.4.3 The Role of Water Knowledge in the Water Licensing Benchmarks of Mine Water Infrastructure in South Africa

The Regulations Regarding the Safety of Dams in Terms of Section 123 (1) of the National Water Act (2014) are another set of regulations pertinent to this section of the study. These regulations respond in detail to the dam safety requirements of the National Water Act. These regulations approach dam safety, as contained in section 2, through the classification of dams in line with the anticipated potential risks. Amongst the many measures under this regulation is setting size classifications in line with dam risks as outlined in section 2 (2) and the parameters set out in section 3. These parameters that include the impact of potential risks on water quality require calculation of water of a particular quality that could be released from the dam; if the dam dealt with polluted water then the risk of that water spilling into the environment must be viewed as significant; and dam risks should also be assessed in broader economic loss, loss of lives and downstream water quality.

Section 2 (7) of these regulations outlines the information a dam owner is required to furnish to the relevant department's DG when dam alterations and repair of an existing dam or a new dam is built. This information is required to classify dam risk safety. This information, amongst others, includes section 2 (7) (c) the water use and users of the scheme; (d) type of dam; (e) the form of enlargements, alterations or repairs; (f) proposed wall height; (g) total crest length of the wall; (h) the storage capacity and (i) the surface area of the reservoir when full.

Section 4 of the Regulations Regarding the Safety of Dams in Terms of Section 123 (1) of the NWA (2014) compel licensing before the commencement of any construction towards the building, enlargement, alteration and repair of a dam with a safety risk classification. Only emergency work to prevent the imminent failure of a dam could proceed without a license from the DG but the DG would have to be informed within seven days of such emergency work. Section 4 (2) deems incorrect information for a license for such work can lead to a licensing request being denied.

These regulations also provide procedural requirements for the application of licenses for categories I, II and III dams. Section 5 outlines licensing for dam I category dams, section 10 did the same for category II dams and section and section 17 outlines licensing for category III dams.

There are further regulations on licensing information requirements. These licensing requirements include the furnishing of design reports, engineering drawings and safety of existing developments that could be affected by the dam. These regulations for design reports, engineering drawings and safety of existing developments are outlined for different categories of dams.

Licensing conditions for the construct, alteration, repair and enlargement of different categories of dams are also outlined in the Regulations Regarding the Safety of Dams in Terms of Section 123 (1) of the NWA (2014). These broadly related to deviations in design, building materials, information on construction and investigations on dam construction. The licensing conditions related that the DG of the DWS is to be informed of deviations relating to the aforementioned areas.

Section 32 of the Regulations Regarding the Safety of Dams in Terms of Section 123 (1) of the NWA (2014) specifies conditions and requirements for the operation and maintenance of dams with a safety risk. Section 1 (a) empowers the DG to inspect a dam or assess components thereof. Section 1 (b) allows the DG to require a dam owner to assess the functioning of components thereof or to fit equipment for the assessment of the functioning of a dam. Moreover, section 1 (c) compels the owner of a dam to supply information on dam safety risk required by the DG or information on the protection of life, property or water quality due to the dam.

Section 32 (d) enjoins the dam owner to utilise an approved professional for the maintenance work coming out of a dam safety evaluation. Section 32 (e) allows for further studies in response to a dam safety evaluation. Section 33 (3) outlined that when a dam with safety risks changed ownership then according to section 33 (3) (a), the records of ownership should be transferred to the new owner within 60 days and section 33 (3) (b) required the DG to be informed within 60 days of the change of ownership and transfer of ownership records.

The Regulations Regarding the Safety of Dams in Terms of Section 123 (1) of the National Water Act (2014), in sections 34 for category I dams and in section 35 for category II dams, outlines dam safety evaluations. These relate to the requirements and processes for dam safety evaluations by the dam owner.

4.4.4 Intergovernmental Relations of Mining and Water Use Licensing in South Africa

Section 4 (1) of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017) set out that water use licensing processes of the DWS must align with the mining licensing processes of the DMR under the MPRDA. Section 4 (1) of the regulations asserts the same need for alignment of water use licensing and environmental authorisations of NEMA.

Section 4 (1) of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017) stipulates that a WUL application must be accompanied by written proof from the DMR (to be submitted no later than five days after it is issued) of a mining license application. Accordingly section 4 (2) restricts the consideration of a WUL for a mine to only after the applicant submits written proof of a mine license application and other supporting documents. The OES was introduced to provide for the alignment of the licensing processes of the DWS and DMR. This followed evidence of failures in such alignment as there was an entrenched practice of mines operating without WULS.

The Environmental Management Plan (2016-2020) of the DMR deals further with the intergovernmental dimension of water regulation. This is specifically in terms of the regulatory nexus of the DMR and DWS (and the DEA, though the environmental regulatory aspect was not a focus of this study). The OES reconstituted the licensing responsibilities of the DMR and DEA in particular by transferring the responsibility for environmental authorisations (EAs) from the DEA to the DMR (DMR, 2018: 84). Further, the OES also transferred processes for licensing decision making, for instance the environmental impact assessments (EIAs), to the DMR.

The OES did not similarly impact the licensing responsibilities of the DWS by shifting water use licensing to another state department. The most significant impact of the OES on the DWS is in terms of instituting a requirement for parallel processes and concurrent decision making in the various licensing requirements for mines. This means the relevant departments responsible for licensing such as the DWS and DMR have to adjust their licensing processes to suit the OES's requirements. This particularly affects the DWS in terms of licensing timelines as WULs are now required, as outlined in the diagram below, to be concluded in 300 days.

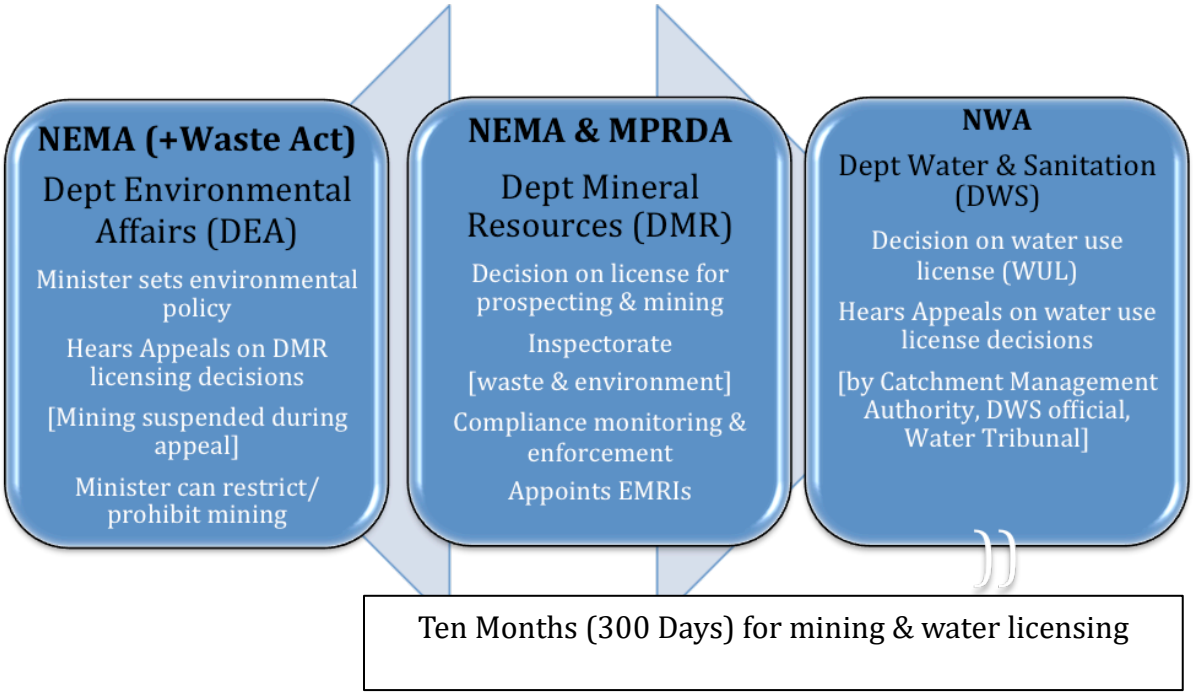


Figure 4.2 Licensing and Environmental Enforcement Responsibilities Within the OES

Forrest and Loate, 2017: 37

4.5 Water Regulatory Enforcement of Water Use of Mines

WULs, particularly their licensing conditions, are fundamental to water regulatory enforcement. Section 28 of the NWA explains the essential elements of a WUL. Section 28 (1) (a) of the NWA specifies the licensed water use(s), (b) property for which the license is allocated, (c) the person to whom the license is allocated, (d) the conditions under which water can be used, (e) the licensing period which cannot exceed 40 years, (f) review periods under section 49 at intervals of not more than 5 years. As stated above licensing conditions are a key element of a license that specify licensed use.

Section 29 expands on section 28 (d) on the conditions a licensing authority can attach to licensed water use. Section 29 (1) provides an extensive list of such conditions. Section 29 (1) states a license may contain conditions pertaining to (a) the protection of (i) water resource in question, (ii) stream flow regime, (iii) other existing and potential water users. Section 29 (1) (b) relates to conditions on water regulatory processes (i) specifying management processes and general requirements for any water use; (ii) requires the monitoring and analysis of and reporting on every water use and imposing a duty to measure and record aspects of water use; (iii) requires the preparation, approval and adherence to a water management plan; (iv)

requires the payment of charges for water use; (v) requires the license to provide or make water available to a person specified in the license.

Section 29 (1) (c) is relevant to return flow and discharge or disposal of waste water by (i) specifying a water resource to which it must be returned or other manner to which it must be disposed, (ii) specifying permissible levels for some or all of its chemical and physical components, (iii) specifying treatment to which it must be submitted before it is discharged, (iv) specifying the volume which may be returned. Section 29 (1) (d) set conditions relating to controlled activities (i) specifying the waste treatment, pollution control and monitoring equipment to be installed, maintained and operated; and (ii) specifying the management practices to be followed to prevent the pollution of any water resource.

Section 29 (1) (e) outlines conditions on the taking or storage of water (i) setting out the specific quantity of water or percentage of flow that may be taken, (ii) setting out the rate of abstraction, (iii) specifying the method of construction of a borehole and method of abstraction from a borehole, (iv) specifying the place from which water may be taken, (v) specifying the time when water may be taken, (vi) identifying or limiting the area of land on which any water taken may be used, (vii) limiting the quantity of water that may be stored, (viii) specifying locations where water may be stored, (ix) requiring the licensee to become a member of a water users association before water may be taken. Section 29 (1) (f) pertains to stream flow reducing activities (i) specifying practices to be followed to limit stream flow reduction and other detrimental impacts on the water resource, (ii) setting or prescribing a method for determining the extent of stream flow reduction due to licensed use.

Section 29 (1) (g) focuses on conditions necessary or desirable to achieve the purpose for which the license is issued. Section 29 (1) (h) is relevant for conditions necessary or desirable for compliance with provisions of the Act. Section 29 (1) (i) outlines that conditions for a license may (i) specify times when water may and may not be used, (ii) contain provisions for its termination if an authorised use of water is not implemented or not fully implemented, and (iii) designating water for future or contingent use or (iv) which have been agreed to by the licensee.

A critical dimension of the water regulation of coal mines relates to water use. The pertinent regulations for this are the Regulations on Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources (1999). These Regulations put limitations on the location, and the water use, of coal mines. Section 4 of the Regulations under sub-section (a)

prohibit the placing of residue, dam, reservoir and any related structures within 100 metres of a watercourse, estuary, borehole or well nor on land that is unstable.

Moreover, Section 4 (c) prohibits the placing of any substance or residue that can or likely could lead to pollution of water within the 1:50 flood line. Section 4 (d) continues to prohibit the placing of sanitary facilities, fuel depots, reservoirs or depots of any substance that will, or is likely to, lead to water pollution within 1:50 food line of a watercourse. Further, section 4 (b), unless there is an exemption, prohibits opencast or underground mining, prospecting or any activities within a 1:50 flood line or 100 metres of a watercourse.

Section 5 prohibits a mine from the use of substances that will or could likely pollute a watercourse. This restriction is particularly for substances that would be used in the building of a dam, embankments, road, rail line or any other use likely to pollute watercourses. Section 6 of the Regulations dealt with clean and dirty water systems in mines. Section 6 (a) commits mines to ensure that a mine had a water system that would keep unpolluted water separate from polluted water. Such a water system should be constructed, operated and maintained, according to section (b); so that clean water is unlikely to mix with polluted water more than once over a 50 year span.

Likewise, a dirty water system should be developed in satisfaction of section 6 (c) to capture dirty water from the mining operations. Section 6 (d) states such a dirty water system should be constructed, operated and maintained to ensure dirty water was unlikely to mix with unpolluted water more than once in 50 years. As part of a dirty water system, section 6 (e), stipulates that a pollution control dam should be developed with 0.8 metres of minimum freeboard above full supply level. Section 6 (f) held that the design, construction and maintenance of these water systems on a mine should be based on flows up to those of a once in 50 years maximum flood.

Section 7 of the Regulations on Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources (1999) focus on the protection of water resources. Section 7 (a) commits mines to ensure that reasonable measures are taken to prevent water with waste, or substances that will or likely could pollute water bodies, from flowing or seeping into watercourses. Water with waste or a potentially polluting substance must be collected, used, re-used, evaporated, purified and disposed of according to the National Water Act.

Section 7 (b) further outlines that water systems should be designed, constructed, maintained, modified and located and used to prevent the pollution of water bodies. This is to limit water pollution of riparian, in-stream habitats and therefore damage to vegetation and alteration of flow characteristics. Section 7 (c) enjoins mines to take steps to limit the surface and floodwater flows from mine works, opencast works, other works or underground. Section 7 (d) outlines that dams or residue deposit or stockpile should be designed, developed, maintained, modified and operated to dispose or store minerals tailings, slime, ash or hydraulic transported substances so that water or waste in water will not damage water bodies. Furthermore, section 7 (e) commits mines to prevent the leeching of stockpiles or residue deposit into, and thus pollution of, water bodies through measures such as barrier dams, evaporation dams, etc.

Section 9 of the Regulations pertains to the obligations of a mine at closure or post-closure with regards its water uses. Section 9 (1) holds that the temporary or permanent stopping of mining operations must be preceded by the design, construct, modification and maintenance of pollution control measures in compliance with these Regulations. Section 9 (2) continues to require before a mine is closed there is remedying of any riparian or in-stream impacts on water bodies affected by a mine's activities. Section 11 (a) requires all residue deposits from coal mines to be rehabilitated so that they are compacted to prevent spontaneous combustion and to limit infiltration by water. Further, section 11 (b) of the residue deposits must occur whilst mining operations are underway.

4.6 Conclusion

The introduction of administrative water use rights was a profound moment in South Africa. This change in water rights brought forward a perfunctorily new - or maybe not so new - approach to the control of water in post-apartheid South Africa. This change - necessitated by the historical injustices of Apartheid - attempted, amongst others; to address historical inequitable access to water, the preference of certain water users and their water uses and economic interests and the protection of the environment such as water bodies through sustainable use. The state was to play a central role in bringing about such changes in society.

Hence, the state is put squarely in control of water through the introduction of administrative water use rights. The introduction of administrative use rights consequently influences water regulation. In other words, administrative use rights shape the content of the rules and

processes that control access and use of water. Consequently, administrative water use rights shape the water regulation that control the water use of coal mines in South Africa. This water regulation is crucial to controlling the water problems associated with the water use of coal mining, and mining in general.

5. Research Design and Methodology

5.1 Introduction

The aim of this study, as introduced in chapter one, is to understand the influence of water regulation on the nature of coal mining water struggles in Delmas. This study interrogates the water problem at the core of coal mining water struggles and the varied mechanisms through which water regulation influences this water problem and thus coal mining water struggles. The above two strands of the focus of this study were reflected in the study's research questions below:

The research questions for this study were as follows:

1) What is the nature of coal mining water struggles in Delmas, South Africa and what is the role of water regulation in the nature of coal mining water struggles?

2) How does water regulation influence the nature of coal mining water struggles in Delmas?

These research questions mean the study is suited to a qualitative research approach. The research questions steer this study towards an in-depth and interpretative research methodological approach. Consequently, the study utilises a case study approach. This chapter explains the study's research design choice as well as the research methods including sampling, data collection instruments, data trustworthiness and data analysis. The chapter also outlines the ethical considerations, limitations of the study, the research study site and case study mines.

5.2 The Research Study Site

Delmas as the study site is selected based criteria aligned to the criteria for the selection of the case study mines, outlined later further below, as well as the study's research questions. Accordingly, this study requires a research study site with a high likelihood of coal mining water struggles. A research site with a high likelihood of coal mining water struggles requires coal mines engaged in water use. Further, a research site with a high likelihood of coal mining water struggles also requires productive water users other than coal mines operating in the

same vicinity, and utilising the same water bodies, as coal mines. Delmas is such a place wherein coal mines engaged in water use. Agriculture is also a significant water use operating in the same area and using the same water bodies as coal mines. Delmas thus has a high likelihood for water struggles between coal mines and agricultural water users and is chosen for this reason.



Figure 5.1
A coal mine separated by a fence from a coal mine in Delmas

The relevance of Delmas, as a research study site, also stems from the recent expansion of coal mining in an area historically dominated by agriculture. Underlying the expansion of coal mines in Delmas is the location of the town in the Witbank Coalfield, an area key to coal mining. The existence of a well established agricultural sector in Delmas emanates from the location of the town in an area well suited for agriculture. This means there have been recent changes in the local economy, with an expanding economic importance for mining, that has most likely led to contestation over water use tied to water regulatory practices. The recent nature of the expansion of coal mining into Delmas meant coal mines commenced operations within the NWA and MPRDA regulatory framework.

The suitability of Delmas as a site is also because it is an important area in terms of water. Delmas is located in the area of the headwaters of the Olifants River, in the Upper Olifants. Consequently, Delmas is an area populated with water bodies. Amongst these water bodies

are surface water bodies such as the Wilge river and wetlands. Delmas also has significant groundwater resources as an area with the Botleng Aquifer.



Figure 5.2
A coal mine operating not far from a wetland in Delmas

However, the Upper Olifants, and therefore Delmas, is also a key area for coal mining. This means coal mines are located in proximity to water bodies and their water use presents the potential for water pollution. There is potential for the pollution of water bodies used by other water users such as the agricultural sector.

5.3 Qualitative Research Design

A number of considerations inform the selection of a qualitative research design for this study. Research questions determine the appropriateness of subjective data to inform qualitative research or objective and numerical data to inform quantitative research (Welman *et al,* 2005: 8). Whereas quantitative data has numerical values (e.g. 0-100), qualitative data categorises values (e.g. animal, vegetable, etc) (Goddard and Melville, 2001: 52). The relevance of this study's research questions is in the framing of the form of knowledge this study's research questions seek. Accordingly, the research questions of this study inform the selection of a research design of this study. The different forms, and suitability, of data relates to the

knowledge the study sought to attain on, and answer, in relation to the research questions. For instance, research questions that aim to understand, explore and explain are largely congruent with qualitative research as it also focuses on understanding, exploring and explaining (Kumar, 2011: 104). Quantitative research designs on the other hand broadly did not – as qualitative research does – focus on exploring the "variation and diversity in any aspect of social life" but rather "measure the magnitude of that variation" (*Ibid*.).

The form of knowledge flowing from the study's research questions inform the research design that best suits this study. The suitability of the research design rests on its relevance in the production of knowledge that answers the research questions of the study. Qualitative research designs are flexible and have a non-linear and non-sequential operationalisation (Kumar, 2011: 104). In contrast, quantitative research designs are well structured, precise and tested for validity and reliability whereas qualitative research designs lack or put less of a premium on being specific, precise and having structural depth (Kumar, 2011: 103). Implicit in this is that quantitative research designs focus on generalisability whilst qualitative research designs do not.

The study deals with research questions, on the role of water regulation in coal mining water struggles, that have not been researched in-depth in South Africa. Further, this study focuses on a small number of coal mines in a particular area - the small town Delmas. Consequently, the study's research questions are exploratory, descriptive and explanatory in nature. Qualitative research is more suited to exploring smaller cases of social phenomena in "depth" rather than in "breadth" and thus seeks as much detail as possible (Blaxter, Hughes and Tight, 2010: 65). Quantitative research on the other hand uses "large-scale and representative data" to gather "facts" (*Ibid*.). This once more speaks to the importance of generalisability for quantitative research designs as opposed to qualitative research designs.

A further influence on the choice of research design, is that this study deals with a research area that is not well researched, this study's research questions seek to explore, describe and explain a research problem that is not well understood in South Africa. Also the research questions require answers stemming from a small number of coal mines in the small town of Delmas. Hence, flexibility is important for this study's research process, hence this study's use of a qualitative research design. The exploratory dimension of the research questions and objectives relates to attaining new knowledge on the nature of, and mechanisms of the influence of water regulation on, coal mining water struggles as a relatively unknown social issue (Wisker, 2001: 119). Exploratory research require a flexible and detailed approach of

inquiry typical of a qualitative research design that focuses on a smaller instances of the research issue (Blaxter, Hughes and Tight, 2010: 65).

The descriptive element comes from the study's focus on the description of the nature of, and mechanisms of the influence of water regulation on, coal mining water struggles as a social issue. This element of the research provides knowledge to answer the research question on what is the nature of coal mining water struggles and what is the role of water regulation in the nature of coal mining water struggles (Nieuwenhuis, 2013: 54). The explanatory dimension of the study comes from the explanation of the "how" (the mechanisms of the influence of water regulation on coal mining water struggles) of the research problem (Leedy and Ormrod, 2013: 96). In relation to the study's research question the explanatory dimension relates to how and why water regulation influences the nature of coal mining water struggles. Both the descriptive and explanatory elements of the study are suitable for a qualitative research design (Leedy and Ormrod, 2013: 96).

The study's research questions illustrate a focus - the influence of water regulation on coal mining water struggles - on a complex, social and contextual research problem. This research problem means this study requires, and depends on, an interpretative paradigm of knowledge that put less of a premium on objectivity in knowledge. The epistemological perspective predominant in quantitative research designs, is that knowledge should be objective to convey the truth of what is studied (Leedy and Ormrod, 2013: 139). With qualitative research the idea of a singular, objective truth behind knowledge is disputed especially for the study of human relations and events open to interpretation (*Ibid*.). A dimension that makes objective knowledge as truth difficult for a study such as this was the dependance of this study on word based data. Word based data is value-laden and contextual, the meaning behind words as data is the focus of this form of data analysis (Nieuwenhuis, 2016: 53). The rationale for using a qualitative research design was that the study relied on word based data in line with qualitative research (*Ibid*.).

Nieuwenhuis (2016: 50) expounds further on the illusiveness of objectivity in qualitative research as research deals with the real, human world and thus has to find meaning in words as symbols that are intrinsically subjective. The subjectivity of symbols was due to them being complex cultural and social products that also have to be interpreted through cultural and social lenses whilst referring to complex realities in the human world (Nieuwenhuis, 2016: 50). Finally, the study partly sought to interrogate the suitability of water grabbing as a theory for the interpretation of coal mining water struggles in Delmas. A qualitative research design

is selected due to the suitability of this research design for providing knowledge to expand on water grabbing as a theory for understanding water struggles (Nieuwenhuis, 2016: 55).

5.4 Case Study Research Design

Each of the qualitative research design option is suited to particular research purposes and thus carries their own benefits and drawbacks. This research study utilises the case study qualitative research design for a number of reasons that mean this research design suits the study's research questions. The case study is a research design that focuses on a particular case of a situation, event, programme, etc (Creswell, 2009: 13). A case study research design focuses on gaining in-depth information about a particular social issue, event, situation, etc (Leedy and Ormrod, 2013: 100). A case study research design gathers information about a particular social issue variably bounded - by time and place, time and activity and definition and context - in "its real-world context" (Nieuwenhuis, 2016: 81). Thus a case study also seeks to understand the particular issue being studied relative to its social context (*Ibid*.).

This study utilises the case study research design because it does not focus on dealing with, and therefore generalising on, a large number of the research problem. The case study design seeks, as is the case with this study, in-depth knowledge about the research problem in a limited quantity. A further reason for the use of a case study approach in this study is its usefulness in the study of research questions that are not well known (Leedy and Ormrod, 2013: 141). This spoke to the in-depth nature of this research design that enabled the building of knowledge on a particular social issue. This study opts for a case study research design as it facilitates the study of complex research problems (Goddard and Melville, 2001: 9). This study design is suitable given the complexity of the research questions focused on the influence of water regulation on the water problem behind extractives based water struggles. Moreover, the case study research design suits small research studies (Blaxter, Hughes and Tight, 2010: 72). The suitability of the case study research design in addressing complex research problems is as it develops in-depth information and also focuses on one or a small number of cases of the research problem.

The case study strategy of inquiry is suitable for the use of words as data, the collection of such data and its analysis and consequently is aligned to this study. As Kumar outlines (2011: 123) – a case study research design best suits flexible and open-ended data collection and analysis approaches (which fit with a qualitative research design). A further reason for the

selection of a case study research design is that it complements the descriptive, exploratory and explanatory nature of the research questions of the study (Nieuwenhuis, 2016: 82). This form of a research design is also pertinent to sourcing data in response to the "how" elements of this study's research questions (*Ibid*.). Another reason for the selection of a case study research design stems from its usefulness in probing for the relevance, and the development, of theory to understand a particular social problem (Goddard and Melville, 2001: 9). This element of the research design was relevant for the study's implicit focus on probing the usefulness of water grabbing as a theory for understanding coal mining water struggles.

The shortcomings of other research designs made them unsuitable or impractical for this study. Ethnography is one such option wherein the researcher lived amongst and participated in the activities of the population that is studied, and over an extended period of time, collects data through observation and interviews (Creswell, 2009: 13). A shortcoming of this research design, for this study, is the unavailability of the target populations for such a protracted and participatory research process. Participatory research advocates for close engagement by the researcher with research participants, including community participation, to facilitate acceptance of research findings and their relevance to participants and community members (Kumar, 2011: 128). Given presumed availability constraints, the target populations is likely not interested in ongoing, in-depth and time consuming participation in the study. Narrative research design focuses on drawing information about the lives of one or more individuals, ordering that information chronologically and juxtaposing it against the researcher's own narrative to form a collaborative narrative (Creswell, 2009: 13). However, this study's research questions do not focus on the lives of the targeted populations, hence this design is not suitable for this study. Action research aims to study a problem but also seeks to spur some action to address the problem requiring active participation of research participants (Kumar, 2011: 126-128). Action research is unsuitable as this study is not designed to solve the research problem behind the research questions.

A drawback of the case study research design is on its limited generalisability to other social problems similar to the one it investigates in a case study's research question (Blaxter, Hughes and Tight, 2010: 72). The focus of a case study research design, and this study, is not on the generalisability of the research findings but rather on providing in-depth data on the specific case study. However, some measures exist to strengthen the generalisability of case study research designs. These measures include the use of critical cases in a case study but also the development, and use, of theory as a basis for generalisability (*Ibid*.). Hence, this study has

opted to utilise water grabbing as a theory on understanding coal mining water struggles but also to facilitate the generalisability of the study.

Further, qualitative research designs - and by implication case study research design - are questioned on their scientific credibility. This criticism is particularly in relation to the validity and reliability of qualitative research designs such as the case study research design. Validity relates to whether a study's research methodology and techniques produce knowledge that answers the research question (Blaxter, Hughes and Tight, 2010: 245). Reliability on the other hand speaks to whether the research study's conclusions were attainable if they were to be carried out by another researcher (Goddard, 2001: 41). Validity and reliability are relevant in the research methodology of the study. Hence, the measures the study undertook to ensure validity and reliability will be outlined in the following section on research methodology.

5.4.1 Coal Mines as the Case Study

This study uses coal mines as the case study level of this research study. The study decided on the use of three coal mines as case study mines. The use of one coal mine makes the study vulnerable to challenges of access to coal mine officials. Further, even with access to coal mine officials; officials are likely to be reticent in supplying information pertaining to the pollution of water due to the water use of the coal mine. The use of three coal mines instead of one counters and limits the challenges, and effects, of access to coal mines, and thus limited access to coal mine officials. The study instead utilises three coal mines to offset anticipated difficulties in access.

The selection of case study coal mines is on the basis of a number of criteria. The criteria for the selection of case study mines is aligned to the study's research questions. The case study coal mines are within the Delmas area. This is so case study mines could shed light on the role of the water regulation of the water rights, and thus water use, of coal mines in the nature of, and mechanisms of the influence of water regulation, on coal mining water struggles in Delmas. The study also selects case study coal mines that are operational through the duration of this study, particularly during the collection of data for this study. This enables the study of the current mechanisms of the influence of water regulation of coal mines on the nature of coal mining water struggles in Delmas. This is particularly relevant for Delmas as a relatively new mining area.

Case study mines are also selected based on the commencement of their operations after the introduction of the NWA and MPRDA water regulatory regime for the water use of coal mines. This criterion specifically enables the study to assess the mechanisms of the influence of contemporary water regulation of the water use of coal mines on the nature of coal mining water struggles. Coal mines are also selected on the basis of their proximity to agricultural water users. This criterion is so the study included coal mines with a high possibility of water struggles between the coal mining and agricultural water users. Coal mines are also selected on the basis of proximity to water bodies. The location of coal mines in proximity to water bodies means a high possibility of water pollution enabling the study to ascertain the regulatory context of such water pollution. This enables the study to assess the contribution of the water regulation of the water use of coal mines to the nature of coal mining water struggles.

5.4.2 Case Study Mines

The following was a brief background of the three case study mines selected for this study. The background covers ownership profile, coal mine reserves, how long the mines have been operating and estimated continued production and the markets the mines supplied.

5.4.2.1 Kangala Coal Mine

Universal Coal, an Australian mining company, owns 70.5% of Kangala Coal Mine whilst a Black Economic Empowerment (BEE) entity, Mountain Rush, owns the remaining 29.5% (Universal Coal, 2018: 2). Universal is a mid-level coal mining company with a portfolio of seven coal mines that is made up of three operational thermal coal mines, three ongoing thermal coal mining projects and one coking coal operation (Universal Coal, 2018: 2-3).

Kangala Coal Mine is one of three operational coal mines of Universal Coal on the Witbank Coalfield. Kangala Coal Mine is an opencast mine situated in Delmas, about 65 kms east of Johannesburg, comprising three areas - Wolvenfontein, Middlebult and Modderfontein (https://www.mining-technology.com/projects/kangala-coal-mine/). The initial open pit mine had an estimated eight-and-a-half life of mine (LOM) with the possibility to extend the LOM to 20 years with further investment and extension. Construction on the mine started in July 2013 and was completed in the first quarter of 2015 (https://www.mining-technology.com/projects/kangala-coal-mine/). Kangala

Coal Mine has proven coal reserves of 22.3 Mt with a 1 year LOM that can be extended by another 20 years with the inclusion of the Eloff Project and Middelbult extension (https://www.universalcoal.com/our-operations-and-projects/thermal-coal/kangala-colliery-thermal-coal). Coal is processed at the mine site and the mine is for both domestic supply (ESKOM) and export. The mine supplied coal to ESKOM on the basis of a coal supply agreement agreed in March 2013 for the supply of 2Mt of thermal coal to ESKOM with the first supply delivered to Eskom in April 2014 with export coal first supplied in September 2014 (http://www.mining-technology.com/projects/kangala-coal-mine/).

5.4.2.2 Brakfontein Coal Mine

The Brakfontein and Brakfontein extension mines are adjacent open pit coal mines owned by Tegeta Exploration and Resources. The extension of Brakfontein Coal Mine in 2015 took coal production to 200000 tpm. (https://www.miningreview.com/top-stories/oakbays-tegeta-resources-expands-production-at-brakfontein-colliery/). Brakfontein, and its extension (referred to simply as Brakfontein henceforth), is situated approximately 19 kms south east of Delmas and owned by Tegeta Exploration and Resources (Kasl, 2013: 14-15). Tegeta Exploration and Resources issued 930 shares: 450 shares is owned by South African corporations, Arrowhead Trading a women owned BEE company owned 280 shares and 200 shares as owned offshore (National Treasury Report, 2018: 456-457).

Controlling stakes in Tegeta Exploration and Resources are held by Oakbay Investments (Pty) Ltd and Mabengela (Pty) Ltd (Competition Tribunal, 2016: 2). In trun, Oakbay Investments is controlled by Mr. Atul Gupta and Mrs. Chetali Gupta and Mabengela is owned by Mr. Duduzane Zuma (*Ibid*.). The mine's scoping report was conducted in 2013. The mine started mining coal by at least July 2014 (National Treasury Report, 2018: 456-457). Thus the coal mine started operating between 2013 and 2014.

In 2015, the existing Brakfontein mine had a five to seven year LOM remaining whilst the extension mine had a 12 to 14 years LOM. The extension mine has 15 Mt of proven coal reserves. The Brakfontein mine supplies coal to Eskom's Majuba power plant. The processing capacity of the mine is being expanded with R10 million investment into a crushing and screening plant to ensure quality coal was delivered to Eskom (http://www.miningweekly.com/article/junior-miners-expansion-plans-on-track-2015-07-31).



Figure 5.3
Open pit mining at the Brakfontein Coal Mine in Delmas, Mpumalanga

5.4.2.3 Vanggatfontein Colliery

Vanggatfontein Colliery is owned 100% by Keaton Energy Holdings Ltd, a junior coal mining company formed in 2016, listed on the Johannesburg Stock Exchange (JSE) since 2008 and headquartered in Johannesburg (Keaton Energy, 2016: 10-12). In 2017 Keaton Energy Holdings Ltd and its mining assets, including Vanggatfontein Colliery, was acquired by Wescoal for approximately R525.9 million (https://www.engineeringnews.co.za/print-version/wescoal-pursues-keaton-in-r525m-acquisition-2017-02-03).

Vanggatfontein Colliery is an opencast mine situated in Delmas, and therefore the Witbank Coalfield, that began operating in 2010 with proven coal reserves of 25.9 Mt, supplying coal to ESKOM for the first time in 2011 (Keaton Energy, 2016). Keaton Energy and ESKOM had a ten year coal supply agreement (CSA) that concluded in April 2022, under which Vanggatfontein had been supplying ESKOM with thermal coal (https://www.miningweekly.com/article/wescoal-puts-vanggatfontein-on-care-and-maintenance-as-it-struggles-to-secure-eskom-csa-extension-2022-02-25/rep_id:3650). There are ongoing discussions with ESKOM to extend the CSA and fully dedicate the mine's coal supply, at 11 Mt, to ESKOM (https://

www.miningweekly.com/article/wescoal-puts-vanggatfontein-on-care-and-maintenance-as-it-struggles-to-secure-eskom-csa-extension-2022-02-25/rep_id:3650).

Vanggatfontein Colliery had a six year LOM as of 2022 (https://miningdataonline.com/property/1863/Vanggatfontein-Mine.aspx). Furthermore, Vanggatfontein Colliery, has a mining right valid up to 22 February 2030 (Keaton Energy, 2016: 38). However, due to the ongoing issue around the renewal of the CSA with ESKOM, Vanggatfontein has been placed under care and maintenance in order for those discussions to bear fruit (https://www.engineeringnews.co.za/print-version/wescoal-puts-vanggatfontein-on-care-and-maintenance-as-it-struggles-to-secure-eskom-csa-extension-2022-02-25)



Figure 5.4
Opencast mining at Vanggatfontein Colliery

5.5 Research Methods

The case study research design influences the research methods selected as this study's blueprint. The following section delves deeper into research methods and explains the reasons behind the choices of research methods for this study.

5.5.1 Population and Sampling

This study utilises purposive sampling, a non-probability sampling strategy. Part of the reason for purposive sampling, as a non-probability sampling approach, related to the kind of knowledge the study seeks to understand, and thus produce, relative to the influence of water regulation on coal mining water struggles as the research problem. For instance, this study seeks in-depth knowledge of the influence of water regulation of specific coal mines, operating in Delmas, on coal mining water struggles. Hence, this study is not focused on reflecting the influence of coal mining water struggles in general (e.g. in South Africa) nor on a numerical reflection of knowledge of coal mining water struggles. This study also did not aim to find out, and make generalisations, about the population but rather sought to attain the knowledge of the population to inform it about a situation, event, etc.

Qualitative research designs, such as this study's case study research design, utilise sampling approaches to enable a study to gain intensive knowledge about a situation/event/ phenomenon (Kumar, 2011: 176). Whereas in quantitative sampling the sample size is predetermined, in qualitative sampling there is no sample size instead data is collected until it met the information needs of the study (*Ibid*.). Kothari (2004: 59) clarifies this distinction stating qualitative research sampling methods are non-probability based, putting less of a premium on each item in the population having the likelihood of selection. Rather than being used to ensure representativity of the population as in quantitative sampling, non-probability forms of sampling have other functions. These functions include access to participants, identifying participants knowledgeable about the subject of the research, and how typical or different a case is of or from a category of individuals (Kumar, 2011: 176).

Accordingly, this study's sampling strategy foregoes techniques associated with quantitative sampling including sampling size (number of the population in the sample from which information is sourced), sampling frame (a list of all of the population that are to be sampled), sample statistics (findings based on information attained from the sample) and population parameters (estimates arrived at through on sample statistics) (Kumar, 2011: 177-178). The above role of the population in relation to knowledge and knowledge production in this study, meant non-probability sampling strategies are the most relevant. There are a number of non-probability sampling strategies that can be considered for this study such as quota sampling, accidental sampling and snowball sampling (Walliman, 2011: 96). To these non-probability sampling strategies Kumar (2011: 188) includes purposive sampling and expert sampling.

The selection and thus relevance of purposive sampling is to access the most relevant respondents that would provide the "most relevant and plentiful data" in answering the study's research questions (Yin, 2011: 88). Therefore non-probability sampling methods involve deliberate choices in selection of cases by the researcher (Kothari, 2004: 59). The decisions of the researcher in their deliberate choices of sample items is guided by the need to attain sample items to provide the most relevant and abundant data for the purpose of the research study (Yin, 2011: 88). The researcher thus selected research participants as interviewees for their knowledge, experience and/or involvement in/of the water regulation of the water rights of coal mines, coal mine water use, agricultural water use and coal mining water struggles. The researcher selected the below participants as interviewees and focus group members, through purposive sampling, to access their relevant and specialised expertise to provide data to answer the study's research questions.

Consequently, the study did not simply target for incorporation in the study, just anyone in the area of Delmas. Instead, the study targeted, as research participants, people with particular knowledge and experience with regards elements of the research problem of this study. Therefore this study utilised key informants. Key informants are individuals with specialised knowledge and/or experience of the social issue under study, and moreover, are willing to participate in the study (Mnwana, 2011: 85). This meant purposive sampling was utilised specifically to access key informants with special knowledge relevant for this research study.

Table 5.1 Interviewees selected through purposive sampling

	Interview	**Gender**	**Interview Location**	**Relevance**
1	Agricultural trade unionist	M	Delmas	Coal mining water use and struggles over water in Mpumalanga Province and Delmas
2	DWS regulatory official	M	Pretoria	Water regulation
3	Coal mine official	M	Johannesburg	Practice of water regulation of coal mining and coal mining water struggles in Delmas
4	Coal mining entrepreneur	M	Witbank	Practice of water regulation of coal mining in Delmas
5	Coal mine official	F	Pretoria	Practice of water regulation of coal mining and coal mining water struggles in Delmas
6	Farmer	M	Delmas	Practice of water regulation of coal mining and coal mining water struggles in Delmas
7	Farmer	M	Delmas	Practice of water regulation of coal mining and coal mining water struggles in Delmas

	Interview	Gender	Interview Location	Relevance
8	Coal mine official	M	Delmas	Practice of water regulation of coal mining and coal mining water struggles in Delmas
9	Farmer	M	Delmas	Water bodies, practice of water regulation of coal mining and coal mining water struggles in Delmas
10	Agricultural trade unionist	M	Ermelo	Coal mining water use and struggles over water in Mpumalanga Province
11	Trade unionist	M	Witbank	Coal mining water use, regulation and struggles over water in Mpumalanga Province
12	Coal mine official	M	Ogies	Practice of mining and water regulation of coal mining and coal mining water struggles in Delmas
13	Civil society	M	Johannesburg	Water regulation and politics of energy reform
14	DWS regulatory official	M	Pretoria	Water regulation
15	Former coal mine employee	M	Delmas	Practice of mining and water regulation of coal mining and coal mining water struggles in Delmas
16	Coal mine official	M	Delmas	Practice of mining and water regulation of coal mining and coal mining water struggles in Delmas
17	Small scale armer	M	Delmas	Water bodies, agricultural water use and regulation
18	Small scale farmer	M	Delmas	Water bodies, agricultural water use and regulation
19	VKLM officials	Two Males	Delmas	Practice of water regulation of coal mining and coal mining water struggles in Delmas and intergovernmental dynamics of mining
20	Farmers	M & F	Delmas	Water bodies, practice of water regulation of coal mining and coal mining water struggles in Delmas
21	Environmental consultant	M	Via Skype	Practice of mining and water regulation of coal mining and coal mining water struggles in Delmas
22	Environmental consultant	M	Via Skype	Practice of mining and water regulation of coal mining and coal mining water struggles in Delmas
23	DMR regulatory official	M	Pretoria	Mining and water regulation of coal mining and coal mining water struggles in Mpumalanga

Table 5.2 Focus group participants through purposive sampling

	Focus group	Gender	Number of participants	Designation of participants	Interview Location	Relevance
1	Delmas farmers	4 males and 1 female	5	Local large scale farmers	Delmas	Water bodies, practice of water regulation of coal mining and coal mining water struggles in Delmas
2	Botleng local black farmers	4 males	4	Local small scale farmers	Delmas	Water bodies, practice of water regulation of coal mining and coal mining water struggles in Delmas
3	Local civil society	4 males	4	Local civil society representatives	Delmas	Water bodies, practice of water regulation of coal mining and coal mining water struggles in Delmas
4	Water regulatory officials	4 males and 2 females	6	Water regulatory officials	Pretoria	Water bodies, practice of water regulation of coal mining and coal mining water struggles in Delmas

5.5.2 Unstructured Interviews

There are various forms of interviews that the study could utilise. Interviews can be structured, semi-structured and unstructured. Structured interviews have standardised and sometimes closed questions; unstructured interviews are flexible in the format of questions, allowed the interviewee to speak freely, and had open questions; and semi-structured interviews were a mix of structured and unstructured interviews (Walliman, 2011: 99). Structured interviews put a premium on the comparability of interview data, the unstructured interview is free flowing in terms of its questions and is useful for depth, and semi-structured interviews focus on themes instead of questions and also had a level of flexibility (MacDonald and Headlam, 2015: 40). Interviews on the one hand are useful for quantitative studies (specifically structured interviews) but interviews are also largely useful for qualitative research (particularly unstructured interviews) (Walliman, 2011: 99).

Considering the range of qualitative data collection methods in general, and interview methods in particular; this study decided on unstructured interviews for data collection. Unstructured interviews are suited to a qualitative research study as this one. The social social interaction, "a social relationship of sorts", between the interviewer and interviewee in unstructured interviews is flexible and mutually interactive so the interaction is in a "conversational mode" (Yin, 2011: 134-135). The unstructured interview method facilitated an in-depth exploration of a research problem (MacDonald and Headlam, 2015: 40). Hence, the selection of unstructured interviews for this study is based on its flexibility in the data collection process. This flexibility facilitates the probing and drawing out of information on, and thus exploration of, the research problem. Furthermore, unstructured interviews are selected to attain as much information as possible about the selected cases and the research questions.

Unstructured interviews enabled a researcher to interactively explore, with and through the interviewee, complex research problems that the interviewer was not deeply knowledgable on (Babbie, 2011: 340). Consequently, unstructured interviews are useful for when the researcher in the role of interviewer was not deeply knowledgeable, as is the case in this research study, about the dynamics of the research question. Thus unstructured interviews are selected for this study to enable the researcher to explore the research problem, interactively through and in collaboration with, the interviewees.

However, unstructured interviews required the interviewer to direct searching questions in order to gain responses to provide insight or be relevant to the research problem (Babbie, 2011: 340). Hence, the interviewer required skill, and a level of understanding of the research problem, to manoeuvre the interview around sensitive issues, manage interpersonal engagement and to draw the relevant information (Kothari, 2004: 98). Given that the study utilised key informants, the probing and conversational approach of an unstructured interview could frustrate an interviewee with specialised knowledge. For instance, one key informant, an environmental consultant, was impatient during the interview due to the lack of in-depth knowledge of the researcher in specialised environmental knowledge.

This frustrated the interviewee leading to a premature end of the interview. Another contextual issue in this regard was that the environmental consultant might have lacked the time required for an unstructured interview. The interpersonal dimension of unstructured interviews, that is key to the flexibility of this data collection approach, is undermined when

the interviews are not face to face. Even though this is in relation to one case wherein the interview is not face to face, the conducting of the interview in this manner likely fed into the impatience of the interviewee leading to a premature end of the interview.

Another reason for the selection of unstructured interviews is that the researcher could navigate and thus manoeuvre sensitive aspects of the study. The unstructured interview method allowed for data collection in a conversational mould providing flexibility to put people at ease to provide the study with data. This is important for this study given the study relates to, and utilises, economic water users as key informants; meaning interviewees have economic interests vested in the issues behind the research problem. Thus some potential key informants expressly chose not to participate in the study despite the anonymity the researcher assured.

The reluctance of some potential key informants to participate in the study was because the study touches on the water use of coal mines, a controversial issue in itself due to its link to water pollution. An example of this is a coal mine official that flatly refused to participate in the study. To overcome this challenge, the researcher had to also consider and utilise former employees of coal mines. The study is also conducted at the height of public controversy over state capture. An element of state capture relates to elite accumulation through politically connected coal mining companies that pollute water. Consequently, some key informants feared backlash from politically connected businesspeople behind coal mining companies. This meant anonymity for key informants is crucial to ensure participation in the study.

At the centre of these controversies is one of the case study mines - Brakfontein Coal Mine - selected for this study. Thus the research problem touches on a politically sensitive issue therefore unstructured interviews were utilised so that interviewees could be put at ease, as well as gently cajoled, to draw out information from key informants.

This study also opted for unstructured interviews as a data collection approach that depended on word based data. Accordingly, the study settled for unstructured interviews as a data collection approach suitable for the collection of word based data from people knowledgeable about the research questions. The drawback of unstructured interviews was the risk of a great deal of irrelevant data (Wisker, 2001: 168). This is due to unstructured interviews not employing closed questions (*Ibid*.). This risk came not only out of the unstructured nature of such interviews but also in the researcher selecting this interview approach to put the interviewees at ease in order to share relevant data with the interviewer.

The impetus is on the interviewer to steer the discussion in directions that are relevant for the study rather than allowing the interviewee to wander in their responses.

MacDonald and Headlam (2015: 42) noted one of the benefits of unstructured interviews was that interviewees can be generous with their time. However, the opposite can also be the case given that unstructured interviews were time consuming. This meant the interviewees needed to be cognisant of management of time for the interviews. Moreover, the prominent role of the interviewer in unstructured interviews, meant the interviewer could influence the interviewee's response through the wording of the questions (Babbie, 2011: 341). Thus the interviewer had to maintain neutral language in the interview.

5.5.3 Focus Groups

In conjunction with unstructured interviews, this study also utilises focus groups. Furthermore, this study also uses unstructured focus groups instead of structured or semi-structured focus groups (Babbie, 2011: 343). Thus this study also incorporates focus groups as a form of interview that involves more than one subject (Leedy and Ormrod, 2013: 154). This meant this study conducted group interviews with a number of interviewees viewed as knowledgeable on a particular subject or experience relevant to the research study (Walliman, 2011: 99).

There are a number of motivations behind this decision. Amongst these is focus groups complemented unstructured interviews as data collection methods aligned to qualitative research studies (Babbie, 2011: 343). Focus groups also facilitate the collection of in-depth data just as unstructured interviews did (Walliman, 2011: 100). One key reason for the use of focus groups related to resolving scheduling challenges by interviewing a number of interviewees at once (MacDonald and Headlam, 2015: 42). This is particularly relevant for this study given the population targeted for this study involved categories of people, e.g. farmers and coal mine officials, that are busy businesspeople and thus difficult to commit to interviews.

Yin (2011: 141) outlines the very nature of a focus group as being the commonality of experience and perspectives. In the context of this study, this commonality also meant prospective focus group interviewees may know each other quite well and thus can assist in scheduling focus groups with interviewees that are difficult to arrange (for instance in the

case of reluctant interviewees). Thus focus groups offer peer engagement, for instance amongst the farmers, to secure focus group participants that the researcher struggled to commit for interviews. This is also in light of the reluctance of some potential interviewees to participate in the study given the prevailing political climate of fear due to state capture. Indeed, the researcher found the focus group approach useful particularly in relation to Brakfontein Coal Mine whose ownership are viewed as protagonists in state capture.

The focus group approach is useful as a data collection method that is not focused on extrapolation to a broader population (Babbie, 2011: 343). This meant focus groups fell outside probability sampling and instead utilise non-probability sampling to select participants knowledgeable or whose views are relevant for a particular topic (*Ibid*.). In other words, focus groups are compatible with the sampling method, and thus the drawing out of knowledge from a set of people knowledgeable on this study's research problem.

Conversely, dependence on a relatively small group of deeply knowledgeable people means access to those people is crucial for this study. Therefore, the focus group is key in accessing some important research participants that the researcher, as an outsider, might not be able to access without the intervention of focus group participants. Furthermore, focus groups facilitated (direct and indirect) discussions amongst participants on a topic thereby leading to in-depth data (MacDonald and Headlam, 2015: 43). This meant focus groups enable access to reliable information on a research problem.

Focus groups are also known to have their own shortcomings. For instance, dynamics with groups that participate in focus groups can be limiting to the participation of some participants (Blaxter, Hughes and Tight, 2010: 194). This requires a level of moderation skills from the researcher to manage group dynamics to enable balanced discussion and participation (MacDonald and Headlam, 2015: 45). Cultural dynamics amongst the focus group participants (predominantly male Afrikaner farmers) mean the discussion is sometimes dominated by older men. This requires some pointed questions for other participants to ensure they participated in the discussion. Moreover, the focus group provides a level of interpersonal trust that facilitated follow up interviews wherein the researcher targeted those participants (for instance there was a female farmer) that might not have been able to voice their opinions as much. However, in the role of moderator, the researcher could become too involved and impart their own views on the topic thereby influencing group discussion (Babbie, 2011: 343). This required the moderator to be mindful that the main aim of the role was to facilitate and elicit interviewee and group discussion.

5.5.4 Record Keeping

The interviews and focus groups are recorded through a digital recorder. The recordings are downloaded and stored onto a computer. The recorded interviews assist the transcription of the interviews that in turn facilitate data analysis (Walliman, 2011: 100). The use of the recorder is unsettling for some interviewees and participants in focus groups. This is to be generally expected with regards the use of a recorder. This is particularly relevant in the political context, and timing, of the study; some research participants were understandably nervous being recorded despite the best efforts of the researcher to strike a rapport with the interviewees to put them at ease.

Consequently not all of the interviews were audio recorded. The prevailing fear around coal mining and the connection of some individuals therein to state capture meant the researcher had to concede to depend on note taking for some interviews and focus groups. In these cases the researcher took care to take notes during the interviews and focus groups whilst also building on the notes immediately after the interviews and focus groups. The researcher took this approach so as to not be dependent on the memory of discussions but instead to have extensive notes to reference (Babbie, 2011: 345). The interview notes were also transcribed to assist with data analysis. Depending on written notes made the interview process time consuming but this is a cost that had to be accepted in order to make interviewees comfortable.

5.5.5 Observation

With regards primary data collection, Kothari (2004: 96) outlines that a research study can select observation (where appropriate for the research purpose and research design), which is a systematic and planned collection of information through direct observation that includes checks on reliability and validity. Observation methods can be categorised as participant observation and non-participant observation; the former involving participation by the researcher in the observed group's activities (either with the group's knowledge or lack thereof) and the latter with the researcher not participating but only engaging in observation (Kumar, 2011: 134).

Non-participant observation is also a useful tool for this research study. Observation in this study is not as a main approach for data collection as would be the case in an ethnographic research study. Hence, this study utilises non-participant observation in support of unstructured interviews and focus groups. Observation allows for the contextualisation of the study (Blaxter, Hughes and Tight, 2010: 198). This contextualisation meant the researcher could see and experience the context of the interview data and what it means for the trustworthiness of the data.

A practical outcome of this observation is photography. Herein, the researcher supported interview data with photographs as visual representations of such data. Thus beyond simple contextualisation, observation is also helpful in presenting visual representation of interview data to assist the reader to understand this thesis.

5.5.6 Trustworthiness of Interview Data

An important consideration in this study is the trustworthiness of data to ensure the study is credible. A first step in ensuring the trustworthiness of data is to be transparent in the research methods the study used to obtain and utilise data in addressing the research focus (Yin, 2011: 20). The setting of the research methods also provides for measures to identify, limit and counter, through the methodical execution of the research methods, factors that could possibly introduce bias and thus undermine the study's data (*Ibid*.).

The emphasis in this study, as a qualitative research study, is not so much on the reliability of data collection procedures and thus data. Reliability is predicated on "standardised, neutral and non-biased" research methods, that consistently produced the same measurement outcomes in terms of data (Mason, 2002: 187). Consequently, reliability is most relevant for quantitative research studies that placed a premium on standardisation of data measurement instruments and methods as opposed to qualitative research studies that valued flexibility in data collection (*Ibid*.).

Consequently, reliability is not important in this research study. That notwithstanding, it is still important to ensure that the study has credibility and trustworthiness in its strategy of inquiry and thus the conclusions that emanated from the data used in the study. In dealing with trustworthiness of data this study focused on validity of the data. A focus on validity

enables the study to maintain research methodological flexibility whilst also ensuring the data produced is relevant to the study's research questions (Mason, 2002: 187).

A step taken to ensure trustworthiness of data in terms of validity in this study is that the study is not dependent on only one data collection methodology. Hence, the study utilises interviews, focus groups and observation. The different forms of data collection methods ensure the respective weaknesses of the methods could be shored up by the other methods used in the study. Furthermore, WULs were the blueprints of water regulation of coal mines, including the case study coal mines. Thus the trustworthiness is ensured through the comparative use of the study's data against WULs. The study also uses peer validation. Peer validation is used not only with regards the interview data collection process but also in the analysis of the data and the use thereof on drawing and interpreting findings.

5.5.7 Data Analysis

Following on the collection of data a key activity is the analysis of the data that has been gathered. There are a variety of approaches to the analysis of data that are influenced by considerations such as the research design, the type of data used in the study and data collection methods. Considering this is a qualitative research, the study depends on word based data. Qualitative data is mostly based on words that represented "descriptions, accounts, opinions, feelings, etc" (Walliman, 2011: 130). Unlike quantitative data and its analysis; the analysis of qualitative data usually (though researchers can sometimes choose to configure qualitative data into numerical data for quantitative analysis) does not focus on the quantitative transformation of data to numbers for purposes of analysis (Babbie, 2011: 418). Qualitative analysis generally focused on isolating explanatory patterns - in terms of frequencies, magnitudes, structures, processes, causes and consequences - in data pertaining to a research question (Babbie, 2011: 420).

Consequently, in this study uses coding as an analytical tool to categorise ideas on the basis of which the data can be ordered. Thus coding makes the data smaller and more manageable by categorising it. Further, this categorisation of data on the basis of different ideas enables analysis through comparison (and where necessary; also other techniques such as exploration, measurement, etc) (Walliman, 2011: 113-114). Coding is an important technique in the transformation of complex and varied non-numerical data to more limited characteristics (Babbie, 2011: 449). Coding based data analysis orders data into classifications

to make sense of data through analytical data subsets that enabled the identification of differences and patterns in those subsets of data (Walliman, 2011: 133).

The case study research design, and data instruments, of this study mean the study depends on case specific and in-depth word based data collected through interviews and focus groups. Consequently, this study requires a data analysis approach, such as coding, suited to dealing with dense, word based data. A key reason for the use of coding is because this was a data analysis tool aligned to qualitative data analysis, that is not centred on the measurement of numerical data. Considering this study utilises unstructured interviews and focus groups as data collection techniques that utilise word based data, this study used coding for its relevance to analysing word based data.

According to Walliman (2011: 133) there are two types of coding: text sequence coding refers to the cutting out and pasting of answers into different categories and the ordering of interpretative ideas rather than bits of text. The latter fit in with Welman *et al's* (2005: 215) view that coding can be developed through a conceptual framework (to facilitate interpretation), on the one hand, and the use of different categories to divide field notes, on the other. Welman *et al* (2005: 213) also states that coding can deal with the conditional relationships between situations, groups, events, etc (focusing on words/phrases like "because" and "due to").

Qualitative analysis using codes relies on a step based process that includes the ordering of data through the compiling, disassembling and reassesmbling of data (Yin, 2011: 176). Before commencing data analysis through coding, the researcher has to re-familiarise themselves with the data. This assists the researcher to understand the data more clearly to be able to identify links and patterns in the data. Another step relates to the development of themes as a useful means for ordering data. Themes were broad constructs identified before, during and after data collection (and that were continuously redeveloped in a non-sequential manner in the research process) (Welman *et al*, 2005: 211). Consequently, themes facilitated the broad ordering of data, through coding.

A further step related to the compiling of data to methodically order data into a database (Yin, 2011: 176). Following that is the disassembling of data in the database using codes as concepts and/or phrases that acted as labels, and thirdly; reassembling refers to the identification of emerging patterns (*Ibid*.).

5.6 Ethical Considerations

This research study is conducted according to ethical considerations for research studies. There are a number of these ethical considerations that are incorporated in, and complied with, in this study. For instance, in line with standard research approaches to ethics; research participants voluntarily participated in the study, participants are provided informed consent and the anonymity of participants is assured. The researcher informs interviewees about the research study's questions and objectives. Hence, participants voluntarily participate in the study on an informed basis.

Further, the study ensures that interviewees provide consent for their participation in this research study as interviewees and focus group participants. By ensuring the consent of interviewees, this study ensures interviewees participate voluntarily in the study. Thus interviewees and focus group participants are not incentivised, coerced nor misled to ensure their participation in the study.

The study, as explained elsewhere, is conducted in the shadow of state capture. This relates to the national political context of the time of the study and the presence of players linked to the controversy through ownership of a case study coal mine in Delmas. The consequence of the tense political context and the footprint of some alleged role-players in state capture in Delmas, a few potential key informants refused to participate in the study. The researcher did not attempt any underhanded methods to force, coerce or mislead them to participate and consequently one or two key informants that would have been extremely helpful to the study did not participate.

As part of the measures of ensuring study participants are comfortable, given the strained political environment, the researcher is very flexible in the interview and focus group venues that are used. This is to ensure that study participants are also not anxious about their safety. Another ethical consideration in this study dealt with the anonymity of interviewees. The interviewees this study depended on included coal mine employees, farmers as local entrepreneurs, agricultural trade unionist, etc based in Delmas and/or exposed to the operations of coal mines. Consequently, these interviewees due to their location or proximity to coal mines have a great deal to lose in terms of business and employment prospects should the coal mines view their participation askance. Therefore anonymity for interviewees is important in this study.

Given the political sensitivities and economic power of coal mines (over their own employees as well as farmers), trust is a major issue in gaining access to research participants. This is a particular challenge as coal mines and their officials are a small set of people that are sensitive to the negative views of coal mining as a polluting water use. However, some of the coal mine officials approached the research as an opportunity to put their own views on issues of water pollution in Delmas. Moreover, the study also used former employees in cases wherein coal mine officials were unwilling to participate in the study.

Further, farmers in Delmas are also a small closely knit predominantly Afrikaner community. Much of this is also cultural given the farmers are predominantly Afrikaners. The researcher addressed this by using a local community member/activist to access key informants in the Afrikaner farming community. The local community member assisted the researcher in gaining the farmers' trust to participate in the interviews and focus groups.

5.7 Study Limitations

The topic of the research study focuses on understanding the contribution of the water regulation of the water use of coal mining to the nature of coal mining water struggles in Delmas. For this study, the understanding of the nature of coal mining water struggles, included the mechanisms of the emergence of water scarcity; as the assumed issue of contestation behind coal mining water struggles. Consequently, at least in part, this study focuses on the water use of coal mines. Thereby coal mines are a crucial focus of this study.

Research studies that focus on private corporations are known to be challenging as corporations, for a range of reasons, are sometimes unwilling to interact with researchers and provide access to the data they control. Given the polluting, and thus controversial, nature of the water use of coal mines; there is a likelihood coal mines are to be unwilling to engage openly in this study. Moreover, mining corporates likely viewed water regulatory information as trade secrets that could impact their business.

Further, the extractive industry in general, and for the purposes of this study, coal mining in particular is a strategic industry in South Africa. The coal mining industry is crucial to the energy economy of South Africa and thus is key to the country's economic growth. Further, the coal mining industry is a significant contributor to the employment statistics of the country.

Hence, a research study that depends on water regulation officials is likely to face hesitance in terms of the participation of officials. Moreover, mining regulation is partly geared towards supporting the growth of the extractives industry meaning mining regulatory officials are likely to be hesitant to participate in such a study.

A further limitation of the study is linked to the research study's case study design. The case study design allowed for a study that provided in-depth data from data sources in a particular area but was limited in terms of it being generalisable to other areas. Consequently, the study will have limited generalisability outside of the water users in the Delmas area.

5.8 Conclusion

This chapter explains the influence of the study's research questions on the study's decision to settle on a case study research design. The case study research design is deemed suitable to this study for a variety of reasons detailed in this chapter. Chief amongst these reasons is that the case study research design is a form of a qualitative research design that produces in-depth knowledge in answering research questions. The study settles on coal mines as the level of case study and selected three coal mines in order to ameliorate challenges of researching private mining corporations that tended to be inaccessible. The chapter also traverses the decisions taken in the selection of the study's various research methods. These are also linked to the decision to take on a case study research design.

The chapter explains the influence of the case study research design on decisions relating to the various elements of research methodology. The overarching rationale for the selection of the research methodology is the study's research questions. The chapter also details the research study site thereby providing context necessary to understanding the study in general but also the selection of the study site in particular. Furthermore, the chapter also detailed the selection of the case study coal mines as well as providing background on the case study coal mines.

The chapter also details the ethical considerations the study faced. These include the basic requirement to ensure research participants engage in the study of their own free will and on an informed basis. Further, explains are outlined on how the study approached these ethical considerations. The study also explains the likely limitations it to face. Much of these are due to the political context connected to the topic, the study dealing with private mining

corporations and the mining sector well as the research design and methods. Explains are provided on how these are circumvented or limited.

6. The Normalisation of Water Scarcity at the Core of the Nature of Coal Mining Water Struggles in Delmas

6.1 Introduction

Chapter six was the first chapter in the presentation of the findings of this study. This chapter presented findings that responded to research question one as outlined below:

> What is the nature of coal mining water struggles in Delmas, South Africa and what is the role of water regulation in the nature of coal mining water struggles?

Research question one was cornerstoned on understanding the water problem at the core of the nature of coal mining water struggles. Based on the findings, this chapter identified water scarcity as the water problem at the core of the nature of coal mining water struggles. In particular, the findings pointed to a form of water scarcity in Delmas that is discussed as the normalisation of potential future water scarcity rather than simply immediate physical scarcity of water due to a lack of water quantity or quality.

The findings presented supported the argument that regulation was integral to the normalisation of water scarcity. Water regulation, as indicated through the findings, normalised the possibility of the scarcity of water for farmers as non-mining in Delmas. These were contestations of the impeding of the future viability of agricultural use due to the normalisation of the likelihood of future water scarcity. These contestations were over regulation that normalised potential future scarcity.

The findings outlined regulation normalised water scarcity as a water problem behind coal mining water struggles in three interconnected ways. Firstly, the findings outlined the normalisation of water scarcity as emanating from the failure of the function of water use licensing of coal mines. Secondly, the normalisation of water scarcity was an outcome of the control of the function of water use licensing to the benefit of coal mines. Thirdly, the findings argued the normalisation of water scarcity was a result of the failure of the regulatory enforcement of the WULs of coal mines.

6.2 Water Scarcity as an Outcome of Delays and Failures in the Allocation of the WULs

The first part of the findings focused on the role of delays and failures of the allocation of WULs for coal mines on the normalisation of scarcity and coal mining water struggles. The findings specified delays and failures of licensing normalised scarcity as a water problem at the core of the nature of coal mining water struggles by enabling extra-legal water use for coal mines.

Delays and failures in licensing were seemingly evident in backlogs in the licensing of WULs. A coal mine official referred to the implicit challenges in licensing in saying "the Letsema Project was instituted to redress the backlog in WULs for mines [05/07/2017]." Another coal mine official highlighted (whilst arguing such delays as having largely been addressed through the introduction of the One Environmental System [OES]) the allocation of "WULs used to be a challenge for mines [15/06/2017]." This official's account also implicitly pointed to the licensing authority struggling to allocate licenses to applicants.

Coal mines raised concerns about the delays and failures of the licensing authority to allocate WULs. According to a DWS official "some mines have complained at the Water Tribunal that some WULSs have taken 5-10 years to be issued [24/08/2017]." So coal mines submitted official complaints over delays and failures in licensing. Continuing on the extended nature of the delays in licensing, a coal mine environmental consultant said "some clients have waited for as much as 12 years for their water use licenses to be finalised [08/09/2017]." A major concern for coal mines was the unreasonable length of time of such delays and failures for a time-sensitive economic activity such as coal mining.

Coal mines were not the only users that voiced a lack of trust in the exercise of the licensing authority. A farmer adjacent to Brakfontein Coal Mine alluded to the lack of trust in the regulatory authority in general, including licensing, stemming from a failure to execute functions. The farmer stated the following:

> Does not engage DMR and DWS neither because they fail to regulate the coal mines [21/07/2017].

Delays and failures in licensing can be understood as driving the extra-legal water use of coal mines in Delmas. All three case study mines had, at one time, operated extra-legally without these licenses.

According to a coal mine official, Vanggatfontein Colliery's license was delayed and the mine operated without one [05/07/2017]. The license for Vanggatfontein Colliery was issued in January 2015. However, as stated in chapter five, Vanggatfontein had operated since 2011. Even at the mine infrastructure development phase, coal mines were meant to have such licenses. Infrastructure development at Vanggatfontein Colliery commenced in 2010. So the mine engaged in extra-legal use even at the mine infrastructure development phase. However, a coal mine official implied the Vanggatfontein Colliery's extra-legal water use stretched even further as "it took Vanggatfontein 7 years from 2008 to 2015 to get a WUL [05/07/2017]." This meant the coal mine had engaged in extra-legal use for years.

Vanggatfontein indirectly attributed delays and failure in operating with a license to the licensing authority. An environmental consultant stated "the WUL application of Vanggatfontein was lost and DWS only had 5 pages from the two thick files that were originally submitted [26/07/2017]."

Brakfontein Coal Mine had also operated without a license. According to a local farmer "Brakfontein mine was initially mining illegally without a WUL [21/07/2017]." This was reiterated by one of the local municipal officials that stated "the VKLM was aware that the Brakfontein coal mine was operating without a WUL [15/07/2017]." A coal mine official rejected the notion that Brakfontein had operated without a license. The official stated the following:

> I never heard about Brakfontein's WUL being late or the mine struggling to get it [12/08/2017].

However, the mine's license was issued in December 2014 yet the mine had started mining at least by July 2014. Indeed, a coal mine official pointed out "a new PCD was built around 2014 with proper lining and to DWS's specifications [12/08/2017]" and this infrastructure development required a license meaning the coal mine likely operated extra-legally. Local farmers implied Brakfontein Coal Mine commenced operations before the issuing of its license as outlined below:

> In 2013 one of the farmers laid a charge with DWS against Brakfontein coal mine [for operating without a water use license] [12/07/2017].

There was no evidence from interview data that Kangala Coal Mine operated extra-legally without a WUL. Documentary evidence, in the form of the WUL, showed that the coal mine's

license was authorised in September 2016. However, as stated in chapter five, Kangala Coal Mine started delivering coal in April 2014. That meant the coal mine had operated extra-legally for about two years. Once more, this ultimately indicated a failure on the part of the licensing authority to ensure Kangala Coal Mine operated with a license.

Chapter three detailed the importance of WULs for water regulation. Section 28 of the NWA explained the essential elements of a WUL. Section 28 of the NWA (1) (a) specified water use(s), (b) property for which the license is allocated, (c) the person to whom the license is allocated, (d) the conditions under which water can be used, (e) the licensing period which cannot exceed 40 years, (f) review periods under section 49 at intervals of not more than 5 years. The license thus specified licensed use in terms of who was responsible as the license holder, what water was allocated for, where use was to happen and the duration of use.

Further, the license carried conditions that specified licensed use and therefore provided a blueprint for regulatory enforcement. Section 29 expanded on section 28 (d) on the conditions a licensing authority can attach to licensed use. Chapter three provided an extensive list of such conditions whilst only conditions relevant for this thesis have been outlined herein. Section 29 (1) of the NWA stated a license may contain conditions pertaining to (a) the protection of water resources in question and existing and potential water users; section 29 (1) (b) related to conditions on water regulatory processes; section 29 (1) (c) was relevant to return flow and discharge or disposal of waste water; section 29 (1) (d) set out conditions relating to controlled activities; section 29 (1) (e) outlined conditions on the taking or storage of water; section 29 (1) (f) pertained to stream flow reducing activities; and section 29 (1) (g) focused on conditions necessary or desirable to achieve the purpose for which the license was issued. Section 29 (1) (h) was relevant for conditions necessary or desirable for compliance with provisions of the Act.

Delays and failures in licensing and consequent extra-legal water use carried serious implications for the efficacy of regulatory enforcement. Coal mines without WULs lacked licensing conditions to guide the protection of water bodies, users, return flows and discharge of water, controlled activities, withdrawal and storage of water, stream flow reduction activities, and the achievement of the purpose of the license; in the context of the use of mines. Extra-legal water use meant coal mines engaged in use without any regulatory conditions to prevent and mitigate the pollution and damage of water bodies. Further, extra-legal water use meant coal mines engaged in use without the stipulation of regulatory processes against which regulatory compliance for the use of coal mines could be enforced.

Chapter two delved in detail on the role of water rights and regulation in controlling allocated uses; for these findings it is useful to recall some points on that discussion. Traditionally water rights emphasised being "clear and enforceable" on the part of both regulators and users (Zwarteveen and Boelens, 2017: 16). According to Boelens (2015b: 1462) water rights were "authorised demands" for a user to use some water from a water body. The authorised uses were within a framework that clarified the "privileges, restrictions, obligations and penalties" of a rights holder (Boelens, 2015b: 1462). Water rights inherently carried rules that practically guided and controlled use, by determining; how water could be used, by whom, for how long, in what quantities and control of the effects of water use on water quality (and other users) (Perreault *et al*, 2018: 38). Extra-legal water use due to delays and failures in licensing meant there were no allocated water rights, let alone clear and enforceable ones that not only outlined claims to water but also obligations (accompanied with enforcement rules) in the use thereof in the consideration of the requirements of watercourses and other users.

Water rights provided a legal authority for a user to use water as well as legal recourse to protect the use (Van Koppen, 2007: 55). The enjoyment of water rights, and implicitly legal recourse, was facilitated by the monitoring of water quantity, quality and other dynamics that influenced and affected water use (Zwarteveen and Boelens, 2017: 16). Conversely, in light of the regulatory obligations; water rights and regulatory rules on use meant non-compliant use that affected the protection of water bodies and use rights of other users could be corrected through regulatory enforcement measures and possible legal claims. Without the elaboration of regulatory rules of use and regulatory processes, enforcement was undermined.

Extra-legal water use in these findings broadly corresponded with the discussion in chapter two on the ordering of the use of extractives through failures in water regulation. These failures were articulated, for instance, as the inability or unwillingness to enforce water regulation against non-compliant use by mines. For instance, some mines in Peru illegally dumped mine water that polluted water bodies (Patrick and Bharadwaj, 2016: 474). In Mexico; the prioritisation of the water use of high value economic users such as silver and gold mining corporations took on the form of the contravention of dimensions of water rights and regulations designed to protect water bodies; leading to to the over-abstraction and pollution of water bodies (Stoltenborg and Boelens, 2016: 453). This fit with the perspective that the prioritisation of mining as an economic activity led to politics that undermined water regulation leading to the pollution, and scarcity, of water (Budds and Hinojosa, 2012: 120).

In these findings, extra-legal use as an outcome of delays and failures of the exercise of the licensing authority, meant not just a failure to allocate water rights for coal mines but particularly the regulatory obligations associated with those rights. The consequence of extra-legal water use, without WULs, meant coal mines possibly operated without undertaking steps to prevent and mitigate pollution and damage. Accordingly, pollution and damage of water bodies due to the extra-legal water use of coal mines due to delays and failures in licensing meant the normalisation of potential future water scarcity for other users; specifically agricultural users in Delmas. Extra-legal use by coal mines meant the failure to allocate regulatory obligations for the protection of water bodies' quantity and quality. This failure benefitted the use of coal mines as it meant coal mines likely operated without the regulatory burden of compliance and enforcement. An outcome of this was the possible lack of regulatory control and restriction of pollution and damage, in the course of the use of coal mines.

In this context, water scarcity was not simply the immediate physical scarcity in quantity and quality. Rather water regulation was central to the potential future water scarcity due to delays and failure in licensing and the resultant extra-legal use of coal mines. The perceived heightened risk of future water scarcity by, and, for agricultural users; meant the perceived threat to the sustainability of future agricultural use in Delmas. Consequently, water struggles in Delmas centred on the role licensing played in the normalisation of potential future water scarcity. Though not particularly highlighting failures in licensing; chapter two identified water rights, and water regulatory rules of allocation, as leading to water scarcity for some water users key to water struggles (Roth *et al*, 2018: 43).

The integral role of water regulation, and indeed water rights, in water scarcity was highlighted in chapter two. Water struggles were argued as not just about the scarcity of water but about the regulatory processes that (re)created scarcity for some users. Water rights (and water regulation) as a water control mechanism, facilitated access and use of water, and transformed water in quantity, quality, flows, etc thereby affecting access to and use of water for other water users and uses (Roth *et al*, 2018: 43). Delays and failure in licensing and consequent extra-legal water use meant a lack of allocation, participation and recognition that was key to coal mining water struggles. Without licensing the use requirements of water bodies and agricultural water users were not fairly considered in licensing and enforcement, agricultural users likely lacked a platform to voice their concerns and the lack of licensing meant a possible failure to recognise the use requirements of water bodies and agricultural users. Thus scarcity as a water problem central to the nature of coal mining water struggles

was driven by the lack of fairness, recognition and participation at the centre of failures in delays and failure in licensing.

6.3 Water Scarcity as an Outcome of the Ordering of the Water Use of Coal Mining through Control of the Licensing Authority

The second part of the findings pertained to the influence of licensing on water scarcity and thus coal mining water struggles. The exercise of the licensing authority facilitated the water use of coal mines nearby water bodies. The exercise of the licensing authority benefitted the use of coal mines in proximity to water bodies thereby normalising scarcity (for agricultural users) behind coal mining water struggles in Delmas.

Licensing, in praxis seemingly supported coal mining even in proximity to water bodies. Licensing facilitated regulated use in proximity to water bodies to the benefit of coal mines. An agricultural trade union official implicitly argued licensing failed to prioritise the protection and sustainability of water bodies as stated below:

> Mining is even happening on wetlands [15/09/2017].

Licensing, in praxis, allocated WULs for coal mines in proximity to water bodies. Accordingly a local farmer stated "conflict between farmers and mining companies is often around mining too close to water bodies such as vleis and wetlands [28/07/2017]." The implication as captured by the farmer was that the licensing of the use of coal mines in locations nearby water bodies led to pollution and damage thereby fomenting contestations amongst users.

Farmers complained that the allocation of mining and WULs for coal mines close to water bodies presented risks for agricultural use of such water as "the export certificates of farmers to the European Union (EU) depend on favourable water test results from the EU [19/07/2017]." The farmers explained "the EU tests the water on the Loskop Dam on an annual basis" and "bad test results threaten the farmers' EU export contracts [19/07/2017]." The inference was that the closeness of polluting uses, such as coal mining, to water bodies jeopardised sustainable agricultural use of nearby water bodies.

Farmers explained the proximity of coal mining use to water bodies impacted agricultural use as "cattle used to drink from the Wilge River but now the cattle won't drink the river's water as its polluted [12/07/2017]." This has meant farmers *"*…are forced to have their cattle drink from borehole water only [12/07/2017]." However, farmers admitted they "…still irrigate their crops from the Wilge River" and consequently:

> *"*….are worried about their international export market contracts due to irrigation with polluted water [12/07/2017]."

The location of coal mines nearby water bodies in Delmas also pertained to groundwater. A farmer outlined "Delmas has (water bearing) dolomite formations spreading to Bapsfontein and Pretoria [28/07/2017]." The dolomitic aquifer was crucial to the local water system in Delmas, including from a temporal and thus seasonal perspective, as outlined by a farmer "there are a lot of fountains that form when the aquifer is full (in the rainy season) [28/07/2017]." A key feature of the water system in Delmas, especially from a seasonal view, was the interconnectedness of groundwater and surface water as a farmer elaborated below:

> The aquifer's groundwater and the fountains they form when they are full are integral to the surface water as they flow into rivers (such as Wilge and Bronkorspruit Rivers), streams and wetlands especially the seasonal – as in winter [dry season] – refilling of surface water bodies [28/07/2017].

As explained in depth in chapter three, section 21 of NWA defined and listed water uses that were regulated and therefore required licensing. Regulated water uses included: (a) abstracting water from a watercourse, (b) storing water; (c) impeding or diverting the flow of a watercourse; (d) engaging in streamflow reduction activities; (e) engaging in a controlled activity; (f) discharging waste or water containing waste; (g) disposing of water in a manner that may negatively impact a watercourse; (h) disposing of water heated from or used in industrial or power generation processes; (i) altering the bed, banks, course or characteristics of a watercourse; (j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or safety of people; and (k) using water for recreational purposes. Some of these water uses directly and indirectly. These regulated uses can directly or indirectly relate to water use in proximity to water bodies thus the licensing of regulated uses sometimes meant the licensing of regulated use nearby water bodies. These uses were regulated precisely as they posed risks to the biophysical nature of water in terms of quality and quantity. The licensing of such uses in proximity to water bodies,

as pointed out above, arguably not only further intensified such risks but actually contributed to the pollution and damage of water bodies and struggles over water by water users.

Licensed uses that heightened the possibility of the pollution and damage of nearby water bodies were relevant, in varying degrees, to all case study mines the case. The Brakfontein Coal Mine's WUL provided insight into the mine's extensive licensing of use in proximity to water bodies. The regulated uses in relation to Brakfontein Coal Mine were captured in the table below:

Table 6.1 Selected Regulated Water Use in Brakfontein Coal Mine

Brakfontein Coal Mine Water Use Licensing of Water Use in Proximity to Water Bodies			
Section 21 (c) and (i) Regulated Water Use	**Water Use Activity**	**Property**	**Coordinated**
Wetland areas, tributaries, boreholes will/have been affected by mining activities	Mining authorised outside 200m buffer but within 500m regulated area of pan	Portion 16 of Brakfontein 264 IR	26° 13'36.52''S 28° 14'49.54''E
	Mining will take place outside the 200m buffer but within the 500m upper reaches of tributary 1 and associated wetland (HGM 3&4)	Portion 16 of Brakfontein 264 IR	26° 13'29.28''S 28° 49'54.55''E 26° 13'30.79''S 28° 50'12.05''E
	Mining within 500m of unchanneled valley bottom wetland (HGM 1 B)	Portion 17 Brakfontein 264 IR	26° 13'7.68''S 28° 51'11.56''E
	Existing mining within 500m of unchanneled valley bottom wetland (HGM 4 B)	Portion 17 Brakfontein 264 IR	26° 13'7.75''S 28° 51'14.51''E
	Existing mining and haul road 100m from tributary 3 and associated channeled valley bottom wetland (HGM 4 B)	Portion 27 Brakfontein 264 IR	26° 13'37.20''S 28° 50'48.37''E 26° 13'42.24''S 28° 52'7.20''E
	Existing mining outside 200m buffer but within 500m of unchanneled valley bottom wetland (HGM 4 B)	Portion 27 Brakfontein 264 IR	26° 13'28.16''S 28° 51'9.97''E 26° 13'42.24''S 28° 51'7.20''E
	Existing PCD within 100m of wetland area encroaching into wetland edge associated tributary 1 (HGM 4 B). PCD planned on being relocated outside 100m buffer.	Portion 27 Brakfontein 264 IR	26° 13'42.24''S 28° 51'7.20''E
	Mining within 500m of a spring (CBFS 1)	Portion 27 Brakfontein 264 IR	26° 13'47.86''S 28° 51'17.93''E

Brakfontein Coal Mine Water Use Licensing of Water Use in Proximity to Water Bodies			
Section 21 (c) and (i) Regulated Water Use	**Water Use Activity**	**Property**	**Coordinated**
	ROM stockpiling within 500m of tributary 2 and associated wetlands	Portion 25 Brakfontein 264 IR	26° 13'48.36''S 28° 50'39.59''E
	Overburden stockpiles outside the 200m buffer but within 500m of tributary 2 and associated wetlands	Portion 22 and Portion 25 Brakfontein 264 IR	26° 14'15.00''S 28° 41'59.89''E
	Mining outside 200m buffer but within 500m of Wilge River and associated wetlands	Portion 22 and Portion 25 Brakfontein 264 IR	26° 14'13.74''S 28° 50'59.32''E
	Discard dump within 500m of Wilge River, tributary 3 and associated wetlands	Portion 25 Brakfontein 264 IR	26° 14'1.54''S 28° 51'7.88''E 26° 13'57.58''S 28° 51'2.84''E
	PCD within 500m of Wilge River, tributary 3 and associated wetlands	Portion 25 Brakfontein 264 IR	26° 13'55.99''S 28° 51'9.04''E 26° 13'54.73''S 28° 51'3.89''E
	Septic tank within 500m of tributary 3 and associated wetlands	Portion 25 Brakfontein 264 IR	26° 13'46.38''S 28° 50'52.76''E
	Wash plant within 500m of tributary 2 and tributary 3 and their associated wetlands	Portion 25 Brakfontein 264 IR	26° 13'59.96''S 28° 50'52.76''E

Amended from Brakfontein Coal Mine Water Use License

These regulated uses were in terms of section 21 (c) and section 21 (i) of the NWA. Section 21 (c) regulated uses that impeded or diverted the flow of water in a watercourse. Section 21 (i) regulated uses that altered the bed, banks, course, or characteristics of a watercourse. The extensive licensing of water use in proximity to water bodies meant Brakfontein had a raft of regulated uses in proximity to water bodies that potentially exposed them to pollution and damage.

Interview data supported the information contained in Brakfontein Coal Mine's license regarding the authorisation of the water use of Brakfontein in proximity to water bodies. Local Delmas farmers complained Brakfontein Coal Mine "Brakfontein Mine is situated within an estimated 500 metres of a wetland and the Wilge River [12/07/2017]." On the connection

between licensing in proximity to water bodies and pollution, the farmers continued "the Brakfontein Mine is situated within 500 meters of a wetland which it pollutes with water decanting from the mine pit & PCD and overflowing into a wetland (12/07/2017)." The pollution and damage of water bodies due to the water use of coal mines in proximity to water bodies occurred despite measures in the licensing process geared towards limiting or preventing such, as outlined below:

> Mining within 500 metres of a wetland requires risk assessment from an independent wetland specialist [15/06/2017].

Despite the focus on the above regulated uses, there was evidence the licensing of the use of Brakfontein Coal Mine nearby water bodies played a role in the mine's pollution of nearby water bodies. For instance, its proximity to water bodies, according to farmers, enabled "Brakfontein mine to pump dirty water (contaminated groundwater) straight into a stream [12/07/2017]." The farmers also noted the proximity to the Wilge River meant "polluted water from the Brakfontein mine overflows during the rainy season into the Wilge River [12/07/2017]." The farmers said the mine was reported to the regulatory authority "…for pumping mine water into a wetland [12/07/2017]." With regards the location of coal mines near water bodies, farmers stated this meant "…dirty mine water decants to the surface flowing into surrounding streams and wetlands [12/07/2017]" and "Tegeta at the Brakfontein mine is pumping contaminated groundwater from the pit straight into a wetland/stream [12/07/2017]."

Vanggatfontein Colliery, as evidenced by the WUL, also had licensed uses in proximity to water bodies. The table below outlined such water uses in the case of Vanggatfontein Colliery:

Table 6.2 Selected Regulated Water Use in Vanggatfonetin Colliery

Vanggatfontein Coal Mine Water Use Licensing of Water Use in Proximity to Water Bodies			
Section 21 (c) and (i) Regulated Water Use	**Water Use Activity**	**Property**	**Coordinates**
Wetland areas, tributaries, boreholes will/have been affected by mining activities	Mine pit H3 (1st)	Portion 04 Vanggatfontein 251 IR	26° 10'39''S 28° 51'05''E
	Mine pit H3 (2nd)	Portion 08 Vanggatfontein 251 IR	26° 10'42''S 28° 51'21''E
	Topsoil stockpile 1	Portion 08 Vanggatfontein 251 IR	26° 10'28''S 28° 51'32''E

Vanggatfontein Coal Mine Water Use Licensing of Water Use in Proximity to Water Bodies			
Section 21 (c) and (i) Regulated Water Use	**Water Use Activity**	**Property**	**Coordinates**
	Topsoil stockpile 2	Portion 04 Vanggatfontein 251 IR	26° 10’28’’S 28° 51’32’’E
	Topsoil stockpile 3	Portion 04 Vanggatfontein 251 IR	26° 10’28’’S 28° 51’35’’E

Amended from Vanggatfontein Coal Mine Water Use License

Though not as extensive as with Brakfontein, Vanggatfontein also had licensed uses in proximity to water bodies that exposed water bodies to possible water pollution and damage. These licensed uses under section 21 (c) and (i) of the NWA were predicated on proximity to water bodies. The mine’s two existing pits were necessarily in proximity to groundwater. This meant the mine pit impeded or diverted the flow of water, and altered the bed, banks, course or characteristics of a watercourse. The consequence was the exposure of groundwater and interconnected surface water to the possibility of pollution and damage.

According to its WUL, licensed uses in proximity to water bodies was also evident in the case of Kangala Coal Mine. The table below captured the regulated uses licensed for Kangala Coal Mine:

Table 6.3 Selected Regulated Water Use in Kangala Coal Mine

Kangala Coal Mine Water Use Licensing of Water Use in Proximity to Water Bodies			
Section 21 (c) and (i) Regulated Water Use	**Water Use Activity**	**Property**	**Coordinates**
Wetland areas, tributaries, boreholes will/have been affected by mining activities	Upgrade of a road that crosses a wetland for the transportation of coal	N/A	26° 11’22.4’’S 28° 39’20.8’’E 26° 11’52.2’’S 28° 40’44.4’’E
	Wetland located within 500m of mining	N/A	26° 11’22.3’’S 28° 39’20.8’’E 26° 12’23.4’’S 28° 39’20.8’’E

Amended from Kangala Coal Mine Water Use License

Kangala Coal Mine's regulated uses, relevant to proximity, under section 21 (c) and (i) of the NWA respectively relating to the impeding or diverting of the flow of water in a watercourse and altering the bed, banks, course, or characteristics of a watercourse. Licensed uses in proximity to water bodies were not as pronounced for this mine. Even so the captured licensed uses in proximity to water bodies potentially exposed those water bodies to biophysical changes that affected water quality and quantity.

Apart from the above regulated uses that potentially risked pollution and damage to a nearby surface water, the location of Kangala Coal Mine above the Botleng Aquifer also risked pollution and damage to the aquifer. Licensing facilitated the location of Kangala Coal Mine in proximity to (specifically above) the aquifer even as this risked damage to the aquifer as a farmer outlined "…blasting from the coal mine can also possibly damage the aquifer which is made of soft dolomitic rock [28/07/2017]." The farmer feared "the mines are destroying the aquifer slowly but surely [28/07/2017]." Damage to the aquifer would likely affect its ability to bear water (water quantity) as well as affect groundwater quality.

Licensing was central in facilitating licensed use in proximity to water bodies for the three case study mines' WULs. For Brakfontein and Kangala mines farmers as interested and affected water users were concerned about the licensing of the water use of coal mines near water bodies. Farmers specifically raised concerns about the heightened risks of pollution and damage to water bodies. Given the role of licensing in facilitating uses near water bodies, farmers concerns were directly and indirectly about the practice of licensing. The practice of licensing was not haphazard.

As detailed in chapter three, the licensing authority functioned based on licensing considerations that informed the outcome of licensing. The considerations of section 27 (1) of the NWA were categorised in chapter three as environmental, economic, strategic, beneficial water use in the public interest, historical equity, historical inter-regulatory alignment of water rights and catchment management. The licensing considerations relevant for this study can be deemed as environmental, economic, strategic and beneficial water use in the public interest. Chapter three detailed the economic slant of the two strategic water uses of inter basin transfer and electricity generation (National Water Strategy, 2013: 9). Though chapter three explained beneficial use in the public interest as grounded in the equity of water allocation but more deeply the equitable access to the economic benefits of the allocation of productive water (National Water Strategy, 2013: 45).

The licensing prioritisation framework of the National Water Strategy prioritised water uses and thereby framed licensing (National Water Strategy, 2013: 47). As explained in detail in chapter three outlined water uses as demarcated into five use priorities. The five priorities were ranked in decreasing priority as basic human and environmental sustainability uses; international commitments; poverty eradication, racial and gender equity and livelihoods development; strategic economic water uses such as inter basin transfer and energy generation; and economic growth, economic value of uses, efficiency of use and employment creation (*Ibid*.). The use priorities relevant to this study included environmental and economic uses.

Licensing was also guided by the regulatory mandate of the NWA. The regulatory mandate was in the context of water scarcity as outlined in the preamble of the National Water Act that stated "Recognising that water is scarce and unevenly distributed natural resource that occurs in many different forms which are all forms of a unitary, inter-dependent cycle…". The regulatory mandate (expressed as the purpose) of the NWA was to protect, use, develop, conserve, manage and control the country's water resources (Woodhouse, 2012: 853). Section 2 of the NWA explained the focus of the regulatory mandate, and therefore licensing, in greater detail. Amongst the focus areas of the regulatory mandate of Section 2 relevant to this study were economic and environmental focuses that included: promoting efficient, sustainable and beneficial use of water in the public interest; facilitating social and economic development; providing for growing demand for water use; protecting aquatic and associated ecosystems and their biological diversity; reducing and preventing pollution and degradation of water resources; meeting international obligations; promoting dam safety.

Superficially, section 27 (1) presented criteria for licensing as expansive and balanced. However, in praxis Brakfontein Coal Mine, Kangala Coal Mine and Vanggatfontein Colliery's WULs illustrated the apparent preeminence of economic considerations in licensing. Environmental considerations were seemingly overlooked in the ordering of economic considerations. The apparent outweighing of economic over environmental considerations (including water bodies) in licensing benefitted the use of the case study coal mines in proximity to water bodies. Further, the National Water Strategy's ranking of uses was also meant to balance, protect and conserve water bodies in licensing. However, the practice of the ranking of uses in licensing was ostensibly turned on its head as economic uses were prioritised above the first priority use of environmental sustainability. The subversion of the practice of the prioritisation of uses in licensing benefitted the use of coal mines. Moreover,

the regulatory mandate also framed uses to balance economic and environmental use interests. This balancing of use interests linked to the regulatory mandate was supposed to flow into the function of licensing. The seemingly parochially focused economic bias in licensing supported the use of case study coal mines even in proximity to water bodies.

The praxis of the economic bias of licensing of water use in Delmas reflected the centrality that water rights sometimes, as outlined in chapter two, played in the allocation of water use. Underlying such economic bias in the allocation of water rights was the ontological construct of water and thus water rights, as an economic good (Bakker, 2013: 256). Intrinsic to the ontological construct of water towards economic water use was the discourse of efficiency that put a premium on uses considered as high value economic water users (Roth *et al*, 2018: 44) Interlinked to the prioritisation of the use of water as an economic good was the understanding of water as fundamentally scarce (Mehta, 2010: 15). The bias of the allocation of water for economic uses was facilitated by a state that took on the role, through the regulation of water rights, of the support of capital through water use (Bakker, 2005: 544).

Notwithstanding their legal status, the closeness of licensed uses to water bodies still elevated the possibility of pollution and damage to water bodies in the vicinity. The licensing of these uses led to the pollution and damage of these water bodies. Licensing of these uses in proximity to water bodies also meant nearby water bodies faced future potential pollution and damage. This illustrated a point made in chapter two that compliance with the rules of the allocation of water rights, as was the case with the Peruvian Yanacocha gold mine, did not translate to the prevention of water pollution and damage (Sosa and Zwarteveen, 2017: 167). In Peru, the regulatory control of water led to the regulatory facilitation of the expansion of mining that in turn led to an attendant pollution of water over extended space and time (Budds and Hinojosa, 2012: 120).

At the core of water scarcity, and coal mining water struggles, was the procedural influence of water regulation in the inequitable access and use of water (Zwarteveen and Boelens, 2014: 147). The licensing of the water use of coal mines nearby water bodies normalised water scarcity for agricultural users limited or impeded agricultural uses in Delmas. The licensing of water use of coal mines nearby coal mines practically meant the failure to recognise the use requirements of nearby water bodies and agricultural users. Consequently, the water use licensing process unfairly normalised water scarcity for agricultural users.

The allocation of water centred on water rights and regulatory rules on the allocation of water rights that provided legitimate authority to access water in terms of control over water, storage and transportation water infrastructure and the practical use of water (Von Benda-Beckmann *et al*, 1997: 1). The licensing authority was key in the normalisation of water scarcity and thus the nature of coal mining water struggles in Delmas. This normalisation, due to the licensing authority, was in terms of the immediate physical scarcity of adequate quantity and quality of water. Water scarcity was also in terms of potential future water scarcity as a result of the function of water use licensing to the benefit of the water use of coal mines was at the core of the nature of coal mining water struggles in Delmas.

6.4 Water Scarcity as an Outcome of the Undermining of the Water Regulatory Enforcement of WULs

The third part of the findings dealt with the influence of failures of water regulatory enforcement of WULs on the normalisation of water scarcity for some agricultural users in Delmas. The findings focused particularly on the practical influence of the failures of water regulatory enforcement on normalising water scarcity as the water problem central to the nature of coal mining water struggles.

Providing a description of powers and duties of authorised persons, section 125 (1) outlined "an authorised person may, at any reasonable time and without prior notice, enter or cross a property with the necessary persons, vehicles, equipment and material in order to carry out routine inspections of the use of water under any authorisation." This section empowered the regulatory authority to conduct water audits and inspections on license holders as part of enforcement. Once a coal mine as a water user was licensed, a water audit was scheduled soon after the allocation of a license. A DWS official explained "six-eight months after the issuing of a WUL the monitoring division [of the DWS] will then conduct an audit [24/08/2017]." Beyond the initial auditing of licensed use at the start of a coal mine's use, water audits were also meant to be conducted annually as detailed below by DWS officials:

> DWS is meant to have annual audits for mines [22/07/2017].

The purpose of water audits, as claimed by a DWS official, was "…to assess compliance with the conditions of a WUL [24/08/2017]." The DWS official detailed the enforcement role of water audits as "the auditing of mines through water audits focused on: stormwater

management plan, PCDs, metering, PCD lining, Integrated Waste Water Management Plan, etc [24/08/2017]." Water audits, according to DWS officials, procedurally dealt with non-compliance as followed:

> Once an audit has been conducted and non-compliance with the mine's WUL has been identified a report is compiled and sent to the water user [22/07/2017].

DWS officials further stated "the water user is required to respond to the report on WUL contraventions and to indicate where they actually get their authorisation in their water use license for their stated contraventions [22/07/2017]." Moreover, DWS officials clarified "if the mine fails to respond to the report by indicating where the water use identified as a contravention is authorised then the mine will be informed that it will be sent a directive to stop its illegal water use [22/07/2017]." Moreover, from the perspective of DWS officials, "the mine will be told through the directive to cease illegal water use and to rehabilitate their illegal water use [22/07/2017]." The importance of the directive phase of enforcement is highlighted below:

> [On] contraventions of the NWA and failure to comply with directives there can be criminal prosecution of directors of mining companies [22/07/2017].

Inspections were conceived to provide support for water audits in regulatory enforcement. The function of inspections was to address non-compliance issues raised in water audits. Accordingly, the timing and function of inspections, as explained by DWS officials, was to "… follow audits in the following year to look at WUL conditions that were found to be problematic [22/07/2017]." On the frequency of inspections, DWS officials said "inspections unlike audits occur twice a year during the rainy and dry season [22/07/2017]." The relevance of biannual inspections, according to DWS officials, was because "dry season inspections provide opportunities to assess seepage [22/07/2017]" whilst "rainy season inspections allow for checks on whether the dams are adequate [22/07/2017]."

However, farmers in Delmas stated that the water regulator was not on the ground in terms of inspection visits to coal mines [12/07/2017]. A coal mine environmental consultant buttressed this view claiming "there are not sufficient enforcement visits from DWS [26/07/2017]." Though Brakfontein Coal Mine began its operations in 2013 the DWS conducted its first water audit two years later in 2016. A former coal mine official explained as such:

> The DWS only sent a team to conduct a water audit on Brakfontein mine in 21-24 July 2016 [12/08/2017].

So even when an enforcement visit in the form of water audits was conducted, this was not aligned with the ethos of water regulatory enforcement. Being implemented approximately two years after the beginning of mining operations meant the water audit of Brakfontein Coal Mine was well outside the six-eight months timeframe for the execution of the first water audit. This meant the water audit failed its intended role of assessing compliance with a water user immediately after the allocation of a WUL.

On water regulatory enforcement visits at Kangala Coal Mine, a coal mine official stated he "does not recall DWS officials on-site at Kangala Mine for audit or inspection [21/07/2017]." A farmer adjacent to Kangala Coal Mine held the same view as "[he] does not know of DWS compliance inspections occurring [28/07/2017]." A coal mine consultant also raised the issue of a lack of enforcement visits at Vanggatfontein Colliery:

> There are not sufficient enforcement visits from DWS [26/07/2017].

There was, on the one hand, a lack of enforcement visits in the case of Kangala Coal Mine; whilst for Vanggatfontein Colliery enforcement visits were considered to be insufficient. In both cases the lack and insufficiency of enforcement visits undermined their intended role in water regulatory enforcement.

Apart from enforcement visits another aspect of regulatory enforcement was the water quantity and quality monitoring programme. The monitoring programme was a set of processes for the monitoring, analysis and use of information on compliance of licensed use with licensing conditions on water quality and quantity. This information on compliance provided a basis for enforcement of licensing conditions on water quality and quantity. Section 26 (j) empowered the executive authority to develop regulations "requiring that waste discharged or deposited into or allowed to enter a water resource to be monitored and analysed, and prescribing methods for such monitoring and analysis." Part of the conditions placed on a licensed user under section 29 (1) (b) related to water regulatory processes by (ii) "requiring the monitoring and analysis of, and reporting, on every water use and imposing a duty to measure and record aspects of water use, specifying measuring and recording devices to be used."

Practically this meant specifying water quality and quantity benchmarks (against which information is collected and analysed), monitoring station equipment (mechanism for collecting information), locations of monitoring stations (where information is collected), testing procedures (procedures for production of information), testing timelines (timelines for when information is produced), reporting lines and timeframes (to whom and when information is provided). Part of the function of a water audit as the assessment of the licensed processes of the water quality and quantity monitoring programme was asserted by a DWS official as "the audit also checks…the monitoring programme as specified in the WUL [24/08/2017]." On the role of water audits vis-a-vis the monitoring programme, the DWS official continued "if mining is close to streams they [regulatory officials] check upstream and downstream as part of [the] audit [24/08/2017]."

The monitoring programme, in the view of the water regulatory official, facilitated the "monitor[ing] [of] water quality through boreholes from which samples are taken back to the labs to be tested [24/08/2017]." The water regulatory official implied scientific analysis was at the core of the monitoring programme as "the labs used must be accredited to deal with water testing [24/08/2017]." A coal mine official attested "…monitoring data is only obligated to be reported to DWS as part of compliance with the WUL [05/07/2017]." Interested and affected parties such as farmers could require and access monitoring data "if we want the results of these water quality monitoring points the mines must provide them [05/07/2017]." Compliance monitoring, through compliance information, and regulatory enforcement were interconnected; for instance an environmental consultant noted "enforcement has suffered because there has been a lack of improvement in compliance monitoring [26/07/2017]." An agricultural unionist makes a similar point on the interdependence of different elements of water regulation by stating:

> …the poor implementation of the NWA negatively affects water licensing for coal mining, monitoring of water use and enforcement [15/09/2017].

According to farmers the lack of enforcement "…of environmental and water regulations exposed water resources to pollution of coal mining [12/07/2017]." Based on inputs from farmers, the result of the lack of regulatory enforcement meant "it is difficult to ascertain which mines are responsible for water pollution [19/07/2017]." Farmers pointed out the lack of implementation of regulatory enforcement, and consequent lack of insight on culpability for pollution, led "mines [to] blame each other for water pollution [19/07/2017]." Further, the lack of enforcement also led the mines to "…blame farmers for water pollution [19/07/2017]."

However, farmers "…disagree that they are responsible for water pollution because their water use is seasonal [19/07/2017]."

The lack of regulatory enforcement, in the view of farmers, enabled mines to obfuscate culpability for pollution. For instance, "Brakfontein mine agrees that the Wilge River is polluted…but says that the pollution of the Wilge River doesn't come from them but rather from Delmas Colliery [19/07/2017]." Farmers disagreed with the obfuscation of responsibility for the pollution of water bodies and implicitly the outcomes of regulatory compliance monitoring and enforcement as outlined below:

> Farmers also argue that they have been using water for a long time but pollution was not at the level it is now before mining [19/07/2017].

The failure of the water regulatory enforcement authority to execute water audits and inspections within their scheduled timeframes meant a failure to ensure coal mines operated according to their licensing conditions and obligations. Likewise, the failure of the water quality and quantity monitoring programme meant a failure to enforce licensing conditions and obligations. This meant coal mines as polluting water uses were not subjected to rigorous water regulatory enforcement to protect water bodies and pollution sensitive water uses such as agriculture. Regulatory practices that favoured particular economic water users, as discussed in detail in chapter two, reflected power dynamics that disproportionately allocated the benefits and burdens of regulated water use (Sanchez *et al*, 2017: 347). The revenue generation of economic uses such as mining had significant political power that undermined rigorous water regulatory enforcement (Mascarenhas, 2007: 567-568). For instance, the failure of water regulatory rules and thus water rights and thus regulatory enforcement amounted to the privileging of the water use of mining over agricultural use (Vela-Almeida *et al*, 2017: 103).

The failure to ensure the execution of water regulatory enforcement, including enforcement processes, meant a failure to ensure compliance with water regulatory obligations and benchmarks, and to ensure water regulation functioned according to design by preventing pollution and protecting water bodies and users as. This meant there was a possibility of water pollution and damage due to the water use of coal mines that raised the spectre of potential future water scarcity for agricultural water users. Water struggles around water regulatory rules were centred on the the lack of recognition of a range of dynamics in the construct and exercise of water regulation; that affected access to, and use of, water for water

users (Zwarteveen and Boelens, 2014: 144). The construct and exercise of water regulatory rules so that unfair and thus inequitable access to water due to water regulatory decision making was normalised (*Ibid*.). The consequent normalisation of water scarcity heightened the risk of future water scarcity for agricultural water users that was at the core of the nature of coal mining water struggles. This meant failures in water regulatory enforcement unfairly exposed agricultural users to the normalisation of potential future water scarcity. The lack of regulatory enforcement meant a failure to recognise, and protect, water bodies and the use requirements of water bodies and agriculture was at the core of coal mining water struggles.

6.5 Conclusion

The findings of this chapter shed light on research question one, the focus of which was understanding the nature of coal mining water struggles and in particular the role of water regulation therein. Given this focus, the findings determined water scarcity as central to the nature of coal mining water struggles in Delmas. Indeed, the evidence indicated water scarcity, as the water problem at the core of coal mining water struggles, was not just about immediate physical scarcity of water for users. Rather the evidence pointed to the normalisation of potential future water scarcity as being the water problem that underlay the nature of coal mining water struggles. The normalisation of water scarcity brought into relief that water regulation was intrinsic to water scarcity as a water problem behind coal mining water struggles.

The findings clarified the normalisation of water scarcity as a result of the ordering of the water use of coal mines in Delmas through water regulation of the water rights of coal mines. The findings outlined three pathways through which water regulation ordered the water use of coal mines thereby influencing the normalisation of potential future water scarcity for non-mining agricultural water users in Delmas. Three approaches were identified in the ordering of the use of coal mines through water regulation, and consequent normalisation of water scarcity. These related to delays and failures in water use licensing, control of licensing and failures in regulatory enforcement.

The three approaches to the ordering of the use of coal mines pointed to a disjuncture between *de jeure* and praxis of water regulation. Whilst water regulation was designed so a range of environmental, economic and public interests could be considered and balanced; the practical function of the water regulation of coal mines ordered the use of coal mines. That

meant the praxis of water regulation in the regulation of the allocation of water rights, allocation decisions and regulatory enforcement processes; in varying degrees eschewed fairness, recognition and participation. The undermining of fairness, recognition and participation in the function of water regulation, and the influence thereof in the normalisation of water scarcity; was at the core of coal mining water struggles in Delmas.

7. The Mechanisms of Water Regulation's Normalisation of Water Scarcity and Influence on the Nature of Coal Mining Water Struggles

7.1. Introduction

Chapter seven was the second empirical chapter that presented the study's findings. The findings of chapter seven focused on research question two as outlined below:

How does water regulation influence the nature of coal mining water struggles in Delmas?

Chapter six elucidated water scarcity as a water problem that underlay coal mining water struggles. Chapter six described water scarcity beyond the immediate physical scarcity wherein failures in, and the coal mining-biased praxis of, water regulation normalised the potential of future water scarcity for agricultural water users in Delmas. This chapter built on chapter six focusing on mechanisms of water regulation that normalised water scarcity as the water problem behind coal mining water struggles.

This chapter explained varied mechanisms that engineered the failures and biases of water regulation that normalised water scarcity and thus coal mining water struggles in Delmas. This chapter argued the mechanisms behind the failures and biases of water regulation normalised water scarcity through unfair, inequitable and unequal practices in water regulation that fomented coal mining water struggles.

The findings on the mechanisms of failures and biases behind water regulation that normalised water scarcity was structured in three parts. These were as followed: delays and failures that undermined licensing; control over, and undermining of, the function of water use licensing; and failures, and undermining, of regulatory enforcement. The normalisation of water scarcity, as a result of mechanisms of water regulation, determined the nature of coal mining water struggles through unfair, inequitable and unequal practices of the allocation, recognition and participation elements of water regulation.

7.2. The Normalisation of Water Scarcity Due to the Undermining of Licensing

Delays and failures in the allocation of WULs were not random but due to the undermining of the licensing authority. The undermining of the licensing authority curtailed the function of

the licensing authority, including the ability to limit and address water pollution and damage of water bodies, and thereby normalised the potential of future water scarcity that underlay coal mining water struggles.

The likelihood of the pollution and damage of water bodies was due to extra-legal water use of unlicensed use of coal mines. Extra-legal water use as a result of the undermining of licensing normalised the potential of future water scarcity for agricultural water users. The undermining of the licensing authority was key to extra-legal water use by coal mines that normalised the potential of future water scarcity at the core of coal mining water struggles.

7.2.1 The Normalisation of Water Scarcity Due to Human Resource Capacity Constraints that Undermined Licensing

A recurring issue raised by various interviewees as a reason behind delays and failures that inhibited the licensing authority was the human resource capacity constraints of the licensing authority. Human resource capacity constraints on the licensing authority were structural due to the nature of the licensing authority of the DWS. An environmentalist explained the licensing authority was responsible for all related licensed uses under the National Water Act because the "DWS is responsible for the regulation of water use of all sectors [10/04/2017]." The environmentalist continued human resource capacity constraints were due to the licensing authority being overstretched:

> DWS is overburdened [10/04/2017].

Human resource capacity constraints were inferred as hindering the exercise of licensing decision making critical to the allocation of WULs. An environmental consultant, outlined the "DWS lacks capacity and experience in the issuing of WULs [26/07/2017]." Referring to the interconnected influence on licensing decision making of human capacity constraints and the OES's licensing decision making timelines, the environmental consultant stated "300 days to issue a WUL is unrealistic at present given DWS's capacity shortcomings [26/07/2017]." Implicit in the environmental consultant's statement were the ineptness of changes to the licensing process introduced through the OES in addressing the human resources capacity constraints in licensing decision that impeded the allocation of licenses.

A dimension of these human resource capacity constraints stemmed from the licensing authority's struggles to retain human resources key to licensing decision making. A coal mine official averred "staff turnover in the DWS negatively affected the issuing of the WUL [05/07/2017]." The consequence of the licensing authority's difficulties in staff retention, was a lack of experience and capacity in licensing decision making and thus the allocation of WULs. An environmental consultant outlined this as such:

> DWS lacks capacity and experience in the issuing of WULs [26/07/2017].

An element of the contribution of human resource capacity constraints to the extra-legal water use of coal mines was the lack of technical human resource capacity of the licensing authority in the allocation of WULs. Shortcomings in the technical capacity of the human resources meant the licensing authority had a dearth of technical knowledge and experience required to execute technical processes that informed licensing decision making. Part of the challenge of technical constraints was linked to the licensing authority's challenges in the retention of human resources with technical skills. In relation to Vanggatfontein coal mine, a mine official commented that "staff turnover at DWS negatively affected efficiency in the issuing of a WUL for Vanggatfontein [05/07/2017]." The impacts of a high staff turnover of technical skills on delays and failures in the allocation of WULs was noted below by an environmental consultant:

> DWS has a high turnover of skills for example Vanggatfontein had three people working on its water use license due to each person leaving and another having to take over [26/07/2017].

The environmental consultant continued on the issue of technical capacity limitations of the licensing authority from the perspective of the inexperience of the technical skills available to the licensing authority as indicated below:

> Human resources capacity should be boosted by bringing some of the experienced personnel that have left DWS [26/07/2017].

The licensing authority noted, through the Letsema Project, the broad human resources capacity constraints in licensing and attempted to address them by sourcing human capital. In so doing, the licensing authority arguably also attempted to address, technical human resource constraints at the heart of the backlogs that resulted from failures and delays in the allocation of WULs. The licensing authority sought to increase its technical human capacity as a coal mine official explained "the Letsema Project that was meant to address WUL backlogs

was instituted but the project used employees straight from university that had no experience, in so doing leading to the issuing of poor quality water use licenses [05/07/2017]." However, the coal mine official made the following observation on the Letsema Project's effect on the licensing authority's technical capacity constraints:

> The DWS employees responsible for the Letsema Project were inexperienced and straight from university [05/07/2017].

The inexperience of licensing officials assigned to the Letsema Project further undermined the technical capacity of licensing. This was seen in the quality of WULs allocated by the licensing authority as pointed out by a coal mine official "[the] quality of WULs can be poor [15/06/2017]." This was not an isolated issue as the technical weakness of WULs was a well known concern. The coal mine official continued "WULs can be issued with miscalculated water quantities [15/06/2017]." In implicit relation to Vanggatfontein's license, the coal mine official provided this context for coal mines being issued licenses that could not be used for enforcement:

> Consequently, WULs had inaccuracies, inconsistencies and incorrect information that made the WULs useless as fundamental instruments for water regulation [05/07/2017].

A contextual issue relevant to delays and failures in licensing decision making as a possible result of the licensing authority's human resource capacity constraints was the mining licensing authority's allocation of mining licenses. Delmas farmers opined "the intensification of coal mining started in 2006/7 [and] was connected to the new MPRDA released in 2004 [12/07/2017]." VKLM officials buttressed the view on the intensification of coal mining in Delmas by stating "from the prospecting licenses that have been issued it is clear that in the near future Delmas will be mined all over [19/07/2017]." Implicitly mining licensing facilitated the expansion of coal mining in Delmas in the context of human resource capacity constraints of the water use licensing authority thereby likely influencing extra-legal water use by coal mines.

The implications of the possible extra-legal water use linked to the intensification of coal mining, and foregrounded by human resource capacity constraints of the licensing authority; was the jeopardising of the protection of water bodies and undermining of the sustainable use of water. VKLM officials complained "the proliferation of coal mining in Delmas and Mpumalanga in general has raised concerns about the sustainability of water resources

[19/07/2017]." An agricultural unionist noted the impact of the general intensification of coal mining in Mpumalanga on sustainable water use was also a concern for environmentalists that "…have also warned about [the] over-utilisation of water resources in Mpumalanga but mining licenses are still issued regardless [15/09/2017]." Mining licensing authorised mining, and plausibly facilitated extra-legal water use in the context of human resource constraints of licensing; in sensitive locations for water bodies. The implication was that mining licensing, operating in tandem with an under-capacitated water use licensing authority, likely posed a risk to water bodies. The role of mining licensing in this regard was implied by water regulatory officials below:

> Sometimes the DMR - especially before the OES system - would authorise mining in areas that are sensitive for water resources [22/07/2017].

Human resource capacity constraints that undermined licensing decision making also impeded legally compliant use by coal mines. Water use licensing delays and failures meant the DMR sometimes issued mining licenses whilst the licensing process and decision making of the licensing authority had not been concluded. DWS officials spelled out the consequence by stating "a mine can get a mine license without a WUL [22/07/2017]." In these circumstances, some coal mines did not wait to be allocated WULs and chose to engage in extra-legal water use without WULs to circumvent the commercial impact of delays in licensing decision making. A coal mine official commented "mines awaiting WULs start mining without licenses to meet commercial commitments [15/06/2017]." The coal mine official continued "some mining companies apply for WULs and start mining in the interim awaiting authorisation of WULs [15/06/2017]."

Apparently coal mining corporations were aware the DWS seemingly lacked the political power (even though it has the legal authority) to prevent the operation of mines with mining licenses (which they took as permission to mine immediately) from the DMR. The commercial motivation for coal mines to exploit the DMR's power to participate in extra-legal coal mining, was captured below by a coal mine consultant:

> Whilst mines await WULs in order to start mining legally they are under pressure from shareholders and investors to gain profits in order to recover capital investments [26/07/2017].

The DMR seemingly used its licensing authority, and power linked to the economically powerful mining sector, to enable coal mines to operate without WULs. The DMR used its own

mining licensing process to indirectly support the extra-legal operation of coal mines without WULs. A DWS official substantiated the above as followed:

> Mines [operate] without a WUL sometimes because they have a mining license and will start operations before they receive a WUL [24/08/2017].

Delays and failures in the allocation of WULs could also be understood through the actual process of licensing. The licensing process was extensive and time consuming. This was a source of much frustration from the coal mining sector as alluded by a coal mine consultant in saying "getting a WUL in South Africa is a nightmare" [08/09/2017]." The coal mine consultant continued as such:

> It is difficult to attain a WUL from the DWS - the process takes very long [08/09/2017].

The coal mining sector argued the curtailment of mining related investment raised the prospect of economic growth scarcity, in hindering coal mining, as a result of delays and failures in the allocation of WULs. A coal mine consultant voiced "the slow process for the attainment of a WUL drives away mining investment [08/09/2017]." According to a coal mine official the lengthy licensing process and the need to protect mining investment and associated economic growth, "…forces mines to operate illegally [05/07/2017]." Hence coal mines operated illegally without WULs.

The extra-legal water use of coal mines was plausibly support by the state for the water use of coal mining over agriculture. This was specifically in the form of a pathway for extra-legal water use by coal mines. Extra-legal water use by coal mines was seemingly incongruent with a coal mine official's view that "there has to be a balance between mining and agriculture [05/07/2017]." The circumventing of licensing by coal mines arguably aligned to a farmer's view that "in practice government seems to prefer mining over agriculture [28/07/2017]." Extra-legal water use betrayed the failure to balance the use requirements, through licensing, of the two dominant economic sectors in Delmas. According to a farmer the failure in water regulation, including water use licensing, of coal mines reflected that "government has lost sight of the strategic value of agriculture in favour of coal mining [21/07/2017]." Extra-legal use by coal mines possibly reflected the prioritisation of the use of coal mining as an economic activity, as indicated below by Delmas farmers:

> It seems there has been a bigger focus on coal mining and farming has lost out in terms of priority [12/07/2017].

The perceived ordering of coal mining as an economic activity through extra-legal water use was despite the context that the ”Delmas area is one of the most fertile areas for agricultural production e.g. maize, soya beans, fruit, etc [15/09/2017]” according to an agricultural trade unionist. Extra-legal use of coal mines in Delmas was evident even as there were serious negative implications for agricultural use in Delmas.

Extra-legal water use by coal mines was likely facilitated by the political and economic power of the political and economic elite. On this point, civic organisation members in Delmas complained of “politically connected coal mines [that] operate almost with impunity [15/07/2017].” “Short term thinking focused on profits only [15/09/2017]” drove what an agricultural trade union official implied were political priorities that overshadowed the water regulation, including licensing, of coal mines as a reflection of a bias towards coal mining that meant “… regulation is a symptom of short term instead of long term planning and strategic thinking from the political elite [15/09/2017].” The BEE regulations also meant the ownership of coal mines was connected to political power; for instance an environmental consultant stated "Universal is an Australian company that uses politically connected BEE partners [28/07/2017]. These statements plausibly shed light on the political and economic elite’s control, through the state and coal mining capital, over licensing. This control feasibly explained both the limitations of licensing and the resultant extra-legal water use by coal mines.

Delays and failures in the allocation of WULs for coal mines were conceivably outcomes of the political and economic power that coalesced around coal mining and was reflected in tacit political and economic bias for coal mining as an economic activity. The bias for the operation of coal mines as an economic activity was even in terms of the facilitation of extra-legal water use without WULs. The implication was that water bodies were exposed to unlicensed water use by coal mines that deepened the potential of pollution and damage to water bodies. This meant water bodies were exposed to the potential of immediate and future pollution and damage that otherwise should have been mitigated or impeded by regulation.

Human resource and technical capacity limitations of the licensing authority undermined the function of the licensing authority. Without adequate human and technical capacity the licensing authority was not in a position to respond to coal mining water uses as uses

contemplated under section 21 of the NWA. These were a range of water uses outlined in detail in chapter three and six pertaining to abstraction, storage, flow reduction, flow impediments, controlled activities, discharge, watercourse characteristics, etc; that required a license because of the impacts they posed for water quantity and quality.

The undermining of human and technical capacity meant the failure or inadequate use of the licensing decision making framework to analyse prospective use of coal mines and allocate licenses on that basis. Firstly, the operation of coal mines without WULs meant there was no application of licensing considerations as set out in section 29 (1) for licensed uses under section 21 of the NWA. Section 29 (1) of the NWA is listed extensively in chapters three and six. The lack of use of this section in the analysis of water use by coal mines meant coal mines operated without considerations pertaining to the protection of water bodies and the aquatic environment, protection of other existing and potential users, outline of regulatory enforcement obligations for the water use, discharge activities, withdrawal and storage, stream flow activities and controlled activities. Further, unlicensed use meant coal mines operated without licenses outlining the obligations of a user in terms of specifying the use, where the use may take place, who may engage in the use, the period under which the use may take place and reviews of the use, and the conditions under which the use may take place. Chapters three and six went into detail on the prioritisation of use as contained in the National Water Strategy. However, unlicensed water use meant such use was not based on the strategy's prioritisation. Extra-legal water use by coal mines in praxis meant the prioritisation of such uses above other priorities such as the protection and sustainability of water bodies and economic use.

Traditionally water rights emphasised being "clear and enforceable" on the part of both regulators and users (Zwarteveen and Boelens, 2017: 16). The extra-legal water use, outlined above, that resulted from delays and failures in licensing lacked the licensing conditions and obligations that were a basis for the regulation of water use. This was consistent with an argument in literature on extractives based water struggles that the facilitation of the water use of extractives sometimes emanated from the importance of an economic activity, such as mining, to a country's political economy influenced the legal context of water regulation (Perreault, 2014: 240). In other words, the water use of extractives was sometimes ordered above other uses, water bodies and the environment; through extra-legal water use that assumedly intrinsically ignored questions of fairness, equity and equality in the allocation of water uses. Extra-legal water use can also be assumed to not fairly and equally recognise other water uses and the sustainability of water bodies in order to ensure equitable water use.

Water regulation was posited in academic discourse as structurally undermined to curtail the prevention or limiting of prioritised water uses such as mining. For instance, in Bolivia small-scale mining operations known as *cooperativistas* operated with little to no practical state regulation and posed serious environmental risk (Marston and Perreault, 2017: 253). In another example in Peru, the extra-legal water trading of water rights, outside of water regulatory rules, from agricultural to mining water users undermined water equity amongst water users. Gold mining benefitted from this undermining of regulatory rules and water rights whilst agriculture suffered in access and use of water (Vela-Almeida *et al*, 2017: 103). Perreault (2014: 233-234) argued Bolivia's mining dominated political economy influenced water rights, and water regulation, that spurred water pollution and thereby induced water scarcity. This pointed to the economic role of extractive industry in a political economy shaping water regulatory practices. The undermining of the practice of water regulation evidently eschewed fairness and equality and thus equitable access through licensing.

Extra-legal water use that resulted from delays and failure in licensing curtailed allocation, recognition and participation key to coal mining water struggles. Without licensing there was a failure to balance diverse interests and uses through the licensing decision making framework to ensure water use was equitable, sustainable and protected water bodies. Extra-legal water use also meant a lack of recognition of other water uses and interests bar the extra-legal water use. The licensing conditions critical to water regulatory enforcement would not be in place in the context of extra-legal water use meaning the undermining of water regulatory enforcement and the ability of other water users to influence licensing and enforcement decision making. The consequent unfair, unequal and inequitable water use due to the undermining of licensing curtailed the protection of water bodies and ensuring sustainable water use as the function of licensing. This meant licensing failed to prevent nor limit pollution and damage of water bodies; this failure was at the core of coal mining water struggles. This was because the failure of the function of licensing normalised the possibility of future water scarcity for agricultural water users in Delmas.

The normalisation of the potential of future water scarcity in this regard related to the political context of the regulation of a key economic activity such as mining ordered the water use of mining through the undermining of water regulation (Budds and Hinojosa, 2012: 120). The undermining of the water regulation of mining devastated the ecological context of water leading to the pollution of water as an increasingly scarce form of nature (*Ibid*.). The effectiveness of water regulation was key to the prevention and mitigation of water pollution

and damage (Lucas and Djati, 2007: 322-323). Ineffective regulation, not only meant there was a likelihood of the pollution and damage of water bodies but also normalised the possible outcome of future water scarcity and thus water struggles.

7.2.2 The Normalisation of Water Scarcity Due to the Undermining of the Licensing Process by Coal Mines

Another thread in academic debates on extractives based water struggles argued that such contestations hinged on water scarcity as a an outcome of the impeding of the exercise of water regulation to the benefit of the water use of extractives. Such arguments highlighted loopholes in the design of water regulation that could be exploited to impede the function of water regulation and thereby order powerful water use interests such as extractive industries (Boelens *et al*, 2005; Bruns, 2005; Nicolas-Artero, 2016). These debates also raised the influence of the inadequate, overcomplicated, imprecise, contradictory and unimplementable construct of water regulation that undermined the function of water regulation (Bruns, 2005; Boelens *et al*, 2005). The undermining of water regulation was discussed as multi-faceted including the ordering of the water use of extractive industry as high value economic sectors, the difficulties of regulating powerful extractive industries, the connection of water use to the interests of political and economic elites, etc (Boelens 2008; Bebbington, Bebbington and Bury, 2010; Bebbington and Williams, 2008).

Corresponding to this academic discourse coal mines also undermined water regulation in Delmas. Coal mines arguably undermined their own licensing as water users. The undermining of licensing specifically related to the role of coal mines as applicants in the licensing process. Coal mines, as applicants, submitted incomplete sets of the requisite reports. The requisite documents for WUL applications, according to DWS officials, were "… hydrological studies, Integrated Waste and Water Management Plan, EMP, civil design report (for dams), etc [22/07/2017]." A DWS official highlighted these technical analyses as the basis of licensing decision making as such:

> Mines must submit EMP, geohydrological study, civil design report (e.g. for dams to be built) for their water license applications to be processed [22/07/2017].

Chapter three listed the technical analyses of the effects, on surface water and groundwater, of a prospective water use and plans to address these as key to a technical report. These

technical analyses covered discharge, construction, streamflow, the current status of surface and groundwater and also public participation on the prospective water use targeting interested and affected parties. Without the requisite technical report the DWS could not approve licenses. The licensing process checked for the technical analyses, according to water regulatory officials, through "…a quantitative element (checklist of required reports) to the WUL application process [22/07/2017]." The individual reports of the technical studies informed the overall technical report that was the spine of the licensing application, the qualitative basis of assessment and decision making on the application. Without the required reports there was no basis for the application process. Water regulatory officials highlighted the licensing process was impeded, and WULs delayed, due to the incomplete submission of the reports as explained below:

> WULs can also be delayed due to license applicants making applications with incomplete (some missing) documents [22/07/2017].

The licensing authority took proactive steps to address this challenge. This intervention failed to achieve the necessary outcome and coal mines continued to submit incomplete requisite reports thereby undermining licensing decision making. Water regulatory officials explained "despite interactions between regional offices of DWS and license applicants, applications are often submitted with incomplete documents [22/07/2017]." The outcome was that coal mines commenced mining operations without WULs, as outlined below by a DWS official:

> Mining companies would go ahead and start mining on the basis of those mining licenses even though their authorisations were incomplete [06/07/2017].

The operation of coal mines without water use licenses was also explicable through the lack of repercussions for such coal mines. A water regulatory official stated, in reference to extra-legal water use, "but criminal prosecution of infringements of the NWA due to failure to adhere to directives is very rare [06/07/2017]." The extra-legal water use of coal mines as suppliers to ESKOM was often not accompanied by commercial repercussions. An environmental consultant explained in reference to Vanggatfontein:

> There were no repercussions for ESKOM's coal supply mines that operated without water use licenses including Vanggatfontein [26/07/2017].

The failures of coal mines to submit technical reports as part of the prerequisite technical analyses that informed the licensing assessment and decision making brought into stark relief

the role of coal mines in extra-legal water use. This can be viewed as an example of the misuse of licensing rules on the obligations of licensing applicants as a gap to benefit of the water use of mines (Srinivasan and Kulkarni, 2014: 174). This meant coal mines were sometimes crucial to the unfair practices that curtailed the function of allocation and anchored the non-recognition of water bodies and other water uses that could be impacted by extra-legal water use. This meant the lack of licensing conditions, as well as enforcement measures, to ensure the protection of water bodies and uses from, and the prevention and mitigation of, the possible inequitable exposure of other water pollution and damage. Water use outside of the regulatory framework also took away the opportunity for public participation for other water users as interested and affected parties of the prospective water use and ultimately debilitated the ability of the regulatory enforcement of the water use of coal mines.

Coal mining water struggles in this regard were arguably due to the failure of licensing, and thus water regulation, to function according to the regulatory mandate (worded as the "purpose" of the Act) in section 2 of the NWA that enjoined national government to "ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons…". Coal mining water struggles revolved around the loss of a layer of protection, in licensing rules; for water bodies and agricultural uses that normalised the potential of future water scarcity for agricultural water users. The normalisation of the potential of future water scarcity, in this context, corresponded with the argument that water scarcity for some users was likely the outcome of compromised regulation of politically influential, lucrative, polluting water uses such as mining (Mascarenhas, 2007: 567-568).

Extra-legal water use circumvented section 27 (1) of the NWA that guided licensing decision making to factor environmental and other use considerations such as: the likely effect of the water use to be authorised on the water resource and other users; the quality of the water in the resource to be required for the Reserve and for meeting international obligations; and the probable duration of any undertaking for which a water use is to be required. This was a further regulatory layer of protection of water bodies and other uses that was circumvented heightening the potential of future water scarcity for agricultural water users. This normalisation of future water scarcity was at the core of coal mining water struggles in Delmas.

The undermining of the licensing function also meant a failure to utilise the prioritisation of water uses of the National Water Strategy to balance licensing decision making through the prioritisation of the environment and sustainability. Once more this meant the undermining of the protection of water bodies and other water uses thereby normalising the potential of water scarcity for agricultural water users in Delmas.

Though the normalisation of the possibility of future water scarcity through extra-legal water use was due to the undermining of licensing process there was a level of correspondence with the perspective that public officials were disinclined to rigorously enforce the water regulation of politically and economically influential water uses (Mascarenhas, 2007: 567-568). The purposeful curtailment of water regulation of uses interlinked with the interests of political and economic elites meant disproportionate distribution of environmental burdens such as water pollution to marginalised groups (Sanchez *et al*, 2017: 347). This placed water regulation at the centre of struggles over the unequal recognition as a result of unfairness of extra-legal water use that structurally exposed agricultural water users to the potential of future water scarcity.

7.3 Control of Licensing Decision Making as a Mechanism of the Normalisation of Water Scarcity

The control of the licensing authority was outlined in chapter six as critical to the licensing of the water use of coal mines in proximity to water bodies. The OES played a critical part in control over the licensing authority. In particular, the OES facilitated control over the decision making of the licensing authority that practically enabled the water use of coal mines in proximity to water bodies. The introduction of the OES on the 8th of December 2014 restructured the intergovernmental interrelation of the regulatory authorities cementing the hierarchy between the respective regulatory authorities of the DWS and DMR. The interrelation of these regulatory authorities benefitted the regulatory authority of the DMR over that of the DWS and ordered the water use licensing of coal mining. The OES was relevant to all three case study mines as their licenses were authorised in the period of the OES.

The OES introduced regulatory reforms that controlled licensing on three levels. Firstly, the streamlining of intergovernmental licensing processes facilitated control over water use licensing decision making. Secondly, the DMR as the initiator of the intergovernmental licensing process also controlled water use licensing decision making. Thirdly, the

reorganising of water use and mining licensing responsibilities between the water use and mining licensing authorities also enabled control over water use licensing decision making.

7.3.1 The Streamlining of Water Use and Mining Licensing through the OES

The OES was introduced by government ostensibly to address extra-legal water use by coal mines. To do so the OES partly targeted the fragmentation of timelines for decision making in pre-OES intergovernmental licensing as the reason for extra-legal water use by coal mines. The problematisation of extra-legal water use of coal mines, and specifically intergovernmental licensing timelines, was the basis for adjustments to intergovernmental licensing timelines as a solution to extra-legal water use. On the fragmentation of licensing timeframes, DWS officials commented "under the regulatory regime before the OES regime the DWS and DMR (and DEA) had separate timeframes and decision-making processes [22/07/2017]." In addressing fragmented licensing timelines and decision making, the OES streamlined and thereby shortened, timeframes for intergovernmental licensing processes for mining and water use licensing, as outlined by a DWS official:

> The issuing of WULs under the OES is now meant to occur within 300 days [06/07/2017].

The streamlining of timeframes and licensing processes under the OES was ostensibly to ensure coal mines had mining and water use licenses before the commencement of mining operations. There were complaints from the mining sector "…that even though WULs are meant to come out under [the] OES in 300 days they still come out after about 24 months [26/07/2017]" according to a coal mine consultant. There were still delays in the issuing of WULs despite the intervention of the OES. This was partly due to the OES's intergovernmental streamlining of licensing decision making being unrealistic in praxis. DWS officials elaborated "the OES's 300 day timeframe for the authorisation of WULs has been very difficult to meet but the DWS does not have a choice [22/07/2017]." Some regions of the DWS stated outright that it was not possible to meet the WUL application deadline under the OES. A coal mine consultant said the following on the matter:

> DWS regions are expected to issue water use licenses under a limited period of time – 300 days and some regions e.g. KZN and North West have stated that it is not possible to meet this deadline [26/07/2017].

Part of the challenges around the intervention of the streamlining of the intergovernmental dimension of water use licensing, in praxis, was the failure to address the capacity constraints behind the issuing of WULs. The implication of the 300 days deadline for the issuing of WULs under the OES was the compromising of the DWS's technical and administrative processes for licensing decision making. This had implications for the quality of WULs issued by the licensing authority under the OES regime. A DWS official elaborated:

> 300 days is not adequate to undertake technical analysis and administrative processes necessary for the issuing of water use licenses [06/07/2017].

The adjustments that came with the OES can be viewed as focused on accelerating the allocation of WULs. However, scant attention was paid to bolstering the licensing authority's effective execution of its role in the allocation of functional licenses. The resultant timelines of licensing were incongruent with the complexities and demands of the licensing process. The OES seemingly prioritised the 300 days timeframe, and thus decision making, and not the allocation of effective WULs. The shortened licensing timeframe of the OES failed to consider the extensive and complex technical process and report that analysed surface and groundwater, prospective water use and interested and affected users, construction on or near water bodies, discharge activities and streamflow. The assessment of, and decision making on, WUL applications was based on the technical analyses of the report. The shortened licensing timeframe arguably denied sufficient time for the applicant to adequately undertake the technical studies integral to the licensing process and decision making.

Licensing decision making was supposed to conform to the regulatory mandate of section 2 of the NWA to "ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons…". Licensing decision making was also framed, according according to a range of environmental, sustainability, economic and other licensing considerations. Water use prioritisation as outlined in the National Water Strategy guided licensing decision making. The technical analyses of the licensing process were a practical expression of the balancing of uses and interests behind the regulatory mandate, licensing considerations and water use prioritisation.

Technical analyses ostensibly informed licensing decision making on the impacts of a prospective use on other users, water bodies and the environment, current and future water availability and so on. However, the undermining of technical analyses meant licensing

decisions were ordered to benefit the water use of coal mines without the adequate considerations of other water uses and water bodies. The likely consequence was the allocation of WULs to coal mines being ordered above other water uses and water bodies leading to inappropriate or risky allocation of licenses for instance in proximity to water bodies. Further, the allocation of WULs without the adequate technical analyses also meant the likely allocation of poor quality WULs whose enforceability was undermined.

Considering this for the licensing of the water use of coal mines, the OES can be viewed as a water control framework that centrally ordered (from national government in tis case) specific external concerns and interests (those of the water use of coal mining) (Lopez *et al*, 2019: 203). Water struggles in this context was about the unequal recognition of local concerns and interests in the allocation of water rights and use based on nationally controlled allocation rules and priorities (Lopez *et al*, 2019: 207). Allocation under the OES was unfair and unequal in the prioritisation of the allocation of WULs to coal mines thus failing to adequately balance other uses and water bodies and fostering inequitable access and use of water that favoured coal mines.

Though the licensing of water use of coal mines nearby water bodies likely led to immediate pollution and damage of water bodies and thus water scarcity, however; the scarcity at the core of the nature of coal mining water struggles was not necessarily about the immediate physical scarcity of water from a quantity or quality perspective. Water scarcity tended to be about the changes of the licensing process as a result of regulatory changes, that undermined the function of the licensing authority. The resultant ineffectiveness of licensing due to these regulatory changes in the allocation of WULs normalised the possibility of future water scarcity for agricultural users. These changes in the licensing process, and their bias for the water use of coal mines, represented a regulatory slant towards efficient uses (such as coal mining in this case), that conversely normalised the scarcity of water for non-efficient uses (Mehta, 2010: 24). Efficiency as a mechanism of the ordering of water use was underpinned by a bias for development and economic growth (Linton and Budds, 2014: 171). Coal mining water struggles can be understood as contestations over the economic ordering of water uses above other water uses, economic and otherwise. This represented the unfair and unequal ordering, and thus recognition, of the water use of coal mines over those of agricultural users.

7.3.2 The DMR as the Initiator in Water Use and Mining Licensing under the OES

According to DWS officials "…under the old system [where the] processes of the DMR, DWS and DEA were operated under separate timeframes for decision making [22/07/2017]." Implicitly, this indicated mining and water use licensing before the OES functioned not only under distinct timelines but also licensing processes. The OES reformed the water use licensing process by positioning the DMR as the procedural initiator of the water use licensing process and decision making. Under the OES coal mines submitted WUL applications to the DMR (implicitly as part of comprehensive mining license applications). The DMR then forwarded the applications and documents relevant to water use licensing to the DWS as the licensing authority. This was implicit in the DWS officials' statement below:

> When a mining license application is submitted to the DMR it gives relevant application documents such as the Environmental Management Plan (EMP) to DWS for comment, recommendation and processing on water related matters [22/07/2017].

Regarding the practical shortcomings of the arrangement a water regulatory official noted "out of confusion water user applicants still send their applications directly to the DWS as if OES is not in place [06/07/2017]." The official continued:

> It is as if water users do not fully trust OES & still apply to DWS according to the old practice [06/07/2017].

The positioning of the DMR as the initiator in the water use licensing process, as part of the OES's streamlining of licensing decision making between the mining and water regulators; undermined the water use licensing authority. A water regulatory official explained:

> The late submission of EMP documents from the DMR to DWS puts the DWS even further pressure to issue water use licenses within an even shorter timeframe [06/07/2017].

The mining regulator used control over the initiation of water use licensing to further shorten, in praxis, the timeframe for water use licensing decision making. The likely outcome was the undermining of the quality of WULs that translated to the undermining of water regulatory enforcement. This meant an increased possibility of the inability of water regulation - in licensing and enforcement - to prevent water pollution and damage to water bodies by coal mines. Key to the undermining of licensing was the curtailment of the technical analyses that guided water regulatory enforcement. The mining licensing authority, whose traditional

mandate was the promotion of mining, used its position in the intergovernmental licensing process to limit the timeframe for development of robust technical analyses of the prospective water use of applicant coal mines.

The likely compromised technical analyses curbed understanding of the impacts of the prospective uses of applicant coal mines on water bodies, other users, the environment and so on; and the converse curtailment of the development of solutions to address and prevent such impacts. The outcome of compromised technical analyses was licensing decision making that failed to align with the regulatory mandate of section 2 of the NWA to "ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons…". An example of this were WULs allocated by the licensing authority in proximity to water bodies even as such uses in praxis heightened the risk of, and led to, the pollution and damage of water bodies. The undermining of technical analyses in the licensing process and decision making curbed their role in informing licensing assessment according to environmental, sustainability, economic and other licensing considerations. The undermining of the development of technical analyses curtailed their role in informing the application of water use priorities, as outlined in the National Water Strategy, in licensing decision making.

Consequently, the undermining of the timeframes for technical analyses curtailed their ability to impede the water use of coal mines in licensing decision making; thereby possibly explaining the allocation of WULs in inappropriate locations nearby water bodies. This meant technical analyses failed to prevent, protect and mitigate pollution and damage to such water bodies from coal mines as water uses. Water pollution and damage was the result of the curtailment of technical studies through the positioning of mining licensing as the first receiver in the intergovernmental licensing process that ordered the water use of coal mines. The outcome was water scarcity for agricultural water users in Delmas. Herein, water scarcity as a water problem behind extractives based water struggles resulted from the ordering of the economy, and particular economic activities, through water regulation. Water scarcity, and thus extractives based water struggles, were the result of the construct, including through water rights, of water regulation as a facilitator of extractives as priority economic water uses (Assies, 2010; Hendriks, 2010; Budds, 2010; Marston and Perreault, 2016; Boelens *et al*, 2005).

Given the effects of the undermining of technical studies of the licensing process on water pollution and damage, the curtailment of technical studies normalised immediate as well as the potential of future water scarcity. This meant the technical processes that were meant to ensure fairness and equality in the licensing process led to inequitable decision making on the allocation of water that polluted water bodies and undermined uses. Regulatory reforms around water rights and water regulation sometimes reflected an efficiency and thus economic ordering bias for water use that exposed non-priority water uses to water scarcity (Molle, 2008: 135). These reforms often shaped water rights, and thus water regulation; around universalistic, individualised, state-vested, modernist and an economic growth and development bias (Boelens, 2010: 166-167). The ordering of water uses through water regulatory reforms were state-driven, national, economic, universal and developmental so licensing decision making reflected those priorities in the recognition of water uses, economic activities, the environment, water bodies, etc. In this context, coal mining water struggles in Delmas could be viewed as the contestations over regulatory reforms that unfairly and unequally ordered the allocation and recognition of water uses that informed licensing decision to the benefit of coal mining in Delmas.

7.3.3 The Reorganisation of Water Use Licensing and Mining Licensing Responsibilities under the OES

Another way in which the OES ordered the water use of coal mines was through the reorganisation of the intergovernmental licensing responsibilities in the allocation of WULs to coal mines. The reorganisation of intergovernmental licensing responsibilities between the water use and mining licensing authorities deepened control of, and ultimately undermined, the licensing authority. Pre-OES the water use licensing authority was responsible for, and required, a report in relation to EIAs as part of technical studies for water use licensing. Post-OES the responsibility for overseeing EIAs (relating to water) was transferred from the water use to the mining licensing authority. This meant the transfer of the assessment of possible impact on water bodies, as noted by a water regulatory official "the DWS now does not undertake EIAs – these are done under the auspices of the DMR [06/07/2017]." Under the OES, water related EIAs required for water use licensing decision making fell under the authority of mining licensing. A DWS official expanded on this:

> WULs are thus issued after the completion of EIAs under the DMR [06/07/2017].

The placing of EIAs under the DMR, as part of solving licensing timeframe fragmentation, implicitly led to tension in regulatory functions between the DWS and the DMR. The housing of EIAs associated with water, under the DMR, undermined the water use licensing process. This was due to the conflicting core mandates of the DMR and DWS and by consequence water use and mining licensing. A water regulatory official commented as such on the conflict of interest in the DMR with the regulatory adjustments of the OES:

> The DMR is conflicted under the OES as it has its longstanding mandate of promoting mining as well as (its newer mandate) the environmental regulation of mining [22/07/2017].

Superficially, the OES, proved to be an important intergovernmental regulatory intervention for the facilitation of legal water use of coal mining within the water regulatory framework. Speaking on this, a water regulatory official stated "there have been no court cases challenging mining licenses since the OES was instituted [06/07/2017]." This pointed to the perfunctory success of the OES in ensuring coal mines operated in compliance with mining and water regulation. Under the OES, these mining licenses faced less regulatory resistance from the water regulator. The water regulatory official continued:

> Before the OES there were many cases against mining license authorisation decisions [06/07/2017].

However, the superficial success of the OES in seemingly dealing with extra-legal water use was predicated on the predominance of the mining licensing authority over the water licensing authority. The structural predominance of mining over water use licensing facilitated water use licensing decision making that ordered the water use of coal mining. The water use of coal mines was ordered even nearby water bodies exposing such water bodies to pollution and damage.

The structuring of the predominance of the mining over water use licensing authorities in decision making was incongruous with the function of water regulation. Indeed, the OES can be argued as reorganising licensing responsibilities to effectively curtail the function of water regulation. This was specifically in undermining the ability of the licensing process to give effect to the function of water regulation by executing technical studies and processes that were meant to shed light on the risks of licensing decision making for the water use of coal mines. The effect of the supervision of water related EIAs by the mining licensing authority was the hampering of the independence of technical analyses to thoroughly investigate, and offer measures for, the impact of prospective water use of coal mines.

Without a thorough and adequately independent supervision of the technical analyses carried out by coal mines as prospective users, there was a lack of a sufficient basis to inform licensing to "ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons…" according to section 2 of the NWA. The impeding of independent supervision of EIAs as part of technical analyses also meant the weakening of the basis for informing the assessment of the various environmental, sustainability, economic, etc considerations that informed licensing decision making. The undermining of the independent supervision of water related EIAs as part of technical analyses curtailed the prioritisation of water uses as outlined in the National Water Strategy.

The reorganisation of licensing responsibilities under the OES was an example of academic discourse on the influence of the construct of water rights and their regulation that ordered the water use of extractives. Pollution, and thus water scarcity, was not simply an outcome of the water use of extractives but also the ordering of the water use of extractives. Thus water regulation was integral to extractives based water struggles (Guevara-Gil *et al*, 2010; Bruns, 2005; Stoltenborg and Boelens, 2016; Sosa, Boelens and Zwarteveen, 2017). Further, reforms on water rights as property rights, and the regulation thereof, were key to determining water availability or water scarcity for water users. The form of water rights and water regulation, as an outcome of reform processes, was key to the allocation and thus accessing of water by water users (Budds, 2010; Bruns, 2005; Stoltenborg and Boelens, 2016; Boelens *et al*, 2018). Similarly in this case, the construct and reforms of water regulation, through the OES, influenced water regulatory practices that normalised the potential of future water scarcity for agricultural water users in Delmas. This normalisation of water scarcity was at the core of coal mining water struggles in Delmas.

At the heart of the normalisation of the possibility of future water scarcity behind extractives based water struggles in Delmas was the dearth of fairness and equality in the technical process that underpinned licensing decision making. This meant not only the ordering of the water use of coal mines above other uses and water bodies but also the ordering of the burdens of the water use of coal mines on other uses and water bodies. This ordering of the use of coal mines indicated the failure of recognition of other uses and water bodies in licensing decision making. The ordering of the use of coal mines illustrated what Linton (2010: 69) captured as a hegemonic ontological framing of water, through the OES; that translated to practical, physical access and use of water as well as the converse in terms of the "manufactured scarcity" of water. In this case water regulation was central to the

normalisation of the possibility of future "manufactured scarcity" at the core of coal mining water struggles.

7.4 Capacity Constraints in the Implementation of Water Audits and Inspection Visits in Failures of Water Regulatory Enforcement

The failures in water regulatory enforcement noted in chapter six were not haphazard but the outcome of human resource capacity constraints that impeded the function of water regulatory enforcement. Human resource capacity constraints curtailed the exercise of enforcement processes that were designed to ensure the water use of coal mines were compliant with their allocated licensing conditions.

The pollution and damage of water bodies that influenced water scarcity was rooted in the capacity constraints of the water regulatory authority in the enforcement of the licensed water use of coal mines. The capacity constraints of water regulatory enforcement normalised the potential of future water scarcity for agricultural water users and thus were at the heart of coal mining water struggles in Delmas.

7.4.1 Capacity Constraints Hindered the Implementation of Water Audits, Inspections and Post-Directive Stage Regulatory Enforcement of WULs

As expressed in chapter six, water regulation was dependent on enforcement visits in the form of water audits and inspections. However, the two part audit-and-inspections annual cycle, in praxis, did not occur or did not occur within the prescribed timeframes. Infrequent and out-of-schedule water audits meant newly issued licenses were not monitored for compliance at the beginning of the licensed use as intended. Infrequent and out-of-schedule inspections translated to a failure to assess as intended PCD and seepage compliance - and where necessary enforce - in the rainy and dry seasons respectively.

The failure to implement water audits, and by implication inspections, as intended was based on the human resource capacity constraints of the regulatory authority. A civil society environmentalist explained shortcomings in the execution of regulatory enforcement processes as stemming from "…a lack of compliance and enforcement capacity [in the regulatory authority] [13/10/2017]." On the topic of the capacity of the regulatory authority in enforcement an environmental consultant suggested "there should be a development of

human resources capacity in DWS [26/07/2017]" as a measure to rectify human resource capacity constraints. Herein, the consultant was interpreted as addressing the quality as well as quantity of human resource capacity in regulatory enforcement. This was reflected in the consultant's proposed remedial action:

> Human resources capacity should be boosted by bringing some of the experienced personnel that have left DWS [26/07/2017].

The repercussions of the human resource capacity limitations of the regulatory authority in the area of enforcement was evident in the infrequent and out-of-schedule execution of water audits and inspections. DWS officials were concerned "audits cannot be done on a scheduled basis on the same mine due to capacity shortcomings in the DWS [22/07/2017]." Inadequate human resources meant a lack of manpower required to execute enforcement visits thereby affecting their scheduling. According to water regulatory officials, the water regulator's capacity limitations affected the annual water audits as such:

> …due to capacity shortcomings annual water audits are in fact not annual but skip a year [22/07/2017].

The general failure to execute water audits and inspections was also in respect of specific case study coal mines. Failures in enforcement were evident in Brakfontein Coal Mine. According to a local farmer, Brakfontein Coal Mine; irrespective of complaints on non-compliance going back to 2013, only had its water audit carried out in 2016 [21/07/2017]. This was at least three years after the mine's water use began. This illustrated the praxis of the compromised implementation of processes of regulatory enforcement. With regards Brakfontein Coal Mine, farmers said the "DMR and DWS hardly come and monitor compliance with mining and WULs [12/07/2017]" meaning enforcement visits were infrequent. Consequently, local farmers complained about regulatory non-compliance of Brakfontein as noted below:

> Polluted water flowing from Brakfontein mine which does not have a [compliant] PCD then flows into maize fields [19/07/2017].

The water regulatory enforcement authority failed to conduct an inspection even in the light of complaints from a farmer. A farmer adjacent to Kangala Coal Mine implicitly referred to failures of enforcement visits in the lack of prompt responses to non-compliance complaints "…on water contamination when the DWS eventually made a site visit they did not take water

samples so they could test the water as they had not brought the requisite equipment to collect the groundwater [28/07/2017]." The farmer, in reference to Kangala said:

> Hence there is ineffective regulatory compliance and enforcement [28/07/17].

Local Delmas farmers further pointed out contamination of nearby water bodies by the Brakfontein Coal Mine led to complaints against the mine filed with the water regulator. Local Delmas farmers reported on non-compliance by Brakfontein Coal Mine that "in 2013 one of the farmers laid a complaint with the DWS against Brakfontein Coal Mine for pumping contaminated water into a wetland [12/07/2017]." A second complaint, according to the farmers, was filed by the farmer "on 29 February 2016 the farmer laid a second complaint against Brakfontein mine for allowing mine water to overflow from the pit into the Wilge River [12/07/2017]."

On both occasions the DWS failed to send an inspection team in response to complaints on Brakfontein Coal Mine's apparent infringement of its licensing conditions. The farmers said the water regulator finally responded to the complaints three years later as "the DWS only sent a team to conduct a water audit on Brakfontein mine in April 2016 [12/07/2017]." The water regulator failed to respond timeously to these complaints. This meant water bodies in proximity to Brakfontein Coal Mine were exposed to water pollution and damage for an extended period of time. Therefore, the licensing of the water use of Brakfontein Coal Mine in proximity to water bodies exposed those water bodies to the heightened risk of pollution and damage particularly as there was a failure to enforce the mine's WUL.

Chapter six explained a water audit resulted in a report that specified the non-compliance a coal mine as a user was to clarify and/or provide corrective measures to address. The non-compliance identified in water audits was further assessed through follow-on inspections. The failure to explain or address non-compliance was followed by a directive that forced a coal mine as a water user to comply with its WUL conditions. DWS officials said "investigations by the environmental management inspectors (EMIs) can stem from officials judging corrective measures to audits as unsatisfactory [22/07/2017]." Further, the officials pointed out that "investigations of the EMIs are sometimes instigated by complaints of citizens (handed over to the EMIs) [22/07/2017]."

The repercussions of investigations, from the perspective of DWS officials, due to the "…failure to comply with directives can be [the] criminal prosecution of directors of mining companies [22/07/2017]." However, on the post-directive prosecution of non-compliant water users, a regulatory official argued "…criminal prosecution of infringements of the NWA due to failure to adhere to directives is very rare [06/07/2017]." The rarity of criminal prosecution was due to human resource capacity constraints of the EMIs that curtailed post-directive regulatory enforcement as explained by water regulatory officials "there are seven EMIs (so called Blue Scorpions) operating at provincial level [22/07/2017]." There was a meagre number of EMIs utilised throughout the country as outlined by water regulatory officials below:

> The seven EMIs have policing powers and operate all over the country [22/07/2017].

The lack of execution of enforcement visits was viewed by an agricultural trade unionist as part of a general trend of the "…the poor implementation of the NWA [that] negatively affects water licensing for coal mining, monitoring of water use and enforcement [15/09/2017]." Enforcement made environmental, including water, regulation a practical reality as indirectly argued by an environmental consultant in stating "environmental legislation is good but the major challenge is with monitoring, compliance and enforcement [26/07/2017]." Regulatory enforcement was crucial to the legal control of water, for instance, farmers in Delmas argued "the enforcement of environmental and water regulations protect water resources from pollution due to coal mining [12/07/2017]." Conversely, farmers implicitly viewed the failure of regulatory enforcement as the exposure of water bodies to pollution and damage.

The undermining of the capacity, and consequent failure of, regulatory enforcement of the WULs, and thus water use, of coal mines in Delmas led an environmental consultant to conclude "mines are not concerned about enforcement [26/07/2017]." On a deeper level the capacity constraints in regulatory enforcement jeopardised agricultural users' trust in regulatory enforcement. For instance, on engaging Brakfontein Coal Mine on the pollution of nearby water bodies, a local farmer stated the following:

> Does not engage Brakfontein mine because doing so leads to no changes [21/07/2017].

Agricultural to coal mining user engagement on the non-compliance of coal mines failed to lead to the enforcement of the water use of coal mines. Farmers stated Brakfontein Coal Mine does not act on the regulatory infringements that farmers engaged it on as outlined below:

> Brakfontein coal mine does not rectify its water regulatory infringements even though the farmer notifies it [12/07/2017].

The outcome of the lack of enforcement visits in the form of water audits and inspections, from the outlook of the environmental consultant, led to the following:

> …mines are not concerned about enforcement [26/07/2017].

As outlined in greater detail in the previous chapter, section 29 (1) of the NWA empowered the licensing authority to allocate licensing conditions that controlled the licensed water use of coal mines. Amongst others, these licensing conditions related to, and in consequence guided, water use through the protection of water bodies and the aquatic environment; protection of other existing and potential users; and outline of regulatory enforcement obligations for the use, discharge activities, withdrawal and storage, stream flow activities and controlled activities. Section 28 (1) also outlined that key components of a WUL were the specification of the use, where the use may take place, who may engage in the use, the period under which the use may take place and reviews of the use, and the conditions under which the use may take place. The significance of the lack of regulatory enforcement human resource capacity was an inability to adequately ensure the water use of coal mines in Delmas was compliant with licensing conditions. In effect this meant regulatory enforcement was compromised and in a broader sense could not adequately ensure the water use of coal mines in Delmas was aligned the regulatory mandate of section 2 of the NWA which was to "ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons…".

Failures in regulatory enforcement, noted in chapter six, that contributed to the normalisation of water scarcity were not haphazard but the outcome of human resource capacity constraints. Human resource capacity constraints curtailed the exercise of enforcement processes designed to ensure the water uses of coal mines were compliant with their allocated licensing conditions. The compromised role of regulatory enforcement meant the dysfunction of a key facet of water regulation. For instance, Boelens *et al* (2010: 18) through the echelons of rights analysis noted one echelon as the outline of a legitimate authority for the construct of rules, enforcement of rules and rights. Inadequate regulatory enforcement meant a failure to control and limit water pollution and damage that curtailed the water use of other water users. For instance, in the case of Peru, mines engaged in the illegal dumping of mine waste that polluted water bodies, an implicit outcome of the inability to regulate such water uses

(Patrick and Bharadwaj, 2016: 474). The operation and practical procedures of regulatory rules ensured the practical reality of water rights as activated rights and not just reference rights (Roth *et al*, 2015: 463). In other words, without practical regulatory enforcement water rights were just on paper.

Consequently, the pollution and damage of water bodies that influenced the normalisation of water scarcity was stemmed from the capacity constraints of regulatory enforcement of the licensed water use of coal mines. These capacity constraints exposed water bodies to immediate pollution and damage due to the failure to enforce licensed water uses. Moreover, the capacity constraints of regulatory enforcement, and interlinked failures to enforce licensing conditions, normalised the potential of future water scarcity for agricultural water users. This normalised water scarcity due to shortcomings in regulatory enforcement was at heart of coal mining water struggles in Delmas.

Herein, as argued in chapter two, coal mining water struggles centred on water scarcity that was not - as water problems are usually outlined in debates on water struggles - a natural or technical problem (Joy *et al*, 2014: 955). The dimension of participation in debates on water struggles was largely argued in terms of the influence of water users in regulatory rule making and thus the regulatory practices that secured access to water (Boelens, 2015: 295). In the context of the evidence of this thesis, coal mining water struggles can be understood as contestations over the failure to adequately capacitate and thus support regulatory enforcement of the licenses of coal mines. From a coal mining water struggles perspective; the under-capacitation of the regulatory enforcement function undermined the participation of the regulatory authority in the enforcement of regulatory rules and practices that determined the praxis of access to, and use of, water. The under-capacitation of water regulatory enforcement can be argued as a form of the lack of equal participatory consideration of water users in regulatory enforcement thereby leading to unfair water regulation and inequitable access to water (Gerlack and Ingram, 2018: 77).

7.4.2 Technical Capacity Limitations in the Implementation of Water Audits and Inspection Visits

Human resource capacity constraints also took on the form of technical capacity constraints. Technical capacity constraints of regulatory officials impeded the ability of the regulatory authority to effectively conduct enforcement visits, in the form of water audits and inspections, key to regulatory enforcement. The failure to adequately execute water audits and

inspections likely further undermined post-directive regulatory enforcement. A coal mine environmental consultant averred "DWS officials responsible for enforcement visits also lack the technical knowledge to know what they must look for in terms of non-compliance of water regulation in mines [26/07/2017]." The coal mine consultant explained further:

> Many DWS officials that conduct enforcement visits do not know what they are looking for during audit and inspection enforcement visits [26/07/2017].

The technical capacity constraints behind the under-capacitation of regulatory enforcement were implicitly touched on by an environmental consultant that said "there should be a development of human resources capacity in DWS [26/07/2017]." The consultant further stated with reference to the lack of technical knowledge in regulatory enforcement:

> Human resources capacity should be boosted by bringing some of the experienced personnel that have left DWS [26/07/2017].

The pursuit of solutions to the afore discussed human resource resource capacity constraints in enforcement led to intersections with technical capacity constraints in enforcement. According to regulatory officials "the DWS due to lack of capacity is being forced to engage police directly in water cases [22/07/2017]." However, a regulatory official was concerned the use of police to investigate criminal infringements of regulation (and thus law) was problematic as "the South African Police Service (SAPS) can be an obstacle [though] as they don't understand environmental crimes [24/08/2017]." For instance, regulatory officials complained of the police's technical constraints on water regulation:

> [The] DWS wants specialists to depose affidavits [22/07/2017].

To overcome human resource capacity constraints in regulatory enforcement changes were introduced in enforcement to overcome such constraints created other technical capacity constraints in regulatory enforcement. A regulatory official elaborated the "SAPS case management system did not allow for environmental cases [24/08/2017]." The official continued "the National Prosecuting Authority (NPA) can also be an impediment or enforcement as prosecutors that don't understand or appreciate environmental crimes [24/08/2017]." From the perspective of DWS officials, these technical capacity constraints also translated to "…discussions with the NPA for it to better understand the NPA so it can understand the NWA and the seriousness of contravention of the NWA [22/07/2017]." To

support investigations through effective prosecutions DWS officials said “there were efforts to develop specialist prosecutors capacitated in dealing with the NWA [22/07/2017].” Accordingly, regulatory officials stated:

> Prosecutors had to be taken to environmental courses by the NPA [24/08/2017].

The regulator’s poor technical capacity in the execution of enforcement visits, and thus enforcement, was evident in case study mines. A local farmer repeatedly reported a non-compliance issue with the DWS regarding Kangala Coal Mine’s impact on groundwater quality compliance as stated below:

> The contamination of groundwater due to blasting was reported to DWS [28/07/2017].



Figure 7.1
The contaminated groundwater from the borehole of the farmer

The farmer was dissatisfied with the DWS’s enforcement visit when the regulator eventually responded to the matter. The farmer stated the “the DWS officials did not test the borehole’s water as they did not have the necessary equipment [28/07/2017].” The regulatory officials failed to take the necessary measures to ensure enforcement could take place on the matter at

Kangala Coal Mine. A Delmas farmer stated "[he] was forced, at his own cost, to test the quality of the borehole water himself through a private company [28/07/2017]." Superficially, the farmer's complaints were about Kangala's non-compliance on the quality of groundwater. However, the farmer had deeper fears with regards the coal mine's impacts on the aquifer, and thus groundwater quality, as noted below:

> The mines are destroying the aquifer slowly but surely [28/07/2017].

Delmas farmers adjacent to the Vanggatfonetin Coal Mine also pointed out shortcomings in the technical capacity of regulatory officials in their enforcement visits. The lack of technical enforcement capacity of regulatory officials, according to one of the nearby farmers, meant "the DWS [officials] visit Keaton and are supplied with tea, cookies and shown what the mine wants them to see and they leave [19/07/2017]."

Farmers complained about a non-compliant PCD at Brakfontein Coal Mine and the water regulator eventually responded to the complaints with an enforcement visit [22/07/2017]. The technical shortcomings of regulatory officials emerged in the regulatory authority's lack of enforcement guidance on PCDs. A former Brakfontein Coal Mine official explained "there was an old PCD for which there was a water use license but it was not lined [12/07/2017]." The Brakfontein Coal Mine took steps to rectify the non-compliant unlined PCD. An environmental consultant advised the Brakfontein Coal Mine as such in terms of the rectification of non-compliance:

> A consultant had suggested they should pump out the PCD and rehabilitate it (by lining it) [12/07/2017].

However, according to a former Brakfontein Coal Mine official, the water regulator "…said they should leave it as is as there was wildlife such as ducks and birds [12/07/2017]." This left Brakfontein Coal Mine unclear as how to deal with the technical problem of the unlined PCD. Brakfontein Coal Mine, was thus offered no technical guidance by the regulatory officials on the rectification of the non-compliance matter. Regulatory officials seemingly chose to ignore the technically challenging non-compliance issue. A former Brakfontein coal mine official stated "…Tegeta was confused as to what to do with it [the PCD] [12/07/2017]." In order to be compliant, Brakfontein Coal Mine decided to build a new PCD. A former Brakfontein Coal Mine official outlined the matter as such:

> A new PCD was built around 2014 with proper lining and to DWS's specifications [12/07/2017].

The lack of technical capacity in regulatory enforcement, as outlined above, meant regulatory authority failed to enforce the licensing conditions of the WULs of coal mines in Delmas. Without enforcement the regulatory authority could not ensure that the water use of coal mines in Delmas was compliant with the licensing conditions captured in sections 29 (1) and 28 (1) of the NWA. The failure to enforce licensing conditions meant a practical inability by the regulatory authority to "ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons…" as the regulatory mandate in section 2 of the NWA outlined. The lack of technical capacity in regulatory enforcement meant a failure to ensure the prioritisation of the water use was equally balanced and thus equitable as implied in the regulatory mandate.

The inability to execute regulatory enforcement, though not explicitly in relation to technical capacity constraints, was a theme in discussions on the influence of regulation on extractives based water struggles. For instance, extractives based water struggles focused on the Mexican state's failure to ensure regulatory process and decision making was impartial and fair (Stoltenborg and Boelens, 2017: 257-258). Water rights distributed not only "authorised demands" for water use but also the right to participate in, and influence, the practical application of regulatory rules (Boelens, 2015b: 1462). Debates on extractives based water struggles often emphasised participation from the perspective of water rights holders with diverse interests (including in terms of water uses); and their influence in regulatory processes (Van Koppen *et al*, 2007: 8-9).

However, water struggles in the context of the failure to enforce regulatory rules can be viewed as struggles over the regulatory authority's failure to exercise the assigned authority to participate, through enforcement, in the practice of regulatory enforcement to ensure fair, equal and equitable water use. The technical capacity constraints of the regulatory authority curbed the regulatory authority's ability to participate effectively in regulatory enforcement to ensure fair, equal and equitable water use by coal mines. In practical terms this meant the exposure of water bodies to pollution and damage. In other words, the lack of technical capacity to ensure the function of regulatory enforcement meant the regulatory authority normalised the potential of future water scarcity for agricultural water users in Delmas. This normalised water scarcity was at the core of coal mining water struggles in Delmas.

7.5 Control and Undermining of Water Regulatory Enforcement of Water Use Licenses through the Utility of Water Knowledge as a Modality of the Normalisation of Water Scarcity

This section of the chapter dealt with findings on water knowledge as a mechanism for the control of the regulatory enforcement of WULs in Delmas. These findings pertained to the praxis of licensing conditions that controlled and undermined regulatory processes linked to water knowledge and therefore the regulatory enforcement of WULs of coal mines. The undermining of licensing conditions on the production and use of water knowledge informed the curtailment of the regulatory enforcement of the WULs of coal mines in Delmas.

7.5.1 The Control and Undermining of Licensing Conditions of Water Knowledge Production as a Mechanism for the Undermining of Water Regulatory Enforcement

The licensing conditions set out in section 29 (1) of the NWA included those that empowered the licensing authority to specify regulatory processes. Section 29 (1) (b) contained elements of regulatory processes designed to facilitate enforcement. The relevant conditions included the specification of regulatory processes, water use obligations including water conservation measures; setting on the water user the obligation to monitor, analyse and report on every licensed water use through specified measuring and recording devices; and the requirement for the development, approval and compliance with a water management plan.

These licensing conditions provided the contours of regulatory processes and obligations of a water user that were undermined through the licensing process. The failure of intergovernmental (water use and mining) licensing of coal mines to incorporate cumulative impact in licensing decision making facilitated the allocation of the WULs of coal mines in proximity to each other leading to the water use of coal mines in proximity to each other. The allocation of the water use of coal mines in proximity to each other undermined the regulatory processes and water knowledge production crucial to the regulatory enforcement of WULs.

The lack of consideration of cumulative impact in mining licensing was due to the mining regulator considering and allocating mining licenses individually as a civil society environmentalist explained “mining rights are considered and issued on a case by case basis [10/07/2017].” The failure of the allocation of mining licenses to consider the local context was often critiqued in terms of a lack of consideration of the impact of existing coal mines on

the environment, including water bodies. Moreover, a civil society environmentalist commented on this point stating "[the] DMR currently does not issue mining licenses on the basis of cumulative impacts on local environments and existing mining companies [10/07/2017]."

Another angle of the lack of consideration of cumulative impact in mining licensing, and the resultant operation of coal mines in proximity to each other, was the intensification of coal mines in Delmas. Local government officials in Delmas expressed concern "the proliferation of coal mines in Delmas has raised questions about the sustainability of water resources [15/07/2017]." This pointed to concern over the impact on water bodies of the lack of consideration of cumulative impact in licensing decision making even when discussed in the form of the outcome of the intensification of coal mines in Delmas. On the intensification of coal mining, and implicitly the non-consideration of cumulative impact, VKLM local government officials expanded on this concern by stating:

> The impact of intensified coal mining on water resources in Delmas and Mpumalanga generally is of particular concern as the area is an important source of many water bodies [15/07/2017].

The intergovernmental dimension of the lack of consideration of cumulative impact was through the water use licensing authority also failing to allocate licenses based on the cumulative impact of the water use of other coal mines in the vicinity of a coal mine considered for water use licensing. A coal mine official said "…the DWS fails to consider the cumulative impact of mines of water quality in terms of pollution [05/07/2017]." In response to this gap in licensing, Vanggatfontein Colliery suggested, to collaborate with other coal mines in the Delmas area, on a study to gauge the cumulative impact of the water use of coal mines on the surrounding water bodies. A coal mine official captured the response of other coal mines below:

> Vanggatfontein tried to initiate a cumulative impact study but other mines were not interested – this should be the responsibility of DWS not mines [05/07/2017].

The lack of consideration of cumulative impact, and the intensification of coal mining, was beyond just the impact on the environment in general and water bodies in particular. "Because the DMR does not take on a cumulative and thus regional approach to the licensing of mines it is difficult to gauge which mines are responsible for pollution [19/07/2017]", according to farmers, implicitly indicating the likely undermining of the licensing conditions that pertained

to regulatory processes and water knowledge production key to the regulatory enforcement of the water use of coal mines. The proximity of the water use of coal mines to each other undermined the premise of the water quality and quantity monitoring programme that was to assign responsibility for the pollution and damage of water bodies to individual coal mines. Specifically, the resultant poor quality water knowledge was not adequate for regulatory enforcement decision making for individual coal mines. For instance, Brakfontein Coal Mine used the proximity of Delmas Colliery to circumvent culpability for pollution and damage of water bodies as outlined by Delmas farmers "Brakfontein Mine argues that the pollution of the Wilge River is not due to them but from Delmas Colliery [19/07/2017]."

The practice of the intergovernmental licensing of water and mining licenses influenced the allocation of WULs in a manner that resulted in unfair and unequal praxis of allocation. In the shadow of intergovernmental licensing the allocation of WULs of coal mines in proximity to each other undermined the efficacy of regulatory processes and water knowledge production to inform enforcement decision making. The consequence was the unfair and unequal recognition of water bodies and agricultural water users that would plausibly negatively affected by the water use of coal mines. The unfair participation of the licensing authority in the praxis of allocation contributed to the undermining of the practice of enforcement and the inequitable access and use of water for agricultural users as a result of likely water pollution and damage. In this context, the likelihood of pollution and thus the inequitable use of water for agricultural users also pointed to the normalisation of the possibility of water scarcity in the future. Coal mining water struggles centred on the role of the licensing authority in the normalisation of immediate and the potential of future water scarcity for agricultural users.

7.5.2 The Misuse of the Regulatory Obligations of Coal Mines as a Mechanism to Control and Undermine Licensing Conditions of Regulatory Processes and Water Knowledge Production

As outlined earlier, the licensing conditions of section 29 (1) partly set out the regulatory obligations of the water user. These conditions clarified the role of coal mines in regulatory processes. In the context of these findings, the role of coal mines particularly centred on regulatory processes of the production and analysis of water knowledge; and the facilitation of the use of water knowledge in regulatory enforcement processes.

Brakfontein Coal Mine's licensing conditions on the water quality and quantity monitoring programme required the mine to have boreholes for the collection and analysis of groundwater quantity and quality data. Delmas farmers explained "according to Brakfontein mine's WUL it was meant to have boreholes to test water quality and quantity but the mine does not have its own boreholes for testing [12/07/2017]." The Delmas farmers highlighted the coal mine's licensing conditions on water quality and quantity monitoring required the boreholes to be placed at specific locations "instead Brakfontein mine insists on testing water quality on the boreholes of surrounding farms [12/07/2017]." The farmers, explained the implications of the misplacement of the boreholes:

> Brakfontein mine doesn't even have the necessary on-site boreholes to monitor the negative impacts of authorised water use as a basis to order rehabilitation [12/07/2017].

Farmers complained should contamination be picked up on adjacent farms there was no means to pinpoint the mine as the source of the contamination [12/07/2017]. Delmas farmers engaged Brakfontein Coal Mine on their concerns regarding the licensing non-compliance of the location of the boreholes as stated:

> The Brakfontein mine has been engaged by farmers on the matter but has not changed the situation on the water quality monitoring programme [12/07/2017].

Accordingly, Brakfontein was not compliant with licensing conditions that framed the water quality and quantity monitoring regime [12/07/2017]. This non-compliance in the context of farmers interactions with the coal mine on the matter, was a purposeful weakening of the practical functioning of licensing conditions that guided the water knowledge production process and thus water knowledge that informed regulatory enforcement decision making.

The licensing conditions of the water quality and quantity monitoring programme also obligated a coal mine engaged in licensed water use to test water bodies near a mine at points stipulated in a mine's WUL. Two local farmers pointed out Vanggatfontein Colliery tested the water quality of the Wilge River to track possible pollution from the mine [19/07/2017]. However, the farmers criticised the mine's testing practice because "Vanggatfontein mine does the testing upstream of the Wilge River meaning the mine is discounted as a polluter [19/07/2017]." By testing upstream of the mine Vanggatfontein was accused of deliberately not following licensing stipulations on testing sites to discount itself as a possible source of the pollution and damage of the river.

Adding to the obfuscation of culpability for pollution and damage of water bodies due to the undermining of licensing conditions, coal mines also blamed farmers for water pollution. However, farmers responded they "…have been using water in Delmas for a very long time without these levels of water pollution that have only emerged after the growth of mining in the area [19/07/2017]." Farmers also noted:

> Farmers cannot be responsible for water pollution because their water use is seasonal and farmers also use contours around the edge of their farms that trap topsoil and thus limit pollution [19/07/2017].

Licensing conditions on regulatory processes and water knowledge production put into relief the role of science in the practice of water regulatory rules on environmental regulatory standards, and their decision making, in the regulation of water use for polluting industries such as mining (Himley, 2014: 1072). Further, rather than being accepted as objective knowledge as it is presented, scientific knowledge claims were contested as they ordered, for instance, hydrological science thereby structuring regulatory decision making often in ways that benefitted specific water users (Linton and Budds, 2014: 171).

An example of the utility of water knowledge in determining water use was in the standardised framing of water knowledge by water regulatory rules that ordered water knowledge and thus expertise that could be deployed to provide assessments of the impact of extractives on water bodies that did not impede the water use of extractives (Cornejo and Niewöhner, 2021: 7). On the other hand, non-extractive water users leaned on knowledge frames on the periphery of water regulatory rules of the authorisation, and enforcement, of water rights (*Ibid*.). Based on the findings, another manner in which water knowledge ordered the water use of coal mines in this case, was through the use of the role of coal mines in regulatory processes that related to the development of water knowledge to impede the adequate function of water regulatory decision making.

This amounted to the curtailment of water regulatory decision making's ability to function in a fair and equal manner that recognised and protected water bodies from pollution and damage thereby also recognising and protecting the water use needs of agricultural water users. Accordingly, coal mines undermined water knowledge, and regulatory enforcement, normalising potential water scarcity for agricultural water users. Herein, coal mines misused the structured participation of licensed water users in regulatory processes and enforcement

decision making leading to the potential of inequitable use of water for agricultural users exposed to pollution and damage. The misuse of the participation of coal mines as users to control regulatory decision making exposed agricultural users to pollution and damage and thus normalised the potential of future water scarcity in Delmas. The role of regulatory enforcement in the normalisation of potential of future water scarcity was at the core of coal mining water struggles in Delmas.

7.5.3 The Role of the Technical Complexity of Licensing Conditions on Water Knowledge in the Control and Undermining of Water Regulatory Enforcement of Water Use Licensing of Brakfontein Coal Mine

Another mechanism of the control, and consequent undermining, of the regulatory enforcement of WULs in Delmas through water knowledge, was the technical complexity of the praxis of water knowledge. Section 29 (1) (b) prescribed licensing conditions on regulatory enforcement processes, the obligations of a license holder relative to these enforcement processes and the production, benchmarking (based on) and use of water knowledge as part of these regulatory processes. These licensing conditions were crucial to the enforcement processes and water knowledge that informed, and undermined, regulatory enforcement decision making on the WULs of coal mines. However, water knowledge as framed by these licensing conditions was sometimes not practical.

The impracticality of water knowledge that enabled the control and undermining of the regulatory enforcement of Brakfontein Coal Mine partly emanated from the mine's change of ownership. This water knowledge was reflected in licensing conditions that informed Brakfontein Coal Mine's water infrastructure. A coal mine official "worked on a lot of brownfield water infrastructure projects to ensure compliance on the mine, which was a brownfield mine, including: installed water meters, dug water trenches as stormwater management was not in a good state, also rehabilitating trenches by cleaning them to allow water flow, putting the water storage tank by the washing bay on a platform, etc [12/08/2017]." Implicit in the above statement from the coal mine official, non-compliance issues with the mine's water infrastructure was due to the acquisition of the coal mine with existing infrastructure. This was stated explicitly below:

> Much of the challenges that are at Brakfontein are due to the mine having being bought as a mine that was previously operational [12/08/2017].

In other words, the mine was acquired with water infrastructure that was non-compliant with the water knowledge, and thus licensing conditions typical, of the NWA and its water regulatory regime. Continuing with non-compliant water infrastructure, "Brakfontein mine did not have a compliant PCD but it received a WUL regardless [19/07/2017]" according to local farmers. The farmers incorrectly assumed a brownfield mine with non-compliant water infrastructure should not be allocated a WUL. The regulatory problem arose from how a PCD non-compliant with water knowledge, in the form of benchmarks of infrastructure licensing conditions, was to be made compliant with water knowledge and thus infrastructure benchmarks aligned to the NWA water regulatory regime. A coal mine official stated the following on the matter:

> There was an unlined PCD that a consultant had suggested should be pumped out and rehabilitate it by lining it [12/08/2017].

The use of a non-compliant PCD, and the alignment thereof to regulatory benchmarks on infrastructure, created technical complexity. Brakfontein Coal Mine battled to ensure compliance of the PCD with infrastructure benchmarks under the NWA water regulatory regime. A coal mine official stated "the challenge, while fixing the non-compliant PCDs to meet WUL requirements, is what to do with the contaminated water stored in the PCDs [12/08/2017]." This technical complexity undermined the regulatory enforcement of water infrastructure that was initially non-compliant such as was the case with the Brakfontein Coal Mine's PCD. Moreover, when Brakfontein Coal Mine attempted to rectify the technically non-compliant PCD, the DWS impeded this effort. A coal mine official explained "…the DWS said they should leave it as is because there was wildlife such as ducks and birds using the water in the PCD [12/08/2017]." This left the coal mine unsure of the proper approach to bring its PCD into compliance with the infrastructure licensing conditions of the NWA water regulatory regime. A coal mine official outlined this below:

> So Tegeta was confused as to what to do with it [12/08/2017].

Furthermore, the technical complexity of bringing the PCD into compliance with infrastructure licensing conditions of the NWA also had a financial facet. Ensuring compliance with infrastructure licensing conditions of the NWA carried prohibitive costs. A DWS official confirmed "the lining of PCDs with clay carries possibly prohibitive costs [06/07/2017]." A Brakfontein coal mine official reiterated this point:

> This speaks to the higher expenses linked to mine infrastructure development for compliance in brownfield mines as opposed to greenfield mining projects – as is the case with Brakfontein mine which had to develop a PCD and other infrastructure which disrupted mining operations [12/08/2017].

The costs of infrastructure compliance for brownfield mine water infrastructure was even more onerous for a junior mining company such as Tegeta that owned Brakfontein Coal Mine. The coal mine was forced to circumvent the technical complexity of technical infrastructure compliance as noted below:

> A new PCD was constructed around 2014 with proper lining to DWS's specifications [12/08/2017].

Technical complexity spoke to licensing conditions, and the water knowledge that informed benchmarks, as sometimes impractical. This impracticality indirectly controlled and undermined the regulatory enforcement of the licensing conditions of the WUL of Brakfontein Coal Mine in Delmas. Due to its impracticality water knowledge failed to facilitate regulatory enforcement so that water infrastructure functioned to "ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons…" in line with the regulatory mandate set out in section 2 of the NWA.

Water knowledge was pivotal to the development, maintenance and operation of water infrastructure as pointed out earlier in chapter two. Infrastructure as engineering interventions on water was based on, amongst others, water knowledge shaped by, and geared to facilitate, regulatory rules (Roth, 2005: 67). So "water truth and knowledge claims" were social expressions of power dynamics that shaped the society-water interrelations and thereby ordered water use (Boelens, 2014: 235). In Peru, water knowledge in water regulatory practices were central to the ordering of the water use of the largest gold mine in the country (Li, 2009: 218-223). Water struggles in this context centred on the exclusion of water users from participation in water regulatory decision making and implementation of rules and processes (Hoogesteger *et al*, 2017: 2). Accordingly, coal mining water struggles particularly related to the role of water knowledge in curtailing the participation of water users and regulator, and recognition of water use interests; in the praxis of the regulatory rules key to the control of water pollution and damage to water bodies. The impeding of the facilitation of the participation of water users and the regulator as well as recognition of water use interests, through water knowledge, in the enforcement of regulatory processes and rules;

likely meant the exposure of such water users to pollution and damage. This meant the normalisation of the possibility of future water scarcity for agricultural users due to the water use of coal mines in Delmas.

7.6 Conclusion

Based on the findings, the regulation of the water use of coal mines was central to the pollution and damage of water bodies and the consequent scarcity of water for agricultural users. The influence of regulatory practices on water scarcity meant scarcity moved beyond immediate scarcity of water quality and quantity. Instead, water regulation structurally normalised the likelihood of water scarcity not just in the immediate but also in the future. In other words, water regulation temporally entrenched the risk of water scarcity beyond contemporary dynamics of scarcity.

The influence of water regulation on the normalisation of potential future water scarcity was varied. The influence of water regulation on the normalisation of water scarcity included delays and failures in allocation due to the undermining of the human resource and technical capacity of the licensing authority, control of licensing decision making and the undermining of the human resource and technical capacity of regulatory enforcement. These dimensions of the influence of water regulation on the normalisation of water scarcity were interconnected as for instance; delays and failures in licensing and control of licensing decision making impacted regulatory enforcement.

The varied approaches to the normalisation of water scarcity through water regulation illustrated diverse mechanisms through which regulation normalised water scarcity. These mechanisms included the undermining of the function of water regulation as well as control of the intended function of water regulation. In the former water regulation was made dysfunctional whilst in the latter the function of water regulation was diverted from its original purposes. Both forms of mechanisms forestalled the regulatory authority's ability to license, ascertain non-compliance and enforce compliance in the water use for coal mines.

The varied mechanisms depended on unfair and unequal water regulatory practices that led to inequitable access to, and use of, water for agricultural users in Delmas. The loci of coal mining water struggles consequently were these mechanisms through which water regulation and regulatory practices shaped the unfair and unequal allocation, recognition and

participation of water users to inequitably order the water use of coal mines in Delmas. This ordering of the water use of coal mines conversely normalised immediate as well as the potential of future water scarcity for agricultural water users. Hence, coal mining water struggles were not necessarily about physical water scarcity or the complete unsuitability of water due to pollution. Coal mining water struggles seemingly concentrated on the failure of water regulation to function as designed in allocation and enforcement in alignment with the regulatory mandate. Agricultural users viewed the failure of water regulation to function as intended as exposing their water use to normalised water scarcity. Agricultural water users also contested the control of water regulation to function, from their perspective, outside of the regulatory mandate and in a manner biased towards the water use of coal mines.

8. Discussion of The Normalisation of Water Scarcity and the Role of Mechanisms of Water Regulation's Normalisation of Water Scarcity on the Nature of Coal Mining Water Struggles in Delmas

8.1 Introduction

State authority was the common factor in the discussion of the normalisation of water scarcity and the mechanisms of the influence of water regulation thereon. State authority was accordingly the focal point to the interpretation of the findings of chapters six and seven and the rationale for the amalgamation of the discussion of the two empirical chapters into this chapter. Accordingly, chapter eight interpreted findings aligned to research question one. Research question one was outlined below:

> What is the nature of coal mining based water struggles in Delmas, South Africa and what is the role of water regulation in the nature of coal mining water struggles?

Chapter eight also discussed findings on research question two on mechanisms of the influence of water regulation on the normalised water scarcity at the core of the nature of coal mining water struggles, as stated below:

> How does water regulation influence the nature of coal mining water struggles in Delmas?

This chapter follows arguments in chapters two and three on the interrelation of the socionatural relations of water and water regulation; by arguing water scarcity, a specific coal-centric ontology of water and water regulation/rights as interconnected component themes of what can be termed coal-centric socionatural relations of water that influenced water regulation. These themes were posited as interconnected discourses and practices of water scarcity, the coal-centric ontology of water and water regulation/rights; that were interpreted through water grabbing as shaping water regulation as a site of state-capital cooperation that influenced society by ordering the water use of coal mines above water bodies and other water uses in Delmas. Water grabbing interpreted coal-centric socionatural relations of water as effecting state-capital collaboration that shaped the function and praxis of the licensing and regulatory enforcement authority to order the water use of coal mines in Delmas. The resultant control was key to the (dys)function of licensing and regulatory enforcement unfairly, unequally and inequitably ordering the water use of coal mines in Delmas. The

discourses and practices of water scarcity, the coal-centric ontology of water and water regulation/rights of the coal-centric socionatural relations of water provided a window to understanding mechanisms behind the function and practice of water regulation that unfairly, unequally and inequitably ordered the water use of coal mines.

In turn, through the perspective of water grabbing; the (dys)function and praxis of water regulation through discourses and practices of water scarcity, the coal-centric ontology of water and water regulation/rights of the coal-centric socionatural relations of water provided insight into the immediate and normalised potential of future water scarcity in Delmas. Thus the understanding of the normalisation of water scarcity was through coal-centric socionatural relations of water and the practical manifestation thereof in terms of the state-capital collaboration that affected the (dys)function and praxis of water regulation to the benefit of the water use of coal mines.

8.2 Control Grabbing Perspective of the Function of the Licensing Authority Due to the Normalisation of Water Scarcity at the Core of Coal Mining Water Struggles

In the case of South Africa the introduction of administrative use rights, in the form of water use licensing, meant a construct of wherein the state was central to the allocation of water rights (Movik, 2009: 1). With the exception of small scale users, small scale water users by groups and ELUs; all water use; required WULs for specific water use with licensing conditions (Movik, 2014: 190-191). Section 21 of the NWA, detailed all regulated uses from and that affected water bodies, that required WULs. Licensed water uses were applied for by prospective users, and authorised, by the state through the DWS; for large volume uses by commercial water users (Anderson *et al*, 2007: 169).

The public trusteeship doctrine and consequent state-centric licensing anchored the central role of the state in the allocation of water rights. The public trusteeship doctrine designated water a national resource of the people of South Africa held in custody by the state for the people of South Africa (Anderson *et al*, 2007: 167). The state did not own water (Thompson, 2006: 279). The discursive construct of public trusteeship of water, detailed in the National Water Act, was the basis for state control of all water, as nature in South Africa, on behalf of South Africans. The construct of public trusteeship the state as the trustee was enjoined, in the National Water Act, to allocate water for water users and uses according to the regulatory mandate in section 2 of the NWA that enjoined national government to “ensure that water is

protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons…". Licensing decision making was also based on the licensing considerations of section 27 (1) of the NWA. Licensing decision making was framed through the licensing prioritisation framework of the National Water Strategy that prioritised five water uses (National Water Strategy, 2013: 47).

Accordingly, the theme and discourse of water regulation/rights was prominent to the construct and function of the licensing authority. The construct of water regulation/rights particularly shaped the practice of licensing decision making that ordered the water use of coal mines in Delmas. The construct of water rights, and associated regulatory rules, determined the allocation of water rights and thus access and use of water by water users. Water grabbing, in the form of control grabbing of licensing decision making explained the role of licensing, and implicitly of the state; on the normalisation of the potential of future water scarcity, mechanisms of the practice of water regulation that normalised water scarcity, and thus the nature of coal mining water struggles.

A form of control grabbing relevant to this thesis was the control grabbing of licensing decision making and use of authority to control the allocation of water use. Control grabbing in the form of the apprehension of authoritative decision-making processes that determined how, why and by whom water is to be used in the present and future in order to grab the value of water use (Franco *et al*, 2014: 3). Water grabbing also targeted water through the control grabbing of water rights and regulatory processes as the "capture" of the power to allocate water use and sharing of their benefits (Mehta, Veldwisch and Franco, 2012: 195-197). This indicated control grabbing as targeting and repurposing the power, as licensing processes, to order water uses.

The state authority was a conduit of the power to allocate water use through licenses. Control grabbing grabbed the power, specifically of the state authority in the context of this study, to centrally order water use through the allocation of water use. The power of users was crucial element to informing the control grabbing of the processes of decision making as implicitly noted below:

> Water grabbing occurred when powerful social actors controlled water and/or used water for their own benefits (Mehta, Veldwisch and Franco, 2012: 197).

The control grabbing of power through state authority, enabled powerful water users to order particular water users in the allocation of water rights. In this case, the control grabbing of power through state authority, and in particular licensing decision making; facilitated the ordering of the ontology of water. The ontology of water, that framed what water could be used for and by whom, was a central, if implicit, thread throughout water grabbing as noted below:

> The central aim of water grabbing was the control of the benefits of water use, what Veldwisch *et al* (2018: 61) referred to as value grabbing.

The power of water users, mirrored the complexity of their water uses and interests, to reflect the consolidation of diverse social interests, groups and forms of power. State-capital or public-private interests coalesced into alliances that control grabbed through the infiltration and control processes of authority in relation to water rights and regulation (Franco, Mehta and Veldwisch, 2013: 1655). Further, the ontology of water was shaped by powerful political and economic interests that ontologically ordered water as an economic water use. The outcome was that the allocation of water rights, water availability through, often supported priority economic water uses as stated below:

> Economic development as a driver of water allocation can lead to political processes and decision making that prioritises the highest value economic activities in water allocation to the detriment of other water users (Finewood and Stroup, 2012: 72-73).

On another level the influence of the ontology of water was also in the shaping of the understanding of what water is that determined water rights, and the regulation and function thereof. The ontological positioning of water as a public good or a commodity shaped how it should be used and therefore allocated (Clarke-Sather, 2012: 99). The centring of efficiency and thus economic uses of water in the ontological construct of water, was another dimension of the shaping of the water regulation as outlined below:

> The discursive predominance of market principles of commodification, privatisation and commercialisation led to market oriented regulation of water focused on economic growth and efficiency gains (in water use) (Ioris, 2013: 915).

Social power played an important role in prioritising efficiency and in turn shaping the discursive construct of water. An avenue of the use of social power in shaping the discursive construct of water through the prioritisation of efficiency was through the control and use of water knowledge in control grabbing through the discursive construct of water use as wasted

or inefficiently used if not developed - through water infrastructure - to serve economic water uses (Mehta *et al*, 2012: 199). The predominant forms of water knowledge informed the structure and function of water regulation.

Given efficiency was a discursive appendage of the discursive construct of water scarcity; the practical ordering of economic-centric ontology of water in water regulation and rights was influenced by the discourse of water scarcity. This perspective centred productivity and efficiency of water use in the problematisation of water scarcity meaning uses deemed inefficient in meeting social and economic outcomes were less prioritised in water regulatory allocation (Jairath, 2010: 226). This meant the praxis of water scarcity for water uses considered to be non-priority uses was linked to the entrenchment of the discourse of water scarcity in water regulatory processes that determined the allocation of water. Water scarcity thus facilitated an economic-centric ontology of water that cemented a bias in allocation decision making towards economic water uses.

The economic-centric ontology of water was embedded in considerations that framed licensing decision making in section 27 of the NWA. Section 27 (1) (c) centred an economic ontology to licensing through the framing of efficiency as a consideration in licensing decision making. Section 27 (1) (c) also utilised the consideration of uses beneficial to the public interest as an ontological frame of the consideration of efficient uses of water. These beneficial uses were expanded on in the National Water Strategy as leaning towards economic benefits to the South African public. Section 27 (1) (d) explicitly referred to the socio-economic consideration in framing the licensing decision making of water uses. Further section 27 (1) (i) ontologically framed water according to the strategic importance of water uses. Accordingly, the strategic benefits to society of a water use framed licensing decision making. These strategic benefits were expanded in the National Water Strategy as inter-catchment transfers and as electricity generation, uses that were of an economic nature. The National Water Strategy, through the ranking of priorities, also ontologically framed water and water use licensing decision making into five categories. These were ranked as 1) water availability for basic human needs and the Reserve for environmental sustainability, 2) water availability for international obligations connected to international water bodies, 3) water availability for the redress of historical racial, gender and poverty reduction, 4) water uses of strategic importance to the national economy, and 5) water use for economic activities. The economic-centric ontology of water was prevalent in the ranking of water use priorities.

Water scarcity was prominent in the preamble of the National Water Act that stated "Recognising that water is scarce and unevenly distributed natural resource that occurs in many different forms which are all forms of a unitary, inter-dependent cycle…". The foregrounding of water scarcity could be viewed as conversely embedding an economic-centric discourse of efficiency.

The control grabbing of state authority meant control over the power to order, in praxis, the coal-centric ontology of water in licensing decision making, a form of an economic-centric ontology of water. The coal-centric ontology of water controlled the function of licensing decision making in a manner that ordered the water use of coal mines beyond the legal framing of water use licensing. The National Water Act did not outline economic water use as the only water use to be considered in licensing decision making. However, in practice the coal-centric ontology of water was ordered above other water use licensing considerations and thus ontological frames of water. The National Water Strategy, as one of the key legal and regulatory instruments that shaped water use licensing, did not prioritise the economic ontology of water as the highest priority water use. For instance, environmental sustainability as a water use was ordered as a priority water use above the economic ontology of water. Nonetheless, in praxis, the coal-centric ontology of water was treated as the highest priority water use in licensing decision making.

The licensing reforms of the OES further hegemonised the coal-centric ontology of water to facilitate the control grabbing of water use licensing decision making. The OES was crucial to the structural interrelation of the water use and mining licensing authorities. The OES functioned as a mechanism for the control grabbing of the licensing authority that subverted the licensing authority supporting the mining licensing authority and thereby the mining-centric mining mandate. The effect of the OES was to order, outside of the regulatory framing of the criteria for licensing decision making; socio-economic impact, strategic importance of the water use and efficient and beneficial water use in the public interest. Thus instead of functioning as an independent state authority, in praxis, the licensing authority simply followed the mining licensing authority. The result was the effective undermining of the mandate of the licensing authority. This was evident in the water use licensing - in line with mining licensing - of the water use of coal mines in proximity to water bodies. Consequently, the water use of coal mines was ordered above considerations that related to the protection of the water quality and quantity of water bodies due to the water use of nearby coal mines.

Consequently, licensing decision making was biased towards the water use of coal mines. This meant licensing decision making ignored other relevant considerations as set out in Section 27 of the NWAt. For instance, Section 27 of the Act required the consideration of the possible impacts of licensed water use on water bodies and other water users, the water quality requirements of the Reserve, and impact on the water quality of water bodies; amongst others. This meant the function, and exercise, of the water use licensing authority was not aimed at the comprehensive attainment of the mandate of water regulation as set out in Section 2 of the National Water Act. Instead, the water use licensing authority was control grabbed into a parochial focus on supporting the water use of coal mining.

Control grabbing of the licensing authority controlled and used state authority and thus power; to effect licensing decision making consistent with the coal-centric ontology. In so doing, control grabbing through the coal-centric ontology of water, stealthily changed the water use licensing mandate. The predominance of the coal-centric ontology of water, aligned to the mandate for the promotion of mining at the heart of the mining licensing authority, facilitated the control grabbing and thus subversion of the mandate of the water use licensing authority. The subsequent implicit refocusing of the licensing mandate arguably informed the licensing of water use of coal mines recklessly in proximity to water bodies, proliferation of coal mines to the extent that mines engaged in water use in close proximity to each other thereby undermining the efficacy of regulatory enforcement processes, lack of adequate exercise of technical analyses to inform licensing decision making, and inadequate capacitation of the licensing authority. The outcome was the ordering of the water use of coal mines over water bodies and other water uses in licensing decision making.

In control grabbing the processes of decision making of the allocation of water use, powerful social actors were not only ensured water availability for their water use interests but also exposed other water users to the burdens of such control and use of water (Franco *et al*, 2014: 3). In other words, control of water or the redirection of the use of water to secure the benefits thereof; meant the exposure of other water users to water scarcity (Mehta, Veldwisch and Franco, 2012: 197). Water availability and conversely scarcity was often the result of the ordering of a predominant ontology of water that shaped the discourse and practice of licensing decision making.

Control grabbing of water use licensing decision making through the coal-centric ontology of water thus normalised water scarcity as a water problem at the core of the nature of coal mining water struggles. The exercise of the licensing authority inconsistently with the

National Water Act and National Water Strategy, meant the failure of licensing to protect water bodies and ensure sustainable water use. The practice of the state authority and power, through licensing, did not recognise and thus consider water bodies, uses and their requirements in an equal and balanced manner. Instead, the water use licensing authority functioned in a partial manner that ordered the water use of coal mines even at the cost of pollution and damage to water bodies and resultant normalisation of the potential of future water scarcity for agricultural water users.

The coal-centric ontology of water ensured the inequitable allocation of water use to coal mines. Conversely, the coal-centric ontology of water also led to the inequitable shouldering of the burdens of pollution and damage of water on agricultural users. The partiality of the licensing authority due to the ordering of the coal-centric ontology of water meant licensing decision making was inherently unfair to agricultural water users. This structurally exposed agricultural water users to the normalisation of potential future water scarcity. Moreover, the failure of the water use licensing authority, as the state, to be objective in dealing with water users and to protect agricultural water users as water users vulnerable to changes in water quality was at the core of the nature of coal mining water struggles. The state, as the water use licensing authority, instead played a pivotal role in facilitating inequitable access to water leading to the normalisation of the potential of future water scarcity key to the nature of coal mining water struggles.

The coal-centric ontology of water further facilitated control grabbing of licensing decision making that in turn undermined fair and equal participation of the regulatory authority in the enforcement of WULs in Delmas. Control grabbing undermined the adequate execution of technical processes meant to inform licensing decision making. In consequence the licensing conditions allocated by the licensing authority failed to provide adequate benchmarks against which the licensing authority could enforce the WULs of coal mines in Delmas. The control grabbing of the licensing authority therefore ordered the water use of coal mines by curtailing the ability of the regulatory authority to enforce the water use of coal mines in Delmas.

The control grabbing of state authority over licensing meant control over the power to determine the use of licensing decision making framework. This meant the discretionary power to decide whether to use, in whole or part, and to the benefit of a specific water use; the regulatory mandate, licensing considerations and water use prioritisation. Control grabbing of state authority was the basis for the determination of the praxis of the function of licensing decision making. For instance, through control grabbing of state authority facilitated the

delays and failures that curtailed the function of licensing decision making. Further, the control grabbing of state authority enabled the undermining of the human and technical capacity of the licensing authority that curtailed the exercise of licensing decision making.

An outcome of the control grabbing of the state authority was the curtailment of the function of licensing thereby leading to unfair, unequal and inequitable water use by coal mines outside of the licensing decision making framework. In other words, this water use was not based on the regulatory mandate, licensing considerations and water use prioritisation that sought to integrate fair and equal allocation based on the recognition of water bodies and other water uses (including those of water as the environment). Thus water use was not equitable as it was not based on technical analysis and decision making processes geared towards recognising the water use requirements of water bodies and other uses. Without the technical analyses that informed licensing decision making there was also a lack of a basis for the adequate participation of other water users in licensing decision making with negative implications for the participation of users and the regulator, through state authority, in regulatory enforcement.

The discursive nexus of water regulation/rights, water scarcity and ontology of water interrelated underpinned coal-centric socionatural relations of water characterised by state-capital cooperation. The control grabbing of state authority as the licensing authority implicitly depended on state-capital cooperation to control the function of the licensing authority and ensure licensing decision making allocated the benefits of water use to coal mines in Delmas. Control grabbing, in the context of coal-centric socionatural relations of water, meant the processes of licensing decision making were inherently unfair and unequal leading to the inequitable allocation of water that benefitted the water use of coal mines. Control grabbing through coal-centric socionatural relations of water also structurally did not recognise the biophysical nature, and requirements, of water bodies nor the economic water use requirements of agricultural users. The control grabbing of licensing decision making, through coal-centric socionatural relations of water, practically undermined the participation of the regulatory authority in the execution of its regulatory role of its enforcement processes. Further, the control grabbing of licensing decision making based on coal-centric socionatural relations of water facilitated the misuse of the regulatory enforcement role of the curtailment of coal mines in the participation of the regulatory authority in enforcement.

8.3 Extra-Legal Water Grabbing Perspective of the Influence of the Undermining of Licensing on the Normalisation of Water Scarcity at the Core of Coal Mining Water Struggles

Water grabbing in this study was relevant partly through the control, use and manipulation of the authority of water rights and the regulation thereof. This control, use and manipulation depended on the power of water users and regulators over, and within, the authority of water rights and regulation. The power of water users and regulators to manoeuvre water regulation was two-part; on the one hand was the power to shape and manoeuvre the form of water regulation that made its function malleable to control and manipulation and on the other hand was the power of water users and regulators that could be exerted on water rights and regulation in order to control and manipulate the function thereof. Water users (and for this study, also regulators) utilised their power over and/or within the authority of water rights and regulation to shape, and navigate through, legal and illegal and formal and informal water rights and regulation regimes (Franco *et al*, 2014: 5). This approach moved water grabbing beyond the legal-extra-legal dichotomy. Legal and extra-legal water grabbing in this study functioned in an interrelated manner, respectively through control grabbing and extra-legal water grabbing, to enable water grabbing.

The discursive construct of public trusteeship of water, detailed in the NWA, was the basis for licensing as a form of water rights. Licensing as an administrative use rights form of water rights discursively centred, and functioned through, the state authority in the control of the allocation of WULs. The exercise of the licensing authority was through the DWS as the executive branch of government. Licensing decision making was framed by licensing considerations and the regulatory mandate of the NWA, and the water use priorities ranked by the National Water Strategy,.

In the context of control grabbing, the role of the state authority as the licensing authority in the allocation of water rights meant state authority was the target of control grabbing. Control grabbing undermined, delaying and preventing, licensing decision making. The undermining of licensing decision making enabled the ordering of the coal-centric ontology of water outside of licensing decision making. The hegemonisation of the coal-centric ontology of water even outside licensing decision making facilitated the extra-legal water grabbing of water use by coal mines in Delmas. In the undermining of the licensing authority extra-legal water grabbing facilitated extra-legal water use as outlined below:

> Extra-legal approaches to water grabbing also took the form of the violation of the law and regulations to appropriate water to the detriment of less powerful water users (Franco *et al*, 2013: 1655). The violation of the law and regulations relative to water was linked to another extra-legal method of water grabbing - the undermining of processes of accountability integral to democracy (*Ibid*.).

Coal mines were central in undermining licensing decision making through the role of coal mines in the technical analyses and processes that informed licensing decision making. The role of coal mines in control grabbing was through the failure to submit technical reports, and presumably conduct some of the technical analyses, that made up the comprehensive technical report on a licensing applicant's intended water use. The comprehensive technical report informed the qualitative assessment of licensing applicants that in turn determined licensing decision making. The result was the undermining of the technical analyses and processes that informed licensing decision making.

The consequence of coal mines' undermining some of the technical analyses and related reports was a lack of a basis for the technical assessment by the licensing authority of the potential impacts of prospective water uses of applicant coal mines on water bodies, other water users, the environment, etc. The implication was the undermining of the ability of the licensing authority to provide decision making on measures and benchmarks outlined by technical analyses and reports to limit, prevent and ameliorate the prospective effects of an applicant's water use. Without licensed water use the water use of coal mines lacked the licensing conditions specifying measures and benchmarks to track the effects of the water use of coal mines to prevent and address pollution and damage as a result of licensed water use.

The undercutting of licensing decision making in tandem with the intergovernmental ordering of the mining licensing authority as state authority above the water use licensing authority as state authority; was key to the transposition, and ordering, of the coal-centric ontology of water outside of the licensing authority's decision making. Key to the ontological hegemony of coal-centric water use outside of the licensing authority was the prioritisation of the mining licensing authority's core mandate of the promotion of mining. The ordering of the mining mandate hinged on the intergovernmental ordering of the mining over the water use licensing authority. The result was the ordering of the coal-centric ontology of water external to the licensing authority thereby facilitating the operation of coal mines only on the basis of mining licenses. The undermining of the technical processes of licensing, by coal mines, and the

intergovernmental ordering of mining mandate, through state authority, ordered the coal-centric ontology of water outside of licensing decision making to facilitate extra-legal water grabbing by coal mines.

Another dimension of extra-legal water grabbing was based on the undercutting of the licensing authority through the undermining of the human resource and technical capacity necessary for licensing decision making. The control grabbing of the licensing authority, likely through regulators and by implication their political oversight, was key to the undermining of the human and technical capacity of the licensing authority. This control grabbing of licensing decision making undermined adequate technical and administrative processes. Without the adequate capacity to execute the necessary technical and administrative processes the licensing authority could not, or was delayed in, licensing decision making. The outcome was the curtailment of the allocation of WULs to facilitate licensed water use by coal mines.

The resultant delays and failures in the allocation of WULs, as an outcome of control grabbing, were utilised by coal mines as a rationale for extra-legal water use of coal mines in Delmas. The purported failure of the licensing authority to execute its function to allocate WULs was presented by mining sector representatives as forcing coal mines to engage in extra-legal water use. This extra-legal water use in practice was extra-legal water grabbing by coal mines dependent on, and fostering, the ordering of the coal-centric ontology of water outside the water regulatory framework. The coal-centric ontology of water in this context was not only the result of the intergovernmental ordering of the mining mandate but also the ordering of the commercial interests of coal mines so that coal mines engaged in water use regardless of the allocation of licenses by the licensing authority. The curtailment of licensing decision making through control grabbing also ordered the coal-centric ontology of water by facilitating the circumvention of the lengthy water use licensing process and decision making. Control grabbing facilitated extra-legal water grabbing that created a pathway for the swift access, and use, of water for coal mines in Delmas.

Control grabbing of licensing decision making that advanced extra-legal water use through extra-legal water grabbing was further utilised to motivate the introduction of the OES. The OES's setting of the structural interrelation of the water use and mining licensing authorities ordered the mining licensing authority, and mining mandate, further anchoring the control grabbing of water use of licensing decision making that facilitated extra-legal water grabbing as extra-legal water use. The OES introduced measures that practically cemented the control grabbing of the water use licensing authority. These measures were based on the

intergovernmental hierarchy of mining licensing over water use licensing. In practice this meant measures that strengthened the state authority of mining over that of water use licensing and included the reorganisation of licensing responsibilities between water use and mining licensing, the streamlining of timeframes for water use and mining licensing decision making and the setting mining licensing as the initiator in mining and water use licensing.

Through these measures the mining licensing authority was able to engage in the control grabbing of the water use licensing authority. Control grabbing impeded independent licensing decision making subordinating the function of water use licensing authority the promotion of mining as a mandate of the mining licensing authority. As a result of control grabbing through the OES, the licensing authority lacked capacity and therefore allocated dysfunctional licensing conditions that inhibited the function of licenses as a blueprint for regulatory enforcement.

A consequence of the control grabbing of state authority as licensing authority was the inability of the licensing authority to allocate licenses according to the licensing decision making framework. Coal mines were able to engage in unlicensed water use even as that water use was meant to be licensed under section 21 of the NWA meaning the licensing authority did not assess the impacts of, and present counter-measures in licensing conditions, for such water use on water bodies. As such extra-legal water use did not balance and reflect the varied licensing considerations section 27 (1) of the NWA nor was such water use consistent with the water use priorities ranked in the National Water Strategy. Accordingly, coal mines engaged in extra-legal water use that the licensing authority failed to ensure was compliant with the regulatory mandate of the NWA.

Behind the extra-legal water grabbing was a bias for the water use of coal mines in Delmas to the extent that the licensing authority was treated as a possible impediment to the water use of coal mines. Hence, the coal-centric ontology of water circumvented the state authority as a licensing authority and thus the potential of that authority to limit, impede or delay water use of coal mines. The ordering of the coal-centric ontology of water illustrated a motivation to ensure the availability of water, and thus avoidance of water scarcity, for coal mines outside of the legal margins of the state authority as licensing authority. The control grabbing of the licensing authority and consequent extra-legal water grabbing was a mechanism that curbed the ability of the licensing authority to expose coal mines to water scarcity particularly due to the risk of the inability of coal mines to comply with licensing requirements and compliant water use.

This facilitation of a pathway for extra-legal water use put into relief water as an economic good, in the form of the coal-centric ontology of water, captured water use for coal mining as a specific economic use, to the extent of enabling extra-legal water use (Franco *et al*, 2013: 1662). Conversely, the water use requirements of water as nature and other water users were not fairly and equally recognised and thus protected. The water use of coal mines as a result of extra-legal water grabbing meant agricultural water users were inequitably burdened with the potential of future water scarcity that put to question the sustainability of their water use in Delmas. The failure to process and allocate the licensing of the water use of coal mines meant the consequent undermining of the fair participation of the state authority in regulatory enforcement and therefore the inability of the state authority to ensure compliance of coal mines as water users with licensing conditions geared towards the protection of water bodies and other water uses. The lack of WULs meant the lack of licensing conditions outlined under section 29 (1) as key to guiding licensed water use. Without these licensing conditions the water regulatory authority lacked the ability to enforce water use to be consistent with the regulatory mandate.

The discursive nexus of water regulation/rights, coal-centric ontology of water and water scarcity interrelated to facilitate coal-centric socionatural relations of water that enabled the control grabbing of the state authority as the licensing authority. Control grabbing of the state authority curtailed the ability of the state authority to execute its function in terms of the allocation of WULs enabling extra-legal water grabbing, and the circumvention of licensing decision making, by coal mines. These coal-centric socionatural relations of water, through extra-legal water grabbing, also meant the failure of the state authority to fairly and equally recognise the water use of coal mines through the licensing authority. The curtailment of the state authority through the licensing authority meant the state authority failed to fairly and equally recognise water uses in a balanced manner in the enforcement of water uses. The coal-centric socionatural relations of water shaped water and its use in Delmas by facilitating the normalisation of water scarcity through unfair and unequal allocation, recognition and participation in water regulation leading to inequitable water allocation and use in Delmas. This inequity in water use as a result of the role of the state authority in bringing about unfair and unequal regulatory practices, the brunt of which was particularly borne by agricultural water users; was at the forefront of coal mining water struggles in Delmas.

8.4 The Influence of the Normalisation of Water Scarcity as a Result of the Undermining of Water Regulatory Enforcement on Coal Mining Water Struggles from the Perspective of Control Grabbing

The normalisation of water scarcity was outlined in the findings as a result of failures in water regulatory enforcement. These failures were expanded on as the result of varied mechanisms through which the function of water regulatory enforcement failed was stymied. The curtailment of water regulatory enforcement can be understood as a practical outcome of the control grabbing of the water regulatory authority and thus the function of enforcement. This control grabbing impeded the function of water regulatory enforcement to order the coal-centric ontology of water that prioritised the water use of coal mines outside of the water regulatory framework.

By creating space for the water use of coal mines external to regulatory enforcement, control grabbing facilitated extra-legal water grabbing that hegemonised the coal-centric ontology of water outside of the regulatory framework thereby facilitating extra-legal water use in Delmas. The control grabbing that facilitated extra-legal control grabbing was dependent on the capture of state authority as the water regulatory authority. This control of the state authority as the water regulatory authority was key to the curtailment of the function of the regulatory authority. The failure of enforcement emanated from varied mechanisms that curtailed the function of water regulatory enforcement as framed by WULs. The result of the capture of the state authority as water regulatory authority as a target and facilitator, for control grabbing and thus extra-legal water grabbing; was scarcity. Water scarcity was not just the outcome of, but also rationalised; the control grabbing of the function of regulatory authority and the resultant extra-legal water grabbing of water use by coal mines.

The discursive nexus of the themes of water scarcity, the coal-centric ontology of water and water regulation/rights informed coal-centric socionatural relations of water that determined the praxis water regulatory enforcement. Through the determination of the practice of water regulatory enforcement as a result of coal-centric socionatural relations also shaped the practical outcome of water availability for coal mines and water scarcity for agricultural waters by ordering coal-centric ontology of water. These coal-centric socionatural relations of water were thus central to the normalisation of water scarcity for agricultural water users that was at the core of coal mining water struggles.

8.4.1 The Undermining of Water Regulatory Enforcement through Control Grabbing of the Human and Technical Capacity

The allocation of WULs for regulated water use under section 21 of the NWA carried licensing conditions. These conditions specified, through section 28 (1) of the NWA; the particular water use, the property for which the license is allocated, the licensee, conditions of use, the period of the license - not exceeding 40 years and review periods not exceeding five years. Section 29 (1) of the NWA detailed the licensing conditions pertaining to the protection of water resources, stream flow, existing and future water users; conditions on water regulatory processes that outlined management processes and general requirements for any water use, the monitoring and analysis of and reporting on every water use and imposing a duty to measure and record aspects of water use, requirements for the preparation, approval and adherence to a water management plan; the specification of return flow and discharge or disposal of waste water, including specifying a water resource to which it must be returned or other manner to which it must be disposed, permissible levels for some or all of its chemical and physical components, specifying treatment to which it must be submitted before it is discharged, and the volume which may be returned. Section 29 (1) also outlined set out conditions relating to controlled activities specifying the waste treatment, pollution control and monitoring equipment to be installed, maintained and operated, and specifying the management practices to be followed to prevent the pollution of any water resource. Section 29 (1) also pertained to conditions on the taking or storage of water by setting the specific quantity of water or percentage of flow that may be taken, setting out the rate of abstraction, specifying the method of construction of a borehole and method of abstraction from a borehole, specifying the place from which water may be taken, specifying the time when water may be taken, identifying or limiting the area of land on which any water taken may be used, limiting the quantity of water that may be stored, specifying locations where water may be stored, requiring the licensee to become a member of a water users association before water may be taken.

Considering the construct of water rights and regulation in the form of licensing the state authority was the locus of the regulatory enforcement of WULs, and thus licensing conditions. The enforcement of WULs as water rights was dependent on the power of the state authority as practically exercised the regulatory enforcement authority through enforcement processes such as enforcement visits and the post-directive investigation and prosecution of non-compliance.

As important as water audits and inspections were to enforcement processes executed through the regulatory enforcement authority, however, water audits and inspections visits tended to not be implemented in line with the intended frequency and were out-of-sequence. The regulatory enforcement authority failed to implement water audits once a year and six-eight months to assess compliance after the initiation of licensed water use; nor were inspection visits twice a year (to assess PCDs' height integrity and seepage respectively in the rainy in the dry seasons) as follow up assessment of non-compliance issues identified through water audits. The consequence of the failure of the regulatory enforcement authority to execute water audits and inspection visits was the failure of the regulatory enforcement authority to issue case-by-case directives for continued post-audit/inspection non-compliance with rectification measures of water audits and follow up inspections to ensure the execution of such measures.

Without enforcement visits the regulatory authority was not in a position to enforce licensing conditions of licensed coal mines in Delmas. Water audits failed to occur six-eight months after the allocation of a WUL to assess compliance with licensing conditions for recently licensed coal mines. The lack of inspection visits following audits meant a gap in follow up assessments of the rectification of non-compliance identified under audits. The dearth of inspection visits also impacted post-directive compliance impeding the culmination of the investigation and prosecution of directors of non-compliant companies at the post-directive stage of enforcement.

At the heart of the failure of enforcement visits was the lack of capacity of the regulatory enforcement authority. This lack of capacity was particularly in terms of a failure to acquire adequate human resource and technical capacity of the regulatory enforcement authority. This lack of capacity can be interpreted as a form, and result, of control grabbing that, in praxis, targeted the control of water rights and regulatory processes (Mehta, Veldwisch and Franco, 2012: 197). The lack of capacity was not organic but can be viewed as an outcome of the purposeful control grabbing of state authority in the realm of enforcement.

This control grabbing of the human resource and technical capacity meant the regulatory enforcement authority was not able to implement enforcement processes and even when these were executed there was a lack of the ability to adequately execute these processes. The control grabbing of water audits and inspections as regulatory enforcement processes meant the control grabbing of information on the status of compliance from coal mines as an outcome of these processes. This either meant there was no information at all as there were

no enforcement processes undertaken or this information was not adequate as it came from comprised enforcement processes. informed regulatory enforcement decision making.

The regulatory authority lacked the basis to make comparisons against water regulatory benchmarks on water quality and quantity licensing obligations of coal mines in order to make water regulatory enforcement decisions. The failure of scheduled water regulatory processes meant complaints from agricultural water users took on greater import in directing the water regulatory enforcement authority to possible non-compliance. However, the regulatory authority, due to human resource capacity constraints, was slow in responding to these complaints. Thus state control of the water regulatory enforcement authority facilitated the control grabbing of the responsiveness to complaints regarding the water use of coal mines.

The discursive construct of licensing as water rights and by extension water regulation not only centred state authority in enforcement but also meant water regulators and their political principles likely held significant control over state authority as regulatory enforcement authority. The control grabbing of the water regulatory authority in this instance entailed the use of state authority, likely by regulatory and political decision makers, to curtail the adequate deployment of the human resources and technical experience and expertise to the water regulatory authority to undermine the capacity thereof to execute enforcement visits and post-directive measures that informed regulatory enforcement decision making. The control grabbing of enforcement decision making facilitated control of the benefits of water for certain social groups to the exclusion of others (Franco, Mehta and Veldwisch, 2013: 1655). The control grabbing of the capacity of the regulatory enforcement authority and consequent curtailment of enforcement decision making impeded the power of the regulatory enforcement authority to ensure compliant water use by coal mines thereby providing a pathway for the extra-legal water grabbing, as extra-legal water use, by coal mines (*Ibid*.).

The coal-centric ontology of water motivated the control grabbing that undermined the function of the regulatory enforcement authority and curtailed the execution of enforcement processes. The praxis of control grabbing in this instance was to unshackle the water use of coal mines from the requirement for rigorous compliance with licensing conditions. Control grabbing enabled the ordering of the coal-centric ontology of water by creating a pathway for the extra-legal water use of non-compliant coal mines for extended lengths of time. Control grabbing thus ordered the coal-centric ontology of water through the extra-legal water grabbing of the water use of coal mines.

The result of was that coal mines likely engaged in water use that led to the pollution and damage of water bodies that in turn normalised the potential of future water scarcity for agricultural water users in Delmas. This normalisation of water scarcity was the outcome of the failure of an under-capacitated water regulatory enforcement authority that struggled to execute its enforcement function; to recognise, and thus equally consider, the water use requirements of agricultural water users in Delmas. Through the coal-centric ontology of water, the water use requirements of coal mines were unfairly and unequally ordered above agricultural water users in Delmas. This led to the inequitable access to, and use, of water by non-compliant coal mines; to the detriment of the protection of equitable access and use of water by agricultural water users.

At the core of the ordering of the coal-centric ontology of water was also the impeding of the participation of the state authority as water regulatory enforcement in enforcement of water regulatory rules and processes. The control grabbing that undermined the state's ability to engage in regulatory enforcement meant the unfair and unequal application of regulatory processes and thus enforcement. The outcome was the inequitable access to and use of water for agricultural water users as users exposed to the inability to enforce the water use of coal mines due to the unfair and unequal participation of the state authority in enforcement.

The praxis of the interrelation of the discursive nexus of the coal-centric ontology of water, water scarcity and water regulation/rights through coal-centric socionatural relations of water; was the predominance of the efficiency rationale above other water use considerations in the regulation of water use. This meant the hegemonisation of an economic bias in the regulation of water use predicated on the highest economic benefits thereby structurally favouring the water use of coal mine as an economic activity in Delmas. The unfair ordering of the coal-centric ontology of water in this manner flowed through the dominant role of the state in regulation stemming from the discursive construct of water rights through licensing.

Control of the state authority (by regulators and the relevant political principals) provided the power to determine regulatory enforcement through the undercutting of the state authority as regulatory enforcement authority. In other words, the coal-centric socionatural relations of water discursively and practically commandeered the state authority to hegemonise the coal-centric ontology of water to ensure the avoidance of water scarcity for coal mines, even through extra-legal water grabbing, whilst unequally exposing agricultural water users to the normalisation of the potential of future water scarcity. Coal mining water struggles centred on

the influence of coal mining water struggles on the unfair, unequal and inequitable water use due to the (dys)function of the regulatory enforcement authority in Delmas.

8.4.2 The Undermining of Water Regulatory Enforcement through Control Grabbing of Water Knowledge

The centrality of water knowledge to the function of the regulatory enforcement authority is outlined explicitly and implicitly in section 29 (1) of the NWA. The relevance of this section is in outlining that licensing conditions may include water regulatory processes that outlined management processes and general requirements for any water use, the monitoring and analysis of and reporting on every water use and imposing a duty to measure and record aspects of water use, requirements for the preparation, approval and adherence to a water management plan. An important aspect of these conditions are that they impose regulatory responsibilities on a water user that obligate and guide participation in regulatory compliance and enforcement.

Section 29 (1) also outlined licensing conditions that likely carried benchmarks on water quality and quantity. These included the specification of return flow and discharge or disposal of waste water, including specifying a water resource to which it must be returned or other manner to which it must be disposed, permissible levels for some or all of its chemical and physical components, specifying treatment to which it must be submitted before it is discharged, and the volume which may be returned. Section 29 (1) also pertained to conditions on the taking or storage of water by setting the specific quantity of water or percentage of flow that may be taken, setting out the rate of abstraction, specifying the method of construction of a borehole and method of abstraction from a borehole, specifying the place from which water may be taken, specifying the time when water may be taken, identifying or limiting the area of land on which any water taken may be used, limiting the quantity of water that may be stored, specifying locations where water may be stored, requiring the licensee to become a member of a water users association before water may be taken.

Considering the above, water knowledge was key to regulatory enforcement processes, and in particular decision making. The use of water knowledge was to facilitate enforcement decision making, as a basis for ensuring "…that water is protected, used, developed, conserved,

managed and controlled in a sustainable and equitable manner, for the benefit of all persons…" in line with the regulatory mandate set out in section 2 of the NWA.

Water knowledge as a product, on the one hand, of the licensing authority, and on the other hand, of the regulatory enforcement processes; as a crucial element of water regulatory enforcement was a target, and result of, social power. This control over water knowledge served to deploy water knowledge to facilitate the water use of powerful social interests (Mehta *et al*, 2012: 199). Water knowledge was framed as functioning objectively to understand and address water problems such as water scarcity, however, in praxis water knowledge tended to entrench water scarcity as water knowledge was deployed in water grabbing to implicitly facilitate water use to the benefit of particular water uses (Mehta *et al*, 2012: 199). A means of the use of water knowledge was in the shaping of the discursive construct of water. In shaping the discursive construct of water, for instance towards efficiency, water knowledge facilitated the control grabbing of the allocation of water to economic water uses (*Ibid*.).

In this study, a form of the control grabbing of state authority as the regulatory enforcement authority, relevant to water knowledge; was through the control grabbing of the state authority as licensing authority. Herein, control over the state authority, through the discursive construct of licensing as water rights and the regulation thereof centred the state authority in licensing; plausibly facilitating regulators and their political principals to control decision making on the capacity of the licensing authority. A specific outcome was the use of control over the state authority as licensing to impede the adequate addressing of the capacity constraints of the licensing authority. This can also be viewed as the passive undermining of the human resource and technical requirements of a fully functional licensing authority capable of reaching licensing decisions. This control grabbing of the licensing authority's licensing decision making further meant the appropriation of the allocation of water knowledge benchmarks on water quality and quantity through the licensing conditions of WULs.

Another facet of this control grabbing was the curtailment of the function of licensing decision making on licensing conditions pertaining, and obligating the water user, to processes of the collection, analysis and use of water knowledge on compliance and thus enforcement. Another example of control grabbing of the licensing authority was the failure of the licensing authority, as a result of the regulatory adjustments of the OES, to engage in independent licensing decision making. The licensing authority in praxis simply mirrored mining licensing

decision making in allocating WULs to coal mines that were allocated mining licenses. The consequence was the proliferation of coal mines engaged in water use in proximity to each other, the outcome of this was the undermining of water knowledge production at individual coal mine level as coal mines could conveniently blame each other particularly for non-compliant water quality.

As stated earlier, licensing conditions informed the production of water knowledge. The production of water knowledge was set through licensing conditions that framed the practice of compliance data collection, analysis and reporting against water knowledge benchmarks on water quality and quantity. The status of water quality and quantity as impacted by the use of coal mines as licensed water user provided an understanding of the compliance of a coal mine as a water user that in turn informed regulatory enforcement decision making and therefore enforcement processes. The deployment of water knowledge as part of regulatory decision making could plausibly result in the cessation of some water uses, the duration of which hinged partly on the implementation of suggested compliance remedial actions and/or the compliance of the water use with licensing conditions. Given the influence of compliance water knowledge on regulatory enforcement decision making; the argument can be made that water knowledge determined the ontology of water and thus water availability or scarcity.

The intergovernmental realignment and reorganisation of timelines and responsibilities that came with the OES enabled mining licensing to control technical processes and studies, such as the rehabilitation plan, that were key to, and sometimes included as elements of, water use licensing decision making. The lack of control over such technical processes and studies was the effective control grabbing of the licensing decision making of the licensing authority through the mining licensing authority; leading to the lack of some of the necessary water knowledge to adequately inform the regulatory benchmarks and obligations key to water use licensing conditions. Another consequence of these adjustments in licensing was that the licensing authority lacked adequate time for the technical analyses and processes, of licensing decision making, that informed water knowledge as licensing conditions on benchmarks of water quality and quantity.

The outcome of the control grabbing of licensing decision making was the allocation of WULs with dysfunctional licensing conditions that were impractical in their utility. The repercussions of the control grabbing of the licensing authority was the indirect control grabbing of the function of the regulatory enforcement authority that depended on firstly, WULs and secondly, specific and accurate licensing conditions. Without WULs with specific,

accurate and consistent licensing conditions; the likelihood was that the regulatory enforcement authority was not in a position to execute enforcement processes in a manner that provided the water knowledge necessary for enforcement decisions on the water use of coal mines.

The consequence of the control grabbing of licensing decision making, and by extension water knowledge, was the lack of water knowledge necessary for the regulatory enforcement of the licenses of coal mines. The lack of water knowledge also implied the lack of a basis for regulatory enforcement decision making. This spoke to the dysfunction of the regulatory enforcement authority. This meant coal mines could engage in extra-legal water use as a form of extra-legal water grabbing of water use by coal mines. Thus the control grabbing of the licensing authority and by implication water regulatory enforcement curtailed the function of water knowledge and in turn facilitated the extra-legal water grabbing of water use by coal mines.

In the context of this study, the control grabbing, and the consequent impeding, of water regulatory decision making was in effect the curtailment of the fair, equal and equitable function of water regulatory enforcement authority. Through the control grabbing of water knowledge, the undermining of the functional participation of the water regulatory authority facilitated non-compliant and thus extra-legal water use by coal mines. This extra-legal water use, that can be considered extra-legal water grabbing, used the state authority often in terms of the licensing authority; to undermine the state authority as water regulatory enforcement. This unfairly and unequally recognised and thereby ordered the water use of coal mines, cementing the coal-centric ontology of water above other water uses and considerations in Delmas, even through the provision of an extra-legal water use avenue facilitated by extra-legal water grabbing.

Extra-legal water grabbing in this regard targeted and sought to nullify the water regulatory authority's capacity to access and use water knowledge to fairly and equally determine whether coal mines could continue their water uses. Extra-legal water grabbing ordered the coal-centric ontology of water, thus recognising that water use above others, beyond the reach of the water regulatory authority's ability to determine curtailments of uses based on non-compliance. The meaning of this was that extra-legal water grabbing ensured coal mines managed to circumvent the possibility of the impeding of their water uses even as some of these were not compliant with licensing conditions. Temporary water scarcity as a

repercussion of non-compliance was thus removed - at least for significant periods of the water use of coal mines - and instead water for coal mines was always available.

Further, coal mines misused their regulatory role in compliance and enforcement as assigned by licensing conditions that outlined the enforcement processes. Instead, coal mines used their roles to engage in the control grabbing of the regulatory enforcement authority by purposefully undermining the processes of water knowledge production that fell within their purview. This ensured that the regulatory enforcement authority lacked the information required to understand compliance and enforce compliance in cases of non-compliance. Coal mines actively facilitated the extra-legal water grabbing that unfairly and unequally hegemonised the coal-centric ontology of water in the shadow of a dysfunctional regulatory enforcement authority.

Conversely, agricultural water users bore the brunt of the dysfunction of the water regulatory enforcement authority. Depleted enforcement processes meant the regulatory authority lacked water knowledge to inform regulatory enforcement decision makers on the status of the water use of coal mines and their impacts on water bodies and other water users. Without this water knowledge the water regulatory enforcement authority was unable to participate in the function of enforcement of WULs of coal mines thereby exposing water bodies and other users to pollution and thus the normalisation of water scarcity. The curtailment of a fair and equal function of the water regulatory authority led to inequitable extra-legal water use that normalised the threat of future water scarcity for agricultural water users. Coal mining water struggles contested the diverse mechanisms through which the function of the regulatory enforcement authority was undermined leading to the normalisation of water scarcity for agricultural water users.

Licensing conditions on water knowledge and regulatory enforcement processes implicitly framed water knowledge in scientific terms. Water knowledge production processes outlined in licensing conditions presented regulatory enforcement as dependent on implicitly objective water knowledge. However, the role assigned to coal mines, through water use licenses, in water knowledge production; undermined the claims of objectivity of water knowledge as scientific knowledge. Aside from the purposeful undermining of water knowledge produced by coal mines; agricultural water users did not trust the water knowledge used for water regulatory enforcement. This was due to coal mines having a material interest in the same water knowledge that they were meant to produce objectively for enforcement against their own water use interests in coal mining. Water knowledge production was developed in a

manner that agricultural water users viewed as unfair and lacking in objectivity. Coal mines and agricultural water users were not equal in water knowledge production nor in regulatory enforcement. This partly explained the motivation by farmers, their attempts to utilise other forms of knowledge, such as memory and knowledge produced outside of the water knowledge production of coal mines.

The distrust of water knowledge also led to the distrust of the state authority as water regulatory enforcement authority. In particular, the regulatory enforcement decision making of the enforcement authority was not trusted by agricultural water users as it depended on water knowledge that was compromised by coal mines. The distrust of regulatory enforcement decisions was also due to the control grabbing of the licensing authority meaning agricultural water users viewed the water knowledge as well as water knowledge production processes outlined in licenses as compromised. This explained the use of alternative water knowledge, outside the control of the state authority and coal mines, to provide insight on the impacts of the water use of coal mines on water bodies and agricultural water uses. This illustrated efforts by agricultural water users to frame, and thus illustrate, water scarcity outside of the the framing of water scarcity based on the licensing benchmarks framed by water knowledge and water knowledge production processes.

The discursive nexus of water scarcity, water regulation/rights and coal-centric ontology of water were central to the praxis of coal-centric socionatural relations of water that flowed through, and utilised, water knowledge to order the water use of coal mines in Delmas. These coal-centric socionatural relations of water made the scientific frame of knowledge predominant in the state authority so as to order that knowledge above other forms and thereby legitimise only regulatory enforcement decisions based on that knowledge. This made the contestation of regulatory enforcement decisions difficult by agricultural water users affected by the water use of coal mines.

Coal-centric socionatural relations of water further ordered the coal-centric ontology of water by undermining the ability of water knowledge to inform regulatory enforcement decisions against the water use of coal mines in Delmas. This was through the curtailment of the possibility of independent knowledge production removed from the control of coal mines and the control of the state authority as licensing authority to undermine water knowledge and the production thereof, thereby controlling the ability of the regulatory enforcement authority to issue decisions that could impede the water use of coal mines. The coal-centric socionatural relations of water also curbed the regulatory enforcement authority's capacity to

use enforcement processes to gain water knowledge and deploy that knowledge in enforcement decision making. Accordingly, coal-centric socionatural relations of water impeded the ability of the state authority to use water knowledge to identify possible water scarcity for agricultural water users as framed through water knowledge.

The normalisation of water scarcity was the result of this failure of the exercise of the state authority as regulatory enforcement authority due to the failure of water knowledge, and the deployment thereof. The resultant dysfunction of the regulatory enforcement authority left agricultural water users structurally exposed to water scarcity not just in the immediate sense but also in the future. This meant future agricultural water use in Delmas was jeopardised. The failure of the fair and equal function of the regulatory enforcement authority to ensure equitable water use was at the heart of coal mining water struggles in Delmas.

8.4.3 The Undermining of Water Regulatory Enforcement through Control Grabbing of Water Knowledge through Technical Complexity of Water Knowledge

Section 26 (1) of the NWA outlined conditions for water use that included restrictions on the licensed water use; the measurement, recording and monitoring of water use from a water body; the registration of an allocated water use; the intended effect or outcome of an installed waterworks; the design, construction, installation, operation and maintenance of a waterworks; the protection of a water body or riparian habitat; and, waste water discharge standards in terms of quantity, quality and temperature. Further, section 7 (c) the Regulations on Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources (1999) enjoined mines to take steps to limit the surface and floodwater flows from mine works, opencast works, other works or underground mining. Section 7 (d) of the regulations outlined that dams or residue deposit or stockpile should be designed, developed, maintained, modified and operated to dispose or store minerals tailings, slime, ash or hydraulic transported substances so that water or waste in water will not damage water bodies. Furthermore, section 7 (e) committed mines to prevent the leeching of stockpiles or residue deposit into, and thus pollution of, water bodies through measures such as barrier dams, evaporation dams, etc.

Mine water infrastructure as outlined above was important to the control of the negative impacts of the water use of mines. The licensing of Brakfontein Coal Mine was an example of a coal mine licensed with existing non-compliant mine water infrastructure. This licensing

resulted in technical complexity in the water regulatory enforcement of licensing conditions pertaining to mine water infrastructure. Technical complexity was an issue particularly for coal mines licensed with existing mine water infrastructure, such as PCDs, that was not constructed in compliance with the broad infrastructure licensing conditions of the NWA water regulatory regime. For instance, the water use of Brakfontein Coal Mine was authorised to engage in water use whilst operating with an unlined PCD that was constructed before the allocation of the existing WUL.

At the heart of technical complexity was that licensing conditions, as the outcome of water knowledge, were unenforceable. The practical application of licensing conditions that outlined technical standards for the development of mine water infrastructure, in cases where mines were operating non-compliant brownfield mine water infrastructure, meant these licensing conditions in praxis could not be enforced. In other words, the rectification into compliance of some mine water infrastructure constructed before the mine was acquired was in praxis not technically feasible. Even when a coal mine, such as was the case with Brakfontein Coal Mine, was willing to rectify mine water infrastructure non-compliance doing so was impractical.

The implications was that water knowledge, reflected through the licensing conditions of WULs, facilitated the non-compliant use of mine water infrastructure. The impracticality of water knowledge undermined the regulatory enforcement of the rectification of non-compliant mine water infrastructure as suggested through regulatory enforcement processes. Part of the impracticality of rectification of non-compliance in brownfield mine water infrastructure was that such measures were also cost prohibitive. This meant technical licensing conditions were not just technically but also financially unfeasible.

Water knowledge in this case could be interpreted as the control grabbing and the consequent undermining of the regulatory enforcement of licenses. At the centre of this control grabbing and thus undermining of water regulatory enforcement was the role of water knowledge in the undermining of state authority as the regulatory enforcement authority. In praxis, the state authority, as the function of water regulatory enforcement, was unable to enforce compliance on the basis of water knowledge that came from licensing as well as regulatory enforcement processes.

The operationalisation of water knowledge, through licensing conditions for the development of mine infrastructure, meant the licensing authority was central to the undermining of the function of the regulatory enforcement authority. The centring of the state authority through

the construct of licensing as water rights meant the state authority as licensing authority was key to the undermining of the function of regulatory enforcement as state authority. Forthrightly, one form of state authority undermined another form of state authority.

The use of non-compliant mine water infrastructure enabled extra-legal water use, and thus extra-legal water grabbing, by coal mines. Extra-legal water grabbing, through the extra-legal water use was due to the utilisation of mine water infrastructure that negated the intended role thereof in protecting water bodies from pollution and damage. Extra-legal water grabbing as extra-legal water use facilitated non-compliant water use that likely led to the pollution and damage of water bodies. Extra-legal water use was thus the result of the failure of water knowledge to protect the biophysical nature of water from the pollution and damage of water bodies. The control grabbing of water knowledge undermined the function of regulatory enforcement as state authority to protect the sensitivity of water to pollution as a characteristic of the biophysical nature of water.

Coal-centric socionatural relations of water in this case can be interpreted as facilitating the water use of coal mines outside of water regulatory enforcement by utilising water knowledge that was not functional in practice. The dysfunction of water knowledge allowed the hegemonisation of the coal-centric ontology of water above not just other water users and water bodies but also unfairly and equally above the regulatory enforcement authority. Through the inequitable ordering of the coal-centric ontology of water as an outcome of the dysfunction of water knowledge, and therefore regulatory enforcement, Brakfontein engaged in extra-legal water use even if it was just for some time.

Water bodies and agricultural water users were burdened with the outcomes of this implicit support for the water use of Brakfontein in the form of possible pollution and damage of water bodies and thus water scarcity. Rather than water knowledge meeting its intended function of the prevention of water scarcity, instead the dysfunction of water knowledge unfairly and inequitably led to the praxis of the normalisation of the potential of future water scarcity for agricultural water users. Moreover, this normalisation of the potential of future water scarcity for agricultural water users came through the state authority as licensing and regulatory enforcement authority as a result of the unequal praxis state-centric construct of licensing and the regulation thereof. Put another way, agricultural water users were exposed to normalised water scarcity, in the present and the future, due to the state authority meaning the state authority in practice functioned in stark difference from its intended function as regulatory enforcement authority.

8.5 Conclusion

Water grabbing provided insight on the use of power, through state authority in this case, to achieve water grabbing for the benefit of the water use of coal mines. Moreover, water grabbing illustrated the interrelation of control grabbing and extra-legal water grabbing in the form of legal and extra-legal forms of water grabbing of state authority, and thus power, to facilitate the water use of coal mines. Both forms of water grabbing illustrated the normalisation of the potential water scarcity was the key issue of contestation behind the nature of coal mining water struggles. Moreover, water regulation was interpreted as key to water scarcity as a water problem at the core of the nature of coal mining water struggles.

Through water grabbing, the normalisation of the potential of future water scarcity, as the issue of contestation behind the nature of coal mining water struggles was due to the coal-centric socionatural relations of water. These coal-centric socionatural relations of water, the chapter argued, controlled state authority as licensing and regulatory enforcement authority to function for the benefit of the water use of coal mines in Delmas. Coal-centric socionatural relations of water also impeded the function of the licensing and regulatory enforcement authority to facilitate the water use of coal mines within and outside the water regulatory framework.

The control and influence of state authority as water regulation was based on the discursive nexus of the coal-centric ontology of water, water scarcity and water use licensing. In other words, the coal-centric socionatural relations of water, and its control on water regulation, was based on the interrelation of the discourses of the coal-centric ontology of water, water scarcity and water use licensing. The nexus of these discourses was critical to the water grabbing of the state authority as different forms of water regulation.

9. Conclusion

The effects of the water use of extractives on the biophysical nature of water in various international contexts, and the resultant water problems for other users, was a prominent theme of discussions on extractives based water struggles. The understanding of water problems emanating from the water use of extractives, their impacts on the water use of non-extractive water users and their influence on extractives based water struggles was often a focus of such academic discussions. The varied forms of the transformation of water and associated water problems notwithstanding; water scarcity as a water problem for non-extractive water users was predominant in these discourses. Water scarcity as a water problem stemming from the water use of extractives was also approached through the interrogation of the role of water regulation, often in terms of regulatory failure, in the transformation of water leading to water problems.

This study was in the same vein as it endeavoured to understand water struggles emanating from the water regulation of coal mining in Delmas, South Africa. The location of the study was significant as a response to a lack of academic study on water struggles focused on productive water use of water resources in South Africa. The focus on coal mining water struggles was also significant as there was generally a dearth of academic discussion on extractives based, and in particular coal mining, water struggles in South Africa as opposed to places such as South America. This was even as South Africa had a rich history of mining with coal mining playing a central role in the political economy of South Africa. Thus coal mining was an important yet polluting water use, in the context of a water scarce country with competing water uses; meaning there was a likelihood of coal mining water struggles in South Africa that required academic attention.

This study focused on two questions: 1) what is the nature of coal mining water struggles in Delmas, South Africa and what is the role of water regulation in the nature of coal mining based water struggles? and 2) how does water regulation influence the nature of coal mining water struggles in Delmas? The first research question sought to understand the water problem behind coal mining water struggles, and the role of water regulation in that water problem. The second research question sought to understand how water regulation influenced coal mining water struggles in Delmas. As stated in the aims, the study also sought to explore the relevance of water grabbing, as a theoretical framework, in understanding water scarcity and coal mining water struggles.

This study tackled coal mining water struggles through water regulation moving away from, especially in the Global South, the assumption and argument that water struggles were the outcome of weak or absent regulatory processes and/or state. The interrogation of water scarcity and thus coal mining water struggles was thus in the context of an established and internationally respected water regulatory regime in Delmas. Water regulation was a gateway to the examination of the role of the state in water scarcity and coal mining water struggles. This provided an implicit focus on the water regulation of coal mining in the context of the historically significant role of coal mining in the South African political economy.

The study utilised a case study approach with three coal mines Vanggatfontein, Brakfontein and Kangala based in Delmas as case study coal mines. The case study design sought was selected to provide in-depth knowledge about the research problem from the perspective of the three case study mines rather than seeking a generalised understanding of all coal mines in Delmas. The case study mines were selected to shed light on the role of the regulation of the water use of coal mines in coal mining water struggles as they were in operation in Delmas during the study and within the National Water Act's water regulatory regime, and proximity to agricultural water users and water bodies.

The findings of this paper were based on empirical data from interviews, focus groups and observation in Delmas, South Africa. The interviews and focus groups used key informants knowledgeable on the regulation of the WULs of coal mines, the intergovernmental dimensions of mining and water use licensing, the water use of coal mines and farming, the water bodies in Delmas, water scarcity, the impacts on water bodies due to the water use of coal mining, the history of coal mining in Delmas and coal mining water struggles. Key informants included coal mine officials, farmers, community members, municipal officials, and agricultural trade unionists.

The findings argued water regulation was central to water scarcity and thus at the core of the nature of coal mining water struggles. The influence of water regulation on water scarcity and thus coal mining water struggles was in three parts. Firstly, the findings determined delays and failures of the licensing authority in licensing decision making facilitated the extra-legal water use of all three case study coal mines. The implication of the water use of coal mines without WULs was the dysfunction of not only the licensing authority but also of the regulatory enforcement authority. Without WULs, coal mines operated without the licensing conditions that provided benchmarks for the enforcement of water use of coal mines and

outlined regulatory enforcement processes and the roles therein and the guidelines. The result was that the unrestricted exposure of water bodies to water pollution and damage. Secondly, the findings identified the licensing authority functioned in a manner that led to the inappropriate licensing of the water use of coal mines in Delmas. Despite the varied considerations, priorities and the regulatory mandate that provided a framework for licensing decision making, in practice licensing decision making seemed to order the economic water use of coal mines above other water considerations and priorities such as water as nature and agricultural water use. Coal mines were licensed in proximity to water bodies imperilling water bodies and undermining agricultural water use. Thirdly, the findings pointed to the undermining of the enforcement of WULs of coal mines. This meant the regulatory enforcement authority failed to execute enforcement processes to ensure coal mines engaged in compliant water use. The consequence was the failure and inability of the regulatory enforcement authority to enforce compliance with licensing benchmarks allocated under the licensing authority.

The function and failings of licensing and regulatory enforcement facilitated, and failed to impede, the pollution and damage of water bodies. This led to water scarcity. However, the findings argued that water scarcity was largely not in terms of the immediate physical scarcity nor the immediate significant change of water quality. Instead, water scarcity was more about the role of licensing and regulatory enforcement leading to the structural normalisation of the possibility of water scarcity for agricultural water users. The function and failings of licensing and regulatory enforcement unfairly and unequally ordered the water use of coal mines whilst inequitably normalising the potential of future water scarcity for agricultural water users. The role of licensing and regulatory enforcement in unfairly, unequally and inequitably enabling the water use of coal mines was at the core of coal mining water struggles in Delmas.

Rather than functioning according to the prescript of the NWA to balance licensing considerations and ensure decision making is based on water use priorities and the regulatory mandate; licensing decision making instead functioned order the water use of coal mines as an economic use. This meant the function of the licensing authority in practice overlooked other dimensions of the licensing decision making framework to unfairly and unequally recognise the particular economic use of coal mining in Delmas. The failure of the function of the licensing decision making was also viewed as the unfair and unequal recognition of the economic use of water above the sustainability of water bodies and the protection of water uses such as agriculture. This was because the failure of the function of licensing decision making in praxis inequitably ordered, extra-legally, the water use of coal mines despite the

likely repercussions in terms of water pollution and damage of water bodies and the normalisation of the potential of future water scarcity.

The findings further explained the above function and failings of the licensing authority and failings of the regulatory enforcement authority were not accidental. Instead the findings identified mechanisms that framed the function and failings of licensing decision making and failings of regulatory enforcement decision making. These were mechanisms through which water regulation influenced the normalisation of the potential of future water scarcity for agricultural water users. The failings of licensing decision making were due to human resource and technical capacity shortcomings in the licensing authority that curtailed licensing decision making. As much as these were well known neither regulators nor their political seniors adequately addressed these human resource and technical weaknesses of the licensing authority. Indeed, the purported effort in addressing human resource shortcomings only served to create technical expertise weaknesses that led to the allocation of dysfunctional licensing conditions in WULs. The outcome of this was the failure of the function of licensing to amongst others; protect water bodies, ensure sustainable water use, outline regulatory enforcement processes, provide benchmarks for water quality and quantity against which regulatory enforcement can occur, etc. The result was the normalisation of the potential of future water scarcity.

The failings of the function of licensing decision making also emanated from the actions of coal mines. Coal mines arguably targeted the function of the licensing authority by failing to provide the necessary technical reports. The implication was a failure to conduct some of the technical analyses that informed the licensing assessment and decision making. Without these technical analyses and reports, the licensing authority was not in a position to adequately assess and provide countermeasures through licensing conditions for an applicant's water use.

The findings also highlighted the regulatory adjustments that came with the OES were key to the control of the licensing authority and in particular licensing decision making. The measures that came with the OES indicated the bias towards the facilitation of licensing decision making through streamlining of intergovernmental mining and water use licensing decision making, the reorganisation of licensing responsibilities and the position of the mining licensing authority as the initiator of intergovernmental licensing decision making. These regulatory adjustments not only controlled, through intergovernmental licensing, the water use licensing authority but also this control functioned to order the water use of coal mines

through licensing decision making that facilitated the water use of coal mines. The bias towards the licensing of the water use of coal mines can also be regarded in the proliferation (though this can be argued as being also present before the OES) of the licensed water use of coal mines in Delmas. The intensification of mining and the water use thereof can also be apportioned to the mining licensing authority; the repercussions of this was the undermining of the integrity of regulatory enforcement processes especially in the production of water knowledge for enforcement decision making. This can be argued as leading to licensing decision making that ordered the water use of coal mines even in inappropriate locations that heightened the risk of pollution and damage of water bodies and thus normalised the potential of future water scarcity for agricultural water users.

The relevance of human resource and technical capacity constraints was also in the area of regulatory enforcement authority. The authority lacked the necessary capacity, in human resource and technical expertise, to carry out regulatory enforcement processes such as water audits, inspection visits and post-directive investigations and prosecutions. These enforcement processes were interlinked in their sequencing and also in informing each other; to the extent that shortcoming of one process affected the efficacy of another. This meant the regulatory enforcement authority could not ensue water use of coal mines were in compliance with licensing conditions pertaining to areas such as protection of water resources, stream flow, existing and future water users; specification of regulatory processes, water use obligations including water conservation measures; setting the water user the obligation to monitor, analyse and report on every licensed water use through specified measuring and recording devices; the specification of return flow and discharge or disposal of waste water, including specifying a water resource to which it must be returned or other manner to which it must be disposed, permissible levels for some or all of its chemical and physical components. In praxis this was the inability of the regulatory enforcement authority to ensure coal mines as water users did not pollute and damage water bodies; this structurally normalised the potential of future water scarcity for agricultural water users in Delmas.

Another mechanism through which the regulatory enforcement authority was undermined was through the curtailment of water knowledge production. This was due to the allocation of water use licensing outside of the consideration of the cumulative impact of the water use of other coal mines. This meant coal mines engaged in water use in close proximity to each other thereby undermining the function of water knowledge production.. The non-inclusion of cumulative impact in licensing decision making meant an inability to utilise water knowledge to pinpoint sources of water pollution and damage. This in turn meant the undermining of

regulatory enforcement decision making. Moreover, coal mines were also able to use their role in regulatory enforcement authority to purposefully undermine licensing conditions on water knowledge production. This also undermined regulatory enforcement decision making.

These mechanisms of the control of the function, and undermining, of water regulation ordered the water use of coal mines. These mechanisms enabled control of the function, and facilitated the dysfunction, of the licensing and enforcement decision making. The control of the licensing authority facilitated licensing decision making that unfairly and unequally recognised and thus ordered the water use of coal mines whilst control of the regulatory enforcement authority undermined enforcement decision making and thus unfairly and unequally recognised and thereby ordered the water use of coal mines. Th outcome was that the licensing and enforcement authority were central to the inequitable water use in Delmas. The dysfunction of licensing decision making curtailed the exercise and thus fair and equal participation of the state authority thereby enabling the ordering of the extra-legal water use of coal mines unburdened by the restrictions of licensing conditions. The dysfunction of the regulatory enforcement authority curtailed the fair and equal participation of the authority in enforcement decision making to enforce complaint water use by coal mines thereby enabling the extra-legal water use of coal mines. This was critical in the facilitation of inequitable water use by coal mines in Delmas. The unfair and unequal water regulatory practices in allocation, recognition and participation and their inequitable outcomes in water use were central to the normalisation of water scarcity at the core of coal mining water struggles in Delmas.

Water regulation was interpreted in this thesis from the perspective of water grabbing. The utility of water grabbing was in the interpretation of what came to be termed as the coal-centric socionatural relations of water that were posited as playing a key role in control grabbing water regulation as state authority. Control grabbing was the apprehension, and repurposing, of the function of water regulation as state authority. Control grabbing shifted water regulation as state authority from the *de jeure* intended purpose to a praxis of the ordering of the coal-centric ontology of water. Central to control grabbing was the discursive construct of water regulation/rights in the form of state-centric water use licensing. Through the control grabbing of licensing, the coal-centric ontology of water was embedded in the function of the allocation of water rights thereby ordering the water use of coal mines in licensing decision making. Control grabbing also captured the licensing authority to curtail licensing decision making to order the water use of coal mines.

The utility of water grabbing was also in the illustration of the complex interconnection of legal and extra-legal water use. This was in the connection between control grabbing and extra-legal water grabbing. The impeding of the function of the state authority as the licensing authority opened the avenue for extra-legal water grabbing in the unlicensed extra-legal water use of coal mines. Extra-legal water grabbing in turn entailed the grabbing of the function of the regulatory enforcement authority as enforcement processes were largely dependent on licensing conditions in their operationalisation. The control grabbing of the function of licensing further impacted the exercise of the function through the allocation of dysfunctional licensing conditions that impaired the function of the regulatory enforcement authority thereby enabling extra-legal water use by coal mines.

The discourse of water scarcity was central in the predominance of the coal-centric ontology of water. The ordering of high value water use activities for a scarce resource predicated the economic water use bias. The coal-centric ontology of water was but a particular version of this economic bias that specifically facilitated the water use of coal mines in Delmas. Water scarcity was thus not just an outcome of water regulation but was central through the discursive nexus of water scarcity, the coal-centric ontology of water and water regulation/ rights; in the praxis of the normalisation of the potential of future water scarcity in Delmas that affected agricultural water users. This form of water scarcity was argued as predicated on water regulation as state authority that structurally exposed agricultural water users to the fear of water scarcity in the future. Thus even as there was limited immediate physical (or extreme chemical transformation of water leading to) water scarcity in Delmas, water regulation as state authority implanted a temporal dimension to water scarcity as a potential phenomenon that could curtail the water use of agriculture in the future.

The discursive nexus of water scarcity, the coal-centric ontology of water and water regulation/rights interrelated as coal-centric socionatural relations of water that captured water regulation as state authority and refashioned the function thereof to be unfair, unequal and inequitable. The influence of these coal-centric socionatural relations of water on the water grabbing of water regulation, and the outcome thereof in the normalisation of water scarcity, was at the core of coal mining water struggles in Delmas.

Water grabbing was useful as a means of understanding how coal-centric socionatural relations of water facilitated state-capital cooperation in the water grabbing of water regulatory authority for the benefit of coal mines. Water grabbing shed light on the exercise of power to swing between the legal and the extra-legal, deftly manoeuvring the water

regulatory authority, intergovernmental interrelations with mining licensing and agricultural water users as affected parties to impose the water use of coal mines in Delmas.

The conduct of this study met with some challenges. The study dealt with significant revenue generating business interests in the mining and agricultural sectors in Delmas. These sectors employed significant amounts of people in Delmas whilst the employment reach of coal mining, including through electricity generation and other industrial sectors connected to coal, reached far beyond Delmas. Coal and thus coal mining in Delmas was a microcosm of the key role of coal in the political economy of South Africa. This context led to some potential key informants being reluctant to participate in the study as there was much to lose in business revenue and employment.

Adding another layer of difficulty was the timing of the study. This study was conducted during a very tense political climate in the country generally, and in Delmas particularly, around issues of state capture that were connected to coal mining generally, and in Delmas particularly. This required the researcher to exercise patience and compromise in dealing with interviewees and focus group participants that required trust.

The study was structured utilised a case study approach and interviews and focus groups for data collection. The study used purposive sampling to access key informants as knowledgeable people connected to the coal mines, Delmas, the water and mining regulator, local government officials, farmers and agricultural industry. This made the study vulnerable as it dealt with a small group of people with expertise and knowledge of the area, local farming, coal mining, case study mines, coal mining water struggles and so on. Consequently, the researcher had to be patient and utilise a local to gain the trust of the key informants.

The difficulties of conducting such a study notwithstanding, there were opportunities for future research related to this study. For instance, a direct and deeper exploration of the influence and interconnection of the political economy and coal-centric socionatural relations of water would assist further understand the origin, underpinnings, influences, trends and changes of such coal-centric socionatural relations of water. In so doing such a study could further understand the dynamics of the influence of socionatural relations of water on water regulation and the likely trends therein. A study exploring coal-centric socionatural relations of water in the shadow of decarbonisation would also be interesting. Such a study would assist understand how coal-centric socionatural relations of water remained predominant and

influenced in water regulation despite a seemingly adverse global and localised decarbonisation policy context.

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