'Analysis of Water Conflicts in Erongo, Namibia
- a Political Ecology Approach'

by

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Declaration of authorship

I, Jiwon Lee, hereby declare that this master dissertation entitled ‘Analysis of Water Conflicts in Erongo, Namibia – a Political Ecology Approach’ has not been submitted elsewhere and was produced without external aid and is entirely of my own work. All materials which have been used in this research are quoted or acknowledged as appropriate.

Place, Date ___________________________ Name and Signature ___________________________
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Abstract

Namibia is the fourth uranium producing nation in the world and at the same time, one of the most arid regions of sub-Saharan Africa. Recognizing that mineral extraction consumes vast amount of water, the influence of water abstraction of the mines to the local water usage was scrutinized in this thesis. The focus of this research is to analyze the conflict over water consumption between the local communities and mines in Erongo region and to examine the interrelation of the political structure and water degradation in Namibia. The research approach adopted in this dissertation includes qualitative data analysis of three case studies; Topnaar community, Swakop farmers and Valencia farm owners. To fulfill the research aim, conflict analysis was used to define the stage of the conflict escalation, the characteristic of the conflict and institutional framework that has the potential to transform the conflict. Political Ecology was applied as theoretical framework to understand the interrelationship between the environmental degradation and political situation by examining how inequality and uneven power distribution affect the right to use of natural resource.

The findings from this research provide evidence that water conflicts can emerge from actors’ own interpretation of the situation and attribution to other relevant actors than the actual facts. Furthermore, water and environmental policy has an effect to the conflict to some extent due to government’s insufficient capacity in operation and in implementing legal frameworks. Institutions played a vital role in conflict, especially as information provider and as the facilitator to take the existing conflict to the next stage. The main conclusion drawn from this study is that the conflict for water can actually imply struggle for information and institution. The dissertation recommends that the government should be prepared for the post-mining phase when making long-term decision.
## Abbreviation

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BGR</td>
<td>Bundesanstalt für Geowissenschaften und Rohstoffe</td>
</tr>
<tr>
<td>BMC</td>
<td>Basin Management Committee</td>
</tr>
<tr>
<td>DRFN</td>
<td>Desert Research Foundation of Namibia</td>
</tr>
<tr>
<td>DRM</td>
<td>Directorate of Resource Management</td>
</tr>
<tr>
<td>DWA</td>
<td>Department of Water Affairs</td>
</tr>
<tr>
<td>DWAF</td>
<td>Department of Water Affairs and Forestry</td>
</tr>
<tr>
<td>DWSSC</td>
<td>Directorate of Water Supply and Sanitation Coordination</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>ELAK</td>
<td>Environmental Learning and Action in the Kuiseb</td>
</tr>
<tr>
<td>EMA</td>
<td>Environmental Management Act</td>
</tr>
<tr>
<td>GIZ</td>
<td>Gesellschaft für Internationale Zusammenarbeit</td>
</tr>
<tr>
<td>IWRM</td>
<td>Integrated Water Resources Management</td>
</tr>
<tr>
<td>KBMC</td>
<td>Kuiseb Basin Management Committee</td>
</tr>
<tr>
<td>LAC</td>
<td>Legal Assistance Centre</td>
</tr>
<tr>
<td>MAWF</td>
<td>Ministry of Agriculture, Water and Forestry</td>
</tr>
<tr>
<td>MET</td>
<td>Ministry of Environment and Tourism</td>
</tr>
<tr>
<td>MME</td>
<td>Ministry of Mines and Energy</td>
</tr>
<tr>
<td>MWRMR</td>
<td>Namibia Water Resources Management Review</td>
</tr>
<tr>
<td>NDP</td>
<td>National Development Plan</td>
</tr>
<tr>
<td>SAIEA</td>
<td>Southern African Institute for Environmental Assessment</td>
</tr>
<tr>
<td>SEA</td>
<td>Strategic Environmental Assessment</td>
</tr>
<tr>
<td>SWAPO</td>
<td>South West African People Organization</td>
</tr>
<tr>
<td>TDS</td>
<td>Total dissolved solids</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WPC</td>
<td>Water Point Committee</td>
</tr>
<tr>
<td>WRMA</td>
<td>Water Resource Management Act</td>
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<tr>
<td>WSASP</td>
<td>Water Supply and Sanitation Policy</td>
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1 Introduction

Uranium has many purposes; from military to civilian electrical energy generation use. Even after the diminishment of the military usage from the 1960s, the demand of uranium has increased exponentially from rise of nuclear power plants. Countries with uranium in their ground are therefore sitting on a coveted resource. Extracting uranium has however important impacts on the environment and destroys the landscape.

While leading uranium providers such as Australia and Canada faced social movements that resulted in stricter legislation for the development of this sector in the past, Africa went on a different path. In the 1980s and 1990s, the regulatory reform favored for Africa provision of harmonization and stability for the mining sector in order to attract foreign investments (Campbell 2004). Even though the high quality reserves are mostly found in Australia and Canada, the movement of international uranium forces shifted to developing world such as Kazakhstan and Africa. In these states, opposition and regulation are relatively weak (Campbell 2009; MEG 2010). The shift has known a peak in the 2000s with the rise of emerging markets such as India and China whose industries put important pressure on the resource’s demand and with developed countries carrying execution into greenhouse gas emission reduction diminishing coal power plant. Behind this peak, there is the perception that these secondary reserves of uranium will not to be sufficient, especially if the demand keeps on increasing as it is expected.

Although it only has low-grade uranium ore, Namibia was also the theater of this so-called ‘uranium rush’. There already existed a uranium mine, but the exploration and extraction of new deposits are spotlighted again to be developed and wealth is expected from this resource. Most of the uranium in Namibia is found in the Central Namib area. Thirty-six exploration licenses were given to explore nuclear fuels in the region until 2007 (MME 2011)

Government intervention is one of the major influences of the uranium business of the country. The minerals policy made clear statements in favor of the development of this resource and seem to be especially inclined to accept to create a welcoming business environment for mining corporations. Indeed, Namibia posits itself as one of the least resistant countries to the uranium mining industry. Weak environmental regulation, low royalty rate in comparison with the international standards, and possible exemption of corporate taxes in Namibia attract foreign investors to continue the exploration (Conde & Kallis 2011). The country’s position on uranium has nevertheless political, social and environmental consequences that are deeply intertwined. These issues are to be taken seriously, since Namibian economy is dependent on mineral extraction, which is located in dry region and therefore facing other related issues, such as access to drinking water.
1.1 Problem Statement

Mining is one of the most pollution-intensive sectors, responsible for environmental conflicts all around the world (Martinez-alier 2001). Mining activities consume vast amounts of water and pollute adjacent water bodies such as rivers and ground water reserves. In fact, mines belong to the generic category of land use known as ‘locally unwanted land uses’, associated to environmentally risky locations. Nonetheless, abundance of minerals can also be considered as a source of competitive economic advantages for nations, and it is a common means for attracting international capital, particularly in developing countries (Muradian 2004).

In Namibia - the fourth uranium producing nation in the world - mining is considered as one of core economic activities of the country. Mine has long been the economic backbone of Namibia since the late 1800s during the colonial period. Mining accounts for 11.4% of the GDP (Van Wyk et al. 2011), and provided more than 50% of foreign exchange earnings (CIA World Fact Book 2012). However, Namibia is one of the most arid regions of sub-Saharan Africa therefore these intense mining activities have also been the cause for quantity and quality-wise water problems, such as water quality depletion and competition of water usage between the domestic and industrial use.

Groundwater covers half of global drinking water needs and provides stable and high quality of water (Zektser & Everett 2004). It is an essential source of water especially in an arid or a semiarid area where there is little surface water available. As groundwater is directly in contact with the surface water and atmosphere, the sustainable yield is closely related not only to geohydrologic factors, but also to anthropogenic aspects. For instance, extreme groundwater exploitation can cause vegetation oppression and its recharge condition (ibid.). Recognizing that groundwater has slow horizontal move that makes it difficult to restore, prevention of its quality and quantity should be secure to not make a fatal mistake.

However, considering that active mining activity is taking place in such arid area, there are little studies tackling the water problem coming from the mines in Namibia being done, even less in the perception of local level. Most of the literatures investigate on either one of the topic, uranium mine or water scarcity of the country. Thus, in this study, the local impact of water degradation from the mines will be researched.

1.2 Research Questions

The objective of the research is to analyze the existing conflict over water consumption between the local communities and mines in Erongo region and examine the interrelation of the political structure and water degradation in Namibia. Through literature review and expert interviews, Topnaar community, Swakop farmers and Valencia farm owners were chosen as case studies in order to understand the conflict and observe the influence of the political factor. These communities are
facing or predicted to have managerial change of water since the uranium mines (Rössing, Langer Heinrich and Valencia mine) have started their explorations. The possible environmental impact from the mineral extraction will be investigated as well as how the locals are marginalized in this condition. Furthermore, the conflict escalation theory from Yasmi et al. (2006) will be applied to the study case in order to identify of the current conflict state and to know if the conflict has the possibility to intensify. The institutional framework that has the potential to transform the conflict will be examined. The political ecology framework will be used as the lens to understand asymmetric power structure of the local communities in the political context. Political, legal and social condition of water resource management in national level will be analyzed as well. Factors and situations of each region that results to different outcome will be given.

The main and sub research questions are:

- How does the uranium mining activity in Namibian political and institutional structure shape the water usage conflict of the local communities?
  1) What are the political and institutional factors that intensify the environmental degradation?
  2) What form of conflict escalation is shown in each case study?
  3) What are the behaviors of actors that characterize the conflict?
  4) What form of institutional framework that has the potential to transform the conflict does exist?

### 1.3 Structure of the Thesis

The thesis is structured as follows. In the following chapter (chapter 2), the two theoretical frameworks, conflict analysis methods and political ecology will be introduced. Then, in chapter 3, the methodology of academic procedure that research has followed will be described. A summary of the socio-economic and natural background of Namibia will be explained in chapter 4 followed by water situation in Erongo region with explanation of water supply and demand. Next, a description of political and institutional framework will be given as well as the identified actors who are involved in the case studies in chapter 6. Chapter 7 consists of empirical results of the three case studies, Topnaar community, Swakop farmers and Valencia farm owners are given with thorough description of the conflict history and its analysis according to the research questions. Chapter 8 and chapter 9 are followed with the discussion and conclusion that were driven from the results.
2 Theoretical Background

2.1 Conflict Analysis

In this section, theoretical background of conflict analysis will be given including its definition, tools and purpose. According to Fisher (2000), conflict is a relationship between two or more parties (individuals or groups) who have, or think they have, incompatible goals. It is important to address the conflict in order to plan and carry out better actions and strategies by taking into account the dynamic of the situation, relevant actors, their relationships and issues. This can be done by systematically analyzing the conflict, which is a practical process of examining and understanding the reality of the conflict from a variety of perceptions (Fisher 2000). This comprehension can increase awareness of problems and that can ultimately give a chance to adapt to changing circumstances (ibid.). When a social structure is stable, it is difficult to expect people who have already access to resources and power to change the existing power relation. This can be done by bringing up the problems with a thorough conflict analysis.

In order to understand the fundamental element of the conflict, it is important to differentiate the attribute of each layer as suggested in ‘the onion’, one of the tools for conflict analysis (ibid.). As illustrated in Fig 1, the outer layer that contains the position of the actors, what they take publicly, doesn’t necessary express the interest, what they want to accomplish in particular situation or the needs which are hidden in the inner layer (ibid.). In an instable situation where mistrust is taking place, stakeholders tend to hide their needs to cover their vulnerability (ibid.). However, in place of negotiation, it is difficult to fulfill the request of the actor without understanding their needs or interest since they are the one that form the basis of action (ibid.). Increasing the level of trust among the group can also make the inner layers reveal (ibid.).

![Fig 1 - Conflict Onion (source: Fisher 2000)](image-url)
2 Theoretical Background

In other literature, especially in natural resource-based political conflict, value is seen as the essential element of actor replacing the needs in conflict onion (Nie 2003). The value conflict doesn’t necessary happen when the values of different parties are mutually exclusive, but more when there are different priorities and economic interest is competed (Schmidtz 2000).

Conflicts in natural resource management demonstrate distinctive characteristics than other individual disputes. In this context, natural resource management indicates the fields such as forestry, fishery, mining, water, etc. According to Yasmi et al. (2006), natural resource conflicts 1) involve multiple stakeholders each having his/her own interest toward the usage of natural resource. 2) Many of this natural resource is ‘common pool’ that is associated with complex institutional arrangement and 3) the excludability is considered to be low.

There are diverse tools for analyzing environmental conflicts. The following tools are the ones that facilitate to reveal the nature and the current status of the conflict.

2.1.1 Conflict Escalation Theory

Conflict analysis helps to visualize how particular conflict evolves over time. It is likely that conflicts at early stage are ignored due to their low intensity and this makes the positive change difficult to be achieved once conflicts are already intensified (Yasmi et al. 2006). Defining the contest in the early stage will help people to constructively manage the conflict.

To give a comprehensive assessment to the conflict, conflict escalation theory from Yasmi et al. (2006) is applied to the case studies. Conflict Escalation theory refers to the rise in the severity of coercive incentives that are used and the increase of the number of participants within a conflict (ibid.). The premise of this theory is that conflict doesn’t happen abruptly, but it evolves or intensifies over time including the latent phase that is difficult to be observed. The authors asserts that actors’ interpretation of the situation is the main driver of the conflict than the direct consequence of the competition of resources (ibid.). Thus, by description of the history of the conflict will enable to reveal the actors’ understanding of the conflict. This theory provided a pragmatic way of implementing the theory to the case by looking at the behavior of the actors.


1. Feeling anxiety: actors start having suspicion toward a certain action or decision and expressing emotional reactions such as anger, unhappiness, complaint or rumor inside the group.
2. Debate and critique: actors have series of debate over the confronted issues and priority of the group while the opposite stakeholders are being criticized.
3. Lobby and persuasion: at this stage, stakeholders have clear position of their group and endeavor to convince the opponents with structured arguments.
4. Protest and campaigning: actors organize protest either small or big to accuse their opponent of their irresponsibility and not being cooperative.
5. Access restriction: actors try to limit the accessibility of the opponent to the natural resource to secure their own use.
6. Court: when the conflict seems to not able to be solved by the stakeholders, actors try to appeal their case to the court in form of lawsuit. In the past decades, it is becoming an important medium for natural resource management conflict resolution.
7. Intimidation and physical measures: it is the stage that actors express their assertion through physical demonstration and intimidating the opponent is often preceded.
8. Nationalization or internationalization: the information of local conflict might be widely spread in national or international level through media exposure or international courts.

In this research, the potential existence of the water conflict will be assessed with theory of environmental conflict.

### 2.1.1 Characteristic of Environmental Conflict

Going along with the social constructivism of the conflict, Dietz et al. (1989) argue that the characteristic of controversy in environmental policy should be defined in order to discern the dynamics of environmental conflicts. They refused the idea that conflict analysis gives an objective description of the case, but rather provides an opportunity to understand the perception of the stakeholders. They classified environmental conflicts by focusing on the different behavior of actors and arranged them to: differential knowledge, vested interest, value conflict and mistrust of expert knowledge. Due to the fact that understanding environmental problems needs scientific knowledge and at the same time, the outcome is uncertain, general public who are not well informed can
possibly have unreasonable fear toward it (differential knowledge). This situation might increase the value of the expertise and the stakeholders who have the accessibility to them tend to have higher position.

In environmental conflict, the benefit and cost are unevenly distributed to the population that makes people to have vested interest according to how they are affected from the environmental change. This leads to struggles between the potential winners and losers. In the third view, it is emphasized that the value is the basis in decision making when it comes to environmental conflict due to the constant existence of uncertainty. If the value at the environmental issues is discussed, it could provide the minorities who are often discriminated in value-free decision made for the government or industry with legitimacy.

The view of mistrust of expert knowledge argues that conflict happens when people realize that forces of certain actor have effect on knowledge, which was previously considered to be value-free. To overcome this situation, it is noted that trust between the experts and stakeholders should be regained and discourse with all actors including the expertise should be the core in decision making.

### 2.1.2 Role of Institution in Environmental Conflict

In conflict transformation theory that describes the process of transforming the existing relationships in order to halt the conflict, stressed the importance of the role of structure (Miall 2004). The premise is that the conflict that are due to inequality and the long-term asymmetric relationship of the actors could be changed by transforming the structure and process that has generated this injustice (Fisher 2000). Thus, designing an appropriate institutional framework can be an effective way to transform the conflict (Miall 2004).

As discussed in this section, environmental resource management involves complex form of institutions and diverse stakeholders. A strong institutional framework that can balance competing interest is necessary in water scarce country. However, a mismanaged system can increase the conflict instead by allocating water or distributing the cost and benefit inequitably that makes the local communities to deal with the environmental consequences (Wolf et al. 2005).

### 2.2 Political Ecology

Political ecology is an explicit alternative concept to apolitical ecology which has ‘ecoscarcity’ and ‘modernization’ as its prominent approaches (Robbins 2004). These apolitical views emphasize on the reason of environmental degradation that are more ‘natural’ such as overpopulation or mismanagement of modern economic techniques (ibid.). On the contrary, political ecology explains the cause of environmental degradation not only limited to biophysical factors, but more focusing on
social and political factors. The common premise of this framework is that ‘environmental change and ecological conditions are the product of political process’ (ibid.).

Inequality and uneven power distribution affect the right to use of natural resource and change the social metabolism (Conde & Kallis 2012). In such political condition, the cost and benefit of environmental change are distributed unequally among the actors and this can enhance or decrease the existing inequality. The marginalized group, who are viewed as the victims of this degradation, are the ones who have less economic and political power that are often neglected in decision making process (Robbins 2004). Political ecology allows researchers to scrutinize why and how the environmental changes occur by investigating on the marginalized social group and understand the larger political and economic context than only focusing on regional operation. The normative use of political Ecology can be to criticize the existing reason of environmental change and at the same time to investigate alternatives or improvement of current mismanagement (ibid.).

The natural resource and environmental depletion of the marginalized countries exacerbate by being integrated to the global market. Zimmerer and Bassett (2003) pointed out also that environmental globalization is derived from global processes in economic, political and cultural changes. It appears in ecological modernization in legal, institutional, techno-managerial reforms. That is why the framework gives special attention to the developing countries that are more directly dependent to its natural resources (Bryant 1998).

Robbins (2004) illustrated this view in ‘Degradation and marginalization’ theses which explains the influence of globalization to environmental change. He explained the adverse effect of the attempt to improve local usage of natural resource such as integrating it in global market can give to the local practices. Introducing new or foreign institution may rather overexploit the natural resource and decrease the equity of distribution. The locals who were already there might have to face the consequences with increase of poverty which eventually lowers the sustainability of local practices. The degradation of environmental system occurs when passing a certain threshold that the capacity permits and to recover the damage, more energy and investment is required than in prior condition. The suggested solution to prevent this is to set ‘carrying capacity’ and establish a robust political foundation to enforce this limit (Schmink & Wood. 1987).

As the prior aim of the theory is not to generalize the pattern or the explanation, not all case studies necessarily have to fit completely to this theses (Robbins 2004). There might be some cases where there is not enough proof of concurrence between degradation and marginalization. Nevertheless, ‘Degradation and marginalization’ can be still applied because the emphasis that political ecology gives is more on ‘the processes and operating influence that link degradation to marginalization’ (ibid.) . The analysis permits the researcher to reveal the power relations, winner and loser of the game, and at the same time, the explanation of why degradation and marginalization did not happen (ibid.).
Environmental conflict is also dealt as one of the theses of political ecology. The complexity of property right over natural resource is the premise of environmental conflict because it comprises of a bundles of rights (ibid.). Especially in traditional societies, trajectory of their history in property rights should be also taken into consideration to understand their social implication of environmental change (ibid.). Many development attempts such as privatization of rights may have adverse impact to these traditional societies since they can exclude their pre-existing property right (ibid.). This can, instead, increase the inequality and lead to natural resource conflict. However, many case studies show that political struggles that were already prevailed are newly expressed as ecological conflict (ibid.).
3 Empirical Research

3.1 Qualitative Methods and Data Collection

The empirical data are collected by literature review and interviews. Through literature review, the general profile of Namibia and its political and institutional framework were examined. Prior to conducting interviews, the political and legal situation of Namibia was reviewed as well as the existing institutional framework.

In contrast to quantitative research that counts and measures data, qualitative research refers to the ‘meanings, concepts, definitions, characteristics, metaphors, symbols and description of things’ (L.Berg 2004). There are diverse ways of collecting qualitative data such as interviewing, focus groups, ethnography, sociometry, unobtrusive measures, historiography and case studies (ibid.). In order to examine how the communities are influenced from the mining policy and activity socially, economically and environmentally, most of the data that was gathered should be in qualitative form. Qualitative research properly seeks answers to questions by examining various social settings and the individuals who inhabit these settings (ibid.). It allows researcher to examine ‘how humans arrange themselves and their settings and how inhabitants of these settings make sense of their surroundings through symbols, rituals, social structures and social roles’ (ibid.). From Qualitative procedures, researcher can have access to unquantifiable facts about the actual people that are observed.

3.1.1 Case study

Case study methods is a methodological approach that enables systematical information gathering about a particular social setting, event or group that allow researcher to effectively comprehend how the subject operates or functions (Hamel et al. 1993). It permits the researcher to uncover elements that are unquantifiable and latent such as nuances and patterns that other research approached might neglect. The data collection for the three case studies was done with documents, interviews and participant observation. The aim of using case study as the method is to capture the manifest interaction of significant factors characteristic of the phenomenon, individual, community or institution. The benefit of the case study is the ability to open the way for discoveries. It can easily serve as the creation for insights and even hypothesis that may be pursued in subsequent studies.

3.1.2 Semi-Structured Interview

Semi-structured interview is a non-standardized formed interview that the content of the questions is fixed while the form is usually open-ended and the sequence of it varies to the interviewees. It permits the respondents to expand their opinion than what they were asked when they think is attribute to the issue (Gray 2009). It enables interviewees to show their subjective point
of view to a certain concepts or events (ibid). 21 semi-structured interviews were conducted during one and a half month of stay in Namibia and one was done via telephone afterwards due to the absence of the interviewee during the field research. The interviewees were the experts and stakeholders involved in the water management of Erongo region. The political condition of Namibia that influences mining sector, environment and livelihood of people was explored. The goal of interviews was to gather the latest status of political and legal situation of Namibia and to establish an objective view by listening to all possible stakeholders that are involved.

The first three interviews were with the key informants who have general insight to the topic and who were able to guide the thesis. To investigate the national political structure and how the water problem is dealt in federal level, national government bodies such as Ministry of Mines and Energy, Ministry of Agriculture, Water, and Forestry, and NamWater who are directly in charge of water and mining policy were interviewed.

As expert interview, people who are professional or who are actively involved in water or mining sector are interviewed. Experts from relevant ministry, international organization, non-governmental organization (NGO) and private sectors were the subjects of interview. Gesellschaft für Internationale Zusammenarbeit (GIZ) was expected to provide an insight of international level showing in what manner the international actors affect national policy. Among the private actors, Rio Tinto, the company that runs the Rössing Uranium Mine, Uranium Institute, Southern African Institute for Environmental Assessment (SAIEA) who took part of Strategic Environmental Assessment (SEA) of uranium rush in Erongo region and SLR consulting that is gives groundwater consulting to the mines and to diverse projects. As NGO, Legal Assistance Centre, Earthlife Namibia who raised its voice against the radiation emission from the mines and Desert Research Foundation of Namibia (DRFN) that conducts research and capacity building in different environmental issues with ministries and local authorities were interviewed.

The villagers of Topnaar, farmers near the Swakop area and Legal Assistance Centre (LAC) who represented the Valencia farm owners were interviewed as stakeholder to examine how they are affected by mining and how they perceive its influence. Based on the primary data, the level of conflict is analyzed as well as the role of the relevant institution in each case study.

The interviewees were chosen through literature review, recommendation from experts and also from other previous interviewees. Besides the group interview with one community in Topnaar, all of the interviews were carried out individually. Most of them were done in their working or living place in English apart from Topnaar community where a translator was translating Nama. Apart from the one interviewee who didn’t agree on recording, the rest of interviews were recorded and summarized after the interview was conducted.
3.2 Data Analysis – Qualitative Content Analysis

Content analysis is known as one of the oldest empirical method to analyze the text by categorizing the raw data to a standardized form (Babbie 2001). It uses transcripts of interviews or other documents as the object of analysis to analyze not only the manifested content through the systematic text analysis, but also so-called the ‘latent content’ that contains the context information (Mayring 2000). It categorizes the text according to the research question and as feedback loops the categories are being revised through the process of analysis (ibid.). In order for the categories to be replicable and not arbitrary, the inclusion or exclusion of content should be done consistently applying criteria of selection (Holsti 1968).

In developing the category, it is recommended to use both deductive and inductive reasoning for providing a fruitful finding. For systematic approach to test the hypothesis that was given prior to the data collection, the deductive reasoning should be used and once the empirical observation has begun, inductive reasoning that emerges concerning patterns from data should be derived (L.Berg 2004).

MAXqda software was used to categorize the transcription from the interview. This software facilitates qualitative data analysis by providing tools to codify the text and classify the sorted information. The codes were first deduced from the research questions and during the process of the analysis, more analytic categories were developed by sorting the themes or category labels of interview question. It is suggested to not add random categories that are not relevant to the research question just because they appear in the interview frequently. Once the criterion of selecting category has been achieved, the transcribed interview was sorted accordingly and tried to uncover the pattern. The pattern should be confirmed with other literature and existing theory.

Although the content analysis has advantage on analyzing the process that occurred for long periods of time helpful for exploratory or descriptive studies, it is not effective to interpret the causal relationships between the variables of the patterns that are being observed. However, this drawback can be minimal by using other source of research strategy.
4 Background

4.1 Socio-economic Background of Namibia

Namibia is a large country in south-western Africa that consists of 823,680km² of area which is 2.5 times larger than Germany (Mendelsohn et al. 2009). Its west coast is facing the Atlantic Ocean and it shares the boarders with Angola and Zambia in the north, Zimbabwe and Botswana in the east and South Africa in the south.

![Map of Namibia](http://source.com/2009)

Fig 2 – Map of Namibia (source: Ezlion.com, 2009)

Namibia has a long colonial history until it gained its independence in 1990. It was occupied by Germany from 1884, and South Africa took over the country in 1915 after defeating Germany in the World War I. Most of the current straight-lined borders were formed after a long negotiation between German, British and Portuguese government the European colonial period (Mendelsohn et al. 2009). South West African People Organization (SWAPO), who is based on the northern region, led the independence.

87.5% of its population is black while 6% and 6.5% is white and mixed consecutively (CIA World Fact Book 2012). About 50% of the population belongs to the Ovambo tribe and 9% to the Kavangos tribe. Other ethnic groups include Herero 7%, Damara 7%, Nama 5%, Caprivian 4%, Bushmen 3%, Baster 2%, Tswana 0.5% (ibid.). English is the official language but Afrikaans and other indigenous languages such as Oshivamb and Herero are widely spoken. With only 2.2 million people in this large
country, Namibia has the second lowest population density in the world counting 2.68 person/km². Half of the population lives in Owamboland, located in the north of the country where the water is more available, and 15% of the population live in the capital, Windhoek. The rural population consists 65% of the population that accounts only 38% of total income (World Bank 2006).

The long colonization history changed the land allocation of the country; now there is 43% of freehold land, 39% as communal land, and 18% as government land (Mendelsohn et al. 2009). Communal lands are owned by the government and the right to use it is given to the people living there. Large portion of the land is used for cattle farming and 3000km² for cultivation of millet, sorghum and maize (ibid.). 14.1% of the land is proclaimed for natural reserves and national park and additional 9.6% are declared as conservancies (ibid.).

The average per capita gross domestic product (GDP) in Namibia is relatively high, five times more than the average for countries in the South African Development Community (SADC). However, poverty remains as wealth is unequally distributed. Few rich people are very rich and a large number of the poor people are extremely poor. 34.9% of the population lives on less than $1 per day and 55.8% on $2 per day (UNDP 2005). The situation is difficult to tackle as 34% of the labor force is unemployed in 2007 and this is something that is prevailing amongst the ones who have little or no skill (Hoadley 2009).

The economy of Namibia is strongly dependent on the one of South Africa, which is rooted from its long colonial history. During South African colonial period, Namibia supplied South Africa with primary and unfinished goods for South African consumer goods, completely being integrated to South African economy (Bertelsmann Stiftung 2007). Until now, Namibia imports almost 80% of its capital and consumer goods from South Africa (Kalaba 2006). Low population density restricts the development of the secondary industries, which are currently only limited to fish and meat sector, metal refinery and beer brewing (Sherbourne 2009).

Mining sector has always played a vital role in Namibian economy since the discovery of the diamond deposit. Its contribution was stronger earlier when it was consisting 13% to GDP and 60% of exports in 1990. Now, the portion has been reduced due to exploitation of the existing deposit and the growth of other sectors, but it is still considered one of the backbones of Namibian economy.

### 4.2 Water and Mining Profile of Namibia

Due to the domination of subtropical high pressure zone that pushes the moist air back with dry air, the climate is dry that makes the country as one of the most arid country in sub-Saharan Africa (Mendelsohn et al. 2009). Scarcity of water leads Namibia to the lack of deep soils and nutrients that are not suitable for agriculture. Plants are adapted to the extreme and arid condition. In the north-east, it is dominated by tall woodlands and it the plants get shorter and more sparse to the west and
The amount of rainfall varies clearly between the arid Namib Desert in the west to the most tropical areas in the north-east. Furthermore, Namibia has one of the highest rainfall variations in Africa that makes it difficult to predict the amount of precipitation. Most of the rain comes during the summer months. In addition, Namibia shows a high evaporation rate of that reduces the amount of water that reaches the groundwater bodies to 1%. 83% of the rain evaporates before it arrives at the ground which makes even more difficult to use the rainfall water resources for human activities such as agriculture.

Fig 3, 4 – medium annual rainfall and yield of boreholes (source: Mendelsohn et al. 2009)

Most of the rivers in the country are dry for most of the time, and they flow only after heavy rain falls. Most of the Namibians are living close to the catchment of the perennial rivers that are shared with the neighboring countries in northern region. As the surface water is so scarce, ground water is the main source of water supply for the population. The knowledge about the aquifer come from the gathered data from 50,000 boreholes (Mendelsohn et al. 2009).

The following figure shows the quality of the underground water. It used total dissolved solids (TDS) as indicator that includes sulphates, nitrates, fluorides and various salts (ibid.). Lower TDS value indicates the purer water and if the water shows less than 2000mg/L, it is suitable for human consumption.
Due to its active continental movements over the past billion years and arid condition that formed and preserved mineral, Namibia is rich in its mineral deposit (Mendelsohn et al. 2009). Mining accounts for 11.4% of the GDP (Van Wyk et al. 2011) and provided more than 50% of foreign exchange earnings (CIA World Fact Book 2012). The contribution of mine has been reduced compare to 1980s when it comprised 25% of the GDP, mainly resulting from declining demand and prices of the mineral and stronger contribution from other sectors (Mendelsohn et al. 2009). Diamond is the strongest supporter to the GDP among the mining activities, and followed by uranium mine after, having the reputation as the fourth uranium producing nation in the world.

Even though uranium mine is important in general mining sector, the grade of the ore that is found in Namibia is low-grade especially compare to Australia and Canada who have ‘super-rich deposit’. Moreover, unprocessed mineral products are exported with little value addition.
Fig 6 – Mines in Namibia (source: Mineral & Exploration 2010)
5 Water Situation in Erongo Region

5.1 General Introduction of Erongo Region

Erongo Region is located in the central western part of Namibia where much of the land is occupied by Namib Desert. It hosts about 135,250 people in which eighty percent of them are living in urban area, mostly in Swakopmund and Walvis Bay (MME 2011). The rest of the population is sparsely distributed, resulting low population density. It faces Atlantic Ocean at the west coast to where the four ephemeral rivers run; Omaruru River, Swakop River, Khan River and Kuiseb River.

![Fig 7 – Main physical features of Erongo (source: MME 2011)](image)

Erongo is the second prosperous province in Namibia gained mostly from mining, fishing and tourism. Commercial fishing industry which employs 33% of economic active population takes place in the coast line including the aquaculture in Walvis Bay lagoon (MME 2011). Tourism plays also a vital role in Erongo’s economy as Walvis Bay and Henties Bay are known for holiday destination as well as Swakopmund, the main center of tourism (ibid.). Traditionally, the region was considered as the land of many Damara people, but due to its continuous growth of these industries, high influx of migrated workers enhances ethnic diversity. As most of the incoming workers are unemployed, this adds the unemployment rate in Erongo to 34% (Hoadley 2009). This led to asymmetric development, shown that 19.7% of the population is considered poor (ERC 2007).
Swakopmund, the biggest town in Erongo region, is a tourist center and at the same time, provide services to mining activities. Due to the historical background, Swakopmund has large white population. Walvis Bay and Henties Bay are the three biggest cities that are located at the coast. Arandis is a town that was made for the workers of Rössing mine with support from Rio Tinto while Karibib supply as well its residents as workers to Navachab Gold Mine. The rural population is spread in small settlements such as Spitzkoppe, Otjimbingwe and Okombahe (MME 2011). There is two protected area that consist large part of Erongo: Namib-Naukluft Park (NNP) in the south and central area where the Topnaar communities are scattered along the Kuiseb River and National West Coast Recreation Area (NWCRA) in the north (ibid.).

Although farming is not considered as the most suitable economic activity in the arid environment of Erongo, communal and commercial farms are in practice. It consists 3.9% of the income in this region from small-scale farming in Swakop River bed and small areas in Omaruru and Okombahe to the formal farming in the lower Swakop River nearer to the coast (ibid.).

### 5.2 Uranium Mines in Erongo

Erongo is known as ‘the Uranium Province’ where the only two operating uranium mines (Rössing and Langer Heinrich mine) are found. Additional exploration went on during the Uranium Rush, and up to now, Husab, Etango and Valencia Mines received their mining license from MME while Trekkopje mine is in their final pilot testing phase in late 2012. Besides the uranium mines, there is Navachab gold mine near Karibib and other small scales of dimension stone, salt, stone and sand quarrying and gemstones are found.

#### Table 1 - Key statistics of uranium mines in 2010

(source: The Chamber of Mines of Namibia 2011)

<table>
<thead>
<tr>
<th>Mine</th>
<th>Start of production</th>
<th>Projected closure</th>
<th>Major shareholder</th>
<th>Product (t)</th>
<th>Royalties (mill N$)</th>
<th>Corporation tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rössing Uranium Mine</td>
<td>1976</td>
<td>2023</td>
<td>Rio Tinto</td>
<td>3,628</td>
<td>213.6</td>
<td>0</td>
</tr>
<tr>
<td>Langer Heinrich</td>
<td>2007</td>
<td>2032</td>
<td>Paladin Resources Ltd</td>
<td>1,673</td>
<td>32.3</td>
<td>0</td>
</tr>
</tbody>
</table>

Rössing Uranium Ltd mine takes place 70km away from Swakopmund in the Namib Desert. Since it is situated where low concentration (0.03%) of uranium is found, Rössing operates in open pit on large tonnages that measures 3km long, 1.2km wide and 345m deep (MME 2011). Sulphate acid leach process is used to extract uranium from the host rock. It employs 1,592 permanent employees and 1,107 contractors (The Chamber of Mines of Namibia 2011). To extend its mine life,
Rössing continued exploring existing uranium concurrences in its mining license area and expanded to the east of current open pit.

**Langer Heinrich Uranium Mine** is located 80km away from Walvis Bay along the Swakop River. As Rössing Uranium, it is placed on the low grade mineralized envelope where the uranium is found near the surface (MME 2011). It uses tank-based alkaline leach process to extract uranium. In 2010, 268 permanent employees and 1,350 contractors were working with Langer Heinrich. It continues with its expansion plan and it started the construction of Stage 3 expansion in 2010 that will provide additional 2,359 tones of production (The Chamber of Mines of Namibia 2011).

**Trekkopje Uranium Mine** is owned by Areva Resources Namibia, located 70km away from Swakopmund and it finished its pilot test in 2012. The uranium grade is lower than the other existing mine, but the project was economic under the premise that the uranium price will remain high. The possibility of this mine’s production is still unclear due to the fall in uranium price. **Valencia Uranium** is owned by Forsys Metals Corporation that obtained its mining license in 2008, in a privately owned area that is 25km away from Rössing Uranium Mine (MME 2011). Due to the pending of funding, the construction is still on hold. **Husab Uranium project** is owned by Swakop Uranium and it will take place in highest-grade of uranium deposit of Namibia. The company received all of the necessary permit and will start the construction by the end of 2012 (Mulligan n.d.)

### 5.3 Overall Water Supply and Demand at Central Coast

Erongo region receives little rain that has great variability annually and its aquifer doesn’t contain large amount of water. Furthermore, some part of this region his high salinity in its underground water. Small areas of productive aquifers are found only along the Omaruru and Kuiseb River in Erongo. Therefore, most of the industrial and domestic use of water is provided from the alluvial aquifer of Omaruru and Kuiseb River. Alluvial aquifers are porous aquifers that occur in sandy areas where the water fills up the void area between the grains. The water levels tend to be shallower and fluctuate from pumping and recharging compare to sedimentary or fractured rock aquifers. Even though the groundwater of Swakop River is saline, it provides water to the farmers in the downstream for farming and to Langer Heinrich Mine for certain portion of their water demand. Navachab Gold Mine is not included in this section since it receives its water from different water scheme.

#### 5.3.1 Water Supply

The water for the existing mines is mainly supplied from the alluvial aquifer of OMDEL dam that is located in the downstream of Omaruru River. Part of the water from Kuiseb River Aquifer is also flowing to the base station near Swakopmund after supplying Walvis Bay. Only small portion of water
demand of mine is used from Khan and Swakop River due to their high salinity and water level decline. The recharge of the coastal aquifers occurs by runoff of rainfall coming from the central highlands where the precipitation is higher and more stable (MME 2011).

Fig 8 - Water Supply Scheme of Central Coast (source: NamWater)

Kuiseb River catchment covers an area of approximately 14,700 km² from Komas Hochland flowing down to the Atlantic Ocean through Namib Desert (Werner 2003). The river forms the boundary between the gravel plain and the Namib sand sea. The Lower Kuiseb Aquifer currently comprises the Swartbank (developed in 1974), Rooibank A (1923), Rooibank B (1966) and Dorop South (1992) alluvial aquifer compartments (NamWater 2002; Christelis & Struckmeier 2011). There are 60 production wells in operation, scattered over a distance of approximately 30 km. The first aquifer, Rooibank A was used to provide water to Walvis Bay and to meet the growing water demand of the city, Rooibank B was further developed (Christelis & Struckmeier 2011). Swartbank was formed afterwards to increase the yield in order to supply Swakopmund and Rössing Mine (ibid.).
The sustainable yield of the aquifer was 11Mm$^3$/a in 1970 which was considered to be overestimated (ibid.) and currently, it has been balanced to 7Mm$^3$/a (MME 2011).

Fig 9 – Layout of water abstraction areas in lower Kuiseb River (source: MME 2011)

Omaruru River is an ephemeral river that covers 15,700km$^2$ of catchment area. Omaruru River Delta aquifer was developed in the 1970s to supplement the water supply of Kuiseb aquifer due to the increased demand of the coastal region (Christelis & Struckmeier 2011). The water Omdel Dam was built in 1994 with artificial recharge scheme to augment the aquifer’s sustainable yield by catching the floodwater (ibid.). The estimated sustainable yield that is documented varies from 4.5 Mm$^3$/a (MME 2012) to 8Mm$^3$/a (NamWater 2002).

However, as it was remarked in the interview (#20) that the water supply from OMDEL aquifer will be reduced to 4.5Mm$^3$/a to meet the sustainable yield, one can speculate that the final sustainable yield that NamWater is using is 4.5Mm$^3$/a. The over-abstraction of Omaruru Delta was also recorded by Department of Water Affairs in 1995, stating that 8.5Mm$^3$/a was being abstracting instead of the annual recharge of that year, 3.5Mm$^3$/a. At the moment as well, water abstraction exceeds the sustainable yield.

Swakop River and its tributary Khan River supply groundwater to the boreholes of farmers in the lower river and to towns in the upper stream (Christelis & Struckmeier 2011). After the construction of Swakoppoort and Von Bach dam in 1970s, the flow has changed drastically. The water recharge has declined due to the reduction of flood. From the point Swakop River joins the Namib Desert, the salinity of groundwater gradually increase to a level where human consumption is not suitable (ibid.). Depending on the spot and depth of the boreholes, the quality of groundwater from lower Swakop River varies from potable to non-potable quality. That is why Swakopmund receives its water supply from the OMDEL scheme, not from Swakop River.

AREVA, the owner of Trekkopje mine, built a desalination plant in Wlotzkasbaken in 2010, which is at the coast between Swakopmund and Henties Bay with 20Mm$^3$/a of fresh water producing capacity to provide water to their new uranium mine. 13-14Mm$^3$/a will be provided to Trekkopje.
Mine and the rest is planned to be sold to NamWater. However, AREVA and NamWater are still in negotiation for the water price (interview #12). Desalinated water is predicted to be 3-4 times more expensive than the current groundwater price.

<table>
<thead>
<tr>
<th>Water source</th>
<th>Actual abstraction</th>
<th>Sustainable yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMDEL</td>
<td>9.27</td>
<td>4.50</td>
</tr>
<tr>
<td>Kuiseb</td>
<td>5.17</td>
<td>7.00</td>
</tr>
<tr>
<td>Wlotskasbaken desalination plant</td>
<td>Not in operation</td>
<td>(6.00) in the future</td>
</tr>
<tr>
<td>Total</td>
<td>14.44</td>
<td>11.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumer</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Towns</td>
<td></td>
</tr>
<tr>
<td>Henties Bay</td>
<td>0.41</td>
</tr>
<tr>
<td>Swakopmund</td>
<td>3.79</td>
</tr>
<tr>
<td>Arandis</td>
<td>0.34</td>
</tr>
<tr>
<td>Walvis Bay</td>
<td>4.72</td>
</tr>
<tr>
<td>Other towns</td>
<td>0.52</td>
</tr>
<tr>
<td>Mines</td>
<td></td>
</tr>
<tr>
<td>Rössing</td>
<td>3.68</td>
</tr>
<tr>
<td>Langer Heinrich</td>
<td>0.86</td>
</tr>
<tr>
<td>Trekkopje</td>
<td>0.06</td>
</tr>
<tr>
<td>Valencia</td>
<td>0.01</td>
</tr>
<tr>
<td>Total</td>
<td>14.39</td>
</tr>
</tbody>
</table>

There is another desalination plant, called Mile 6 plant that the government was reviewing for more than two decades about its feasibility and it is in tender at the moment (September 2012, interview #3; #12). It is planned to be in build-own-operate-transfer principle, in other words, that the consortium who wins the contract will finance, design, construct, maintain and operate the plant for the next 20 years (interview #12). The capacity of the new plant will be 20Mm³/a and it is planned to be finished by 2015 (interview #12). The possibility of using the existing plant in Wlotskasbaken instead of constructing a new one has been reviewed as the plant from AREVA can be expanded as it is composed modularly. However, it has come to a conclusion that the expanding capacity of Wlotskasbaken desalination plant, 4.5Mm³/a is not enough for the future demand. Moreover, the having two different companies running one plant brings more complication in managerial point of view (interview #12). However, Mile 6 desalination plant project is being delayed due to the lack of funding and uncertainty of water demand from the mine.

### 5.3.2 Water Demand

The sum of sustainable yield from Kuiseb and Omdel scheme is 11.5Mm³/a, but the actual abstraction increased to 14.44Mm³/a over the last years. This is mainly from the increase of new demand of Langer Heinrich Uranium Mine who met its full expansion in 2009 and construction of Trekkopje Uranium Mine. Almost two thirds of the water demand of the Central Coast is coming from
the mining activities.

Moreover, the increase of population in Swakopmund and Walvis Bay has augmented the domestic demand. The population growth in Swakopmund began since the 1970s when uranium exploration of Rössing started. The population has doubled since 1991 from 17,670 to about 40,000 in 2010 (NACOMA n.d.). Most of the new influx consists of people searching economic opportunity. The population of Walvis Bay grew rapidly after the independence which has doubled (Hoadley 2009). Walvis Bay has its fishery industry and harbor that attract many job seekers.

In 2010, Ministry of Mines and Energy published Strategic Environment Assessment of the Uranium Rush that is happening in Erongo Region. In this report, the water supply of central Namib was thoroughly examined and four different scenarios according to the mining development were developed. It examined that the water demand of the coast will most likely to be 25Mm³/a as scenario 2 by 2014 from the growing water demand of the mines and increasing population. It emphasized that the current groundwater capacity cannot support this quantity. Thus, it is suggested that desalination plant should be installed in the coastal area and that the mines should use desalinated water. Domestic consumption was reviewed to continue using water from alluvial aquifers.

5.4 Environmental Degradation

The experts that were interviewed asserted that there is no detectable water quality pollution from the mining activity (interview #1, #2, #13). This due to the fact that the mines are located in the middle of desert where no community is found and where there is no flowing river that mineral extraction does not affect the water quality significantly. In the study that was conducted by Kringel et al. (2010) for the SEA, it was found that most of the water quality indicators from Khan and Swakop River samples met the Namibian and World Health Organization (WHO) environmental standard. Only uranium and sulphate were detected in high concentration from the samples that was taken near Rössing Uranium Mine, Langer Heinrich Uranium Mine and in the confluence of Swakop and Khan River. However, the data wasn’t sufficient to prove whether this is due to the contamination from the mines or to the geogenic background concentration.

On the other hand, the concern about quantity-wise water degradation from mining activity was recognized by the experts (interview #1, #10, #12, #13). Each mine is extracting its permitted maximum amount of water, but the accumulative effect can reduce the water table decline of the compartment (MME 2011). This will affect the ecosystem that is dependent on the river basin and reduce the boreholes yields that supply domestic consumption and irrigation (ibid.).

OMDEL aquifer is in a vulnerable condition at the moment because of the over-abstraction that exceeds its sustainable yield and it this continues and goes beyond its threshold, the water table will be irreversibly exhausted. This will lead to water shortage for the mines and especially for the people.
According to the permit of Department of Water Affairs and Forestry (DWAF), NamWater has to reduce the abstraction amount of OMDEL aquifer to its sustainable yield (interview #12, #20), but at the moment, there is no alternative source to meet the demand. This problem would be difficult to be solved without the negotiation between AREVA and NamWater with the water price.
6 Institutional, Political and Legal Frameworks in Water Conflicts

In this section, the identified actors including governmental, private and non-governmental institutions who were involved in the three case studies are introduced. Many of the governmental institutions are associated to more than two case studies. This will be followed by review of political and legal framework of Namibia to understand the political situation regarding mineral extraction and water supply.

6.1 Actors in Water Management

6.1.1 Ministry of Agriculture, Water and Forestry (MAWF)

Ministry of Agriculture, Water and Forestry (MAWF) was originally Ministry of Agriculture, Fishery, Water and Rural Development that was created after the independence from the incorporation of Department of Water Affairs (DWA) and the Department of Agriculture (Heyns 2005). The goal of the ministry is to promote and facilitate sustainable development in utilization of water resources. The three major divisions regarding in water resource management are Department of Water Affairs and Forestry (DWAF), Directorate of Resource Management (DRM) and Directorate of Water Supply and Sanitation Coordination (DWSSC).

![Organization chart of MAWF focusing on water bodies (source: MAWF)](image)

DWAF serves as decision maker, working closely with planning and policy making regarding water issues while DRM and DWSSC function in controlling and operating the water resources respectively. DRM issues permit and is in charge of revising Water Resource Management Act (WRMA) (Hein 2011). DWSSC took over the role of former Department of Agriculture and Rural Development that executed social responsibility of rural development. Now it has the mandate to supply water and sanitation facilities in rural areas (ibid.).
6.1.2 Basin Management Committee

Basin Management Committee (BMC) was established to manage water according to the hydrological boundaries that can actively involve local communities in their water resource management, planning and operation (Amakali & Shixwameni 2003). WRMA provides the legal establishment of BMC and MAWF serves as a facilitator for better management of water resources (Amakali & Shixwameni 2003). However, there is no division in the ministry that directly deals with BMC (interview #14). Their main objective is to give advice with their direct interest as stakeholders on how to manage the natural environment and resource of the river basin such as soil, flora, fauna and land (Amakali & Shixwameni 2003).

It supports the concept of Integrated Water Resources Management (IWRM) on basin level that was identified as the key foundation of water sector reform of Namibia. At the moment, there are 8 committees running in Namibia. The committee was first initiated from a pilot project of Environmental Learning and Action in the Kuiseb (ELAK), which was implemented by DRFN with the European Commission funding (interview #17).

![Demarcation of water basins that was proposed in 2004](Source: BIWAC 2004)

BMC comprises of forum, committee and execute body. The forum is open to all water users and managers, while committee is formed with maximum 20 key stakeholders that are selected from the forum (interview #14). Execute body consists of 6 members from the committee who actually execute the plan and operate the committee (interview #14). The performance of each BMC differs because the stakeholders that are involved and the condition of the river basin are different in each
river basin. Except the basin support officers, all actors are working voluntarily. MAWF gives technical and financial support such as procurement of necessary equipment as well as guidance on operation (interview #14). The accounting is also done in the head office (interview #14).

The existing Water Point Committees who plays as the executive institution in the BMC are also part of the committee in forum or in execute body. However, it has been criticized that they are not working as it was expected. They serve also as treasurer and are in charge of collecting money of water tariff. However, considering that they are not paid and being responsible for the collected money, it is being criticized that too much liability is given to them (interview #17).

Kuiseb Basin Management Committee (KBMC) is the first BMC that was established in Namibia where the basin management principles were being newly developed and was successful enough to bring all of the relevant stakeholders (BIWAC 2004). It has the simplest structure with 17 stakeholders, 12 committee members and 6 members of execute body. The Swakop BMC is not yet established because the initial idea was to integrate it with Omaruru BMC as the lower Swakop River catchment area receives water from Omaruru Delta (interview #14). However, it will soon be formed in an independent BMC

6.1.3 Namibia Water Corporation Ltd. (NamWater)

Namibia Water Corporation Ltd. (NamWater) is the only bulk water supplier in Namibia. During the feasibility investigation on intuitional review, it came to an agreement that the bulk water supply activity that was initially given to DWA should be separated from the work scope of the ministry. In this way, government could focus on its own mandates such as making policies, legislation and strategies and regulating the water abstraction (Heyns 2005) and water could be supply in cost-recovery base.

That is how NamWater was founded as a parastatal body under NamWater Act in 1997. NamWater supply water in bulk to local authorities, villages, private consumers and industries such as mines. Local authorities sell the water further to the end-users. Furthermore, it is also responsible to manage the infrastructures such as dams, water treatment plants and water supply networks. Even though it became independent from MAWF, when it comes to water price-setting, the two institutions work closely together. MAWF review the tariff adjustment that was proposed by NamWater and gives it to the Cabinet for approval (Matros-goreses 2009).

6.1.4 Ministry of Mines and Energy (MME)

Ministry of Mines and Energy (MME) is responsible for creating and enforcing minerals and energy policies. It has the mandate to issue mining license under the condition of securing environmental protection and by collaborating with other governmental bodies such as Ministry of Environment and Tourism. It is the custodian of the minerals that are found in Namibia that
facilitates and regulates the exploration and its utilization for the benefit of all Namibians. It promotes mining industry and endeavors to make Namibia as an attractive country for investment (MME 2002).

To benefit from the revenue of the mining activity, MME held shares in mining operation (interview #19). In 2008, Epangelo Mining Company (Pty) Ltd was established to maximize the benefit coming from the mines and to assist the state in implementation of mining policy. Taking advantage of being a parastatal company, it collaborates with mining projects in forms of joint ventures, marketing and others (Epangelo n.d.). Epangelo would have exclusive control over new strategic minerals developments, including uranium. For instance, in the late 2012, it acquired 10% of shares of Husab Mine that will be in operation in 2015 under the lead of Swakop Uranium (Klerk 2012).

6.1.5 Ministry of Environment and Tourism (MET)

The Ministry of Environment and Tourism (MET) is responsible to ‘maintain and rehabilitate essential ecological processes and life-support systems, to conserve biological diversity and to ensure that the utilization of natural resources is sustainable for the benefit of all Namibians’. The Directorate of Parks and Wildlife Management is in charge of managing national parks and proclaiming conservation areas. The Directorate of Environmental Affairs is responsible in policy making, planning and implementing environmental matters (MME 2011). Therefore, it is in charge of evaluating and approving Environmental Impact Assessment (EIA). MME can give permit for mineral exploration only when the environmental assessment is satisfied and the environmental clearance certificate is issued by MET (Shindondola-Mote 2008).

6.1.6 Nongovernmental Organizations (NGOs)

Desert Research Foundation of Namibia (DRFN) is an environmental research NGO that is involved in water management issues in close cooperation with the ministries and local authorities. It conducts research and capacity building in different environmental issues aiming to improve the sustainable livelihood of the Namibians. Environmental Learning and Action in the Kuiseb (ELAK) is a good example of DRFN projects that was later developed to BMC. Gobabeb Research and Training Centre hosts researchers of diverse backgrounds to Namib Desert where they are able to conduct research on dry land or desert ecosystem. It also has environmental education programs where they can improve public awareness on desert ecology and environmental issues. It is located near the Topnaar communities and this enables Gobabeb to give various workshops and serve as a hub of researchers and the villagers. Since 1998, it has been a joint venture between DRFN and MET.

Earthlife Namibia is an environmental NGO that tackles various environmental issues by raising
questions to textile plant, hydropower plant and uranium mines (interview #9). One of its main concerns at present is to improve public awareness in radiation emission from the uranium mine and to reevaluate critically the environmental impact of uranium mines. For instance, with the fund from Gesellschaft für Internationale Zusammenarbeit (GIZ), it requested a German consultancy institute to review the environmental assessment report of Langer Heinrich Uranium Mine. Legal Assistance Centre (LAC) is a non-profit environmental firm that has the attempt to protect human right. It represented the owners of Valencia farms to oppose the usage of water of Valencia Mine. This institution will be illustrated in details in chapter 6.

6.1.7 International Actors

The Gesellschaft für Internationale Zusammenarbeit (GIZ) is a German governmental organization that is closely cooperating with MAWF to assist the government in developing water policy. They were engaged in implementing IWRM to WRMA through ‘Namibian water resources management review’ project (interview #10). In addition, they also give financial aids to run the projects.

Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) is an implementing organization of German development cooperation that gives technical advice to MAWF and MME. It provides groundwater investigation and management and supports the geological survey of Namibia.

6.1.8 Private Actors

Southern African Institute for Environmental Assessment (SAIEA) is a South African consulting firm that was in charge of took part of SEA of uranium rush in Erongo region. SLR Consulting is an international consulting firm that took over the management of Bittner Water Consult CC (BIWAC). With the main consultants from previous BIWAC, SLR gives groundwater and surface water resource consultation assisting feasibility studies, environmental management and project management to the mines and other industries. It provided technical explanation in Swakop farmer case studies.

The uranium mining companies, which are described in the previous chapter and Uranium Institute, are crucial actors in water conflict in Erongo Region. Uranium Institute is an executive body of Chamber of Mines of Namibia that promotes Namibia’s uranium as an environmentally clean product. It aims to support and protect the Namibian uranium brand by bridging the gaps between policy, practice and research. It is funded by Rössing Uranium Ltd, Langer Heinrich Uranium Ltd, AREVA Resources Namibia, Swakop Uranium (Pty) Ltd and Bannerman Resources (Uranium Institute 2012). It is located in Swakopmund, in where all the offices of the mines are based. Its main activities are communication and advocacy and running the information and training center.
6.1.9 Other Stakeholders

Topnaar communities, Swakop farmers and farm owner in Valencia are the communities or the farmers who raised their concern against the mine in each case. Municipalities were not included as actors in this study because the three water receivers are receiving water directly from NamWater or from their own boreholes. Further explanation on each stakeholder will be described in chapter 6.

6.2 Political Frameworks

Namibia has a multiparty system that is however, dominated by a single party. SWAPO, the ruling party who led the liberation against South Africa for the independence, is the one who is in power since the naissance of the country. Herein, opposition parties are allowed to be formed but have little voice. This makes it difficult to encompass diverse social groups into main political schemes or to have a consensus-oriented feature, as the dominant party does not represent a broad coalition or ethnic alliance (Van Cranenburgh 2006).

Before the independence, SWAPO was strongly connected to the socialist countries such as Soviet Union. However, at the same time, it recognized the high dependence on the existing white business community, and witnessed the fall of eastern bloc that lead Namibia to have ‘mixed-economy’, acknowledging private property right and maintaining socialist rhetoric (Rosendahl 2010). This applied also to the attitude toward the mining industry. Prior to the independence, Rössing was a symbol of the capitalist that faced opposition from the SWAPO party under the alliance of anti-nuclear and anti-apartheid movements outside of Namibia (Hecht 2010). However, SWAPO reversed its position after the independence from nationalizing the mines to welcoming foreign investments (ibid.).

6.2.1 Mineral Policies

The government’s acknowledgement of the importance of mining sector is demonstrated in the Minerals Policy (2002). It stated ‘Government will promote the exploration and development of Namibian mineral resources’ (MME 2002). As the mineral exploration is mainly taking part in areas where population is low, the major interest of the government is to maximize benefit coming from the mines. The first National Development Plan (NDP1) promoted the value-addition to the raw materials that are being exported stating that ‘Namibia must reduce its dependence on mineral resources…and increase output in other areas such as manufacturing’. Processing of raw material was lacking behind in the beginning years due to lack of high-skilled industrial workforce and small production quantities, but it has been increased in the areas of diamonds, zinc and copper (Rosendahl 2010).
The Mineral Policy acknowledged the ineffective environmental management reality in Namibian mining sector and stressed the importance of strong coordination between different ministries, especially with Ministry of Environment and Tourism. It proclaimed that it will endeavor to enhance the mining legislation to meet the global environmental standard and to ensure the environmental monitoring and rehabilitation of the mine.

To secure accountability and sustainable development in the listed policy, program and projects, **Environmental Assessment Policy (1995)** requires EIA in projects that have potential impact on the environment to implement integrated environmental management. This will ensure the decision makers to receive all the relevant information and can make accountable judgment that takes all the alternatives and environmental costs and benefits into account (MME 2011). However, it didn’t have any legislative support until the Environmental Management Act of 2007 was enacted in early 2012.

### 6.2.2 Water Policies

Prior to independence, the apartheid policy was deep in the system of Namibia. This has neglected the poor but has benefited the whites instead who lived in the urban and freehold farming areas. Therefore, after the independence, the government attempted to eradicate this disparity by reversing the policy to support the majority of the population. Enhancing water supply and sanitation of the majority of the population was critical in order to improve the social conditions (Heyns 2005).

The bulk water supply was heavily dependent on subsidy. Subsidy consisted 71% of total water supply cost in 1993, particularly 98% in commercial crops and 71% in mining (Davis 2000). This made the water availability being over-exaggerated and brought entrepreneurs with water intensive business to the arid country. Therefore, cost-recovery approach in water sector was needed. This could enhance the rural water supply that was neglected before the independence.

The central government recognized the need of a new Water Resource Management Plan to substitute the outdated Water Act that has been used for more than 40 years. In 1998, Namibia Water Resources Management Review (MWRMR) was formed to review the existing water management scheme and to develop a new water policy and act (Shirley Bethune et al. 2005). Their goal was to have equitable access to water by all population and promote sustainable water resource management of water sector (ibid.). That is how the **National Water Policy White Paper 2000** was promulgated including the fundamental principles for national water resource management.

The policy recognizes drinking safe water as the basic human need and that the state has responsibility for adequate water supply to the people. At the same time, in ‘Principle of Ecosystem Values and Sustainability’ section, it stresses harmonizing human and environmental requirements by acknowledging the role of water in supporting the ecosystem (ibid.). It vested the ownership of
water in the state who will distribute it on behalf of the whole society (Ruppel & Ruppel-Schlichting 2011). Furthermore, it emphasized the sectoral coordination to achieve the integrated management and planning. To address the problem of water scarcity and mismanagement of pre-independence government, it recognized the economic value of water stressing that the abstraction, management, conservation and use of water should be cost effective (ibid.).

In the ‘Legislative and Regulatory Principles’, it stated that ‘The legislation will provide for determining an environmental water reserve for freshwater sources before they can be used to supply any other demand than domestic and subsistence livestock watering; prioritizing the environmental flow requirements. It was expected that the WRMA will give a supportive legislative framework to put the policy into action. However, since the WRMA is still not enacted after 8 years since its first draft, the water sector stumbles to achieve the sustainable water resource management.

The Water Supply and Sanitation Policy (WSASP) of 2008 has replaced the first Water Supply and Sanitation Policy of 1992. The previous policy paper gave the background to establish the Directorate of Rural Water Supply in MAWF that improved community-based management of rural water supplies (MAWF 2008). Furthermore, it gave the Water Point Committee (WPC) the responsibility to raise concerns about their local water resource management in any developments or change that may pose a threat (Ruppel & Ruppel-Schlichting 2011). The new WSASP stresses the promotion of water and sanitation supply at an affordable cost to all Namibians under the concept of Integrated Water Resources Management. Herein, it has an attempt to give the right of allocating the environmental needs and solutions to the communities. It further gave the priority of providing water supply to domestic demand over economic activities (MAWF 2008). The principle of cost recovery manner applied in this policy paper as well to ensure the autonomy of the system. However, for the rural population who cannot afford the pay the service, government will provide subsidy on the tariff structure to meet the Millennium Development Goals (ibid.).

6.3 Legal Frameworks

6.3.1 The Namibian Constitution

The Namibian Constitution that makes up the basic legal framework of the country was written when Namibia obtained its independence in 1990. It was recognized as one of the most democratic and liberal constitution in the world that has strong dedication on the issues of fundamental human right (Ruppel & Ruppel-Schlichting 2011). The constitution embraces several elements that give the basis of environmental protection and all of the legislative framework are ought to be consistent with it.
Article 95 specifies the role of the state to actively promote and maintain the welfare of the people by policies that protect the environment and use natural resources in sustainable manner (GRN 1990). It gave the government the responsibility to provide measures to forbid foreign nuclear and toxic waste in Namibian territory. It acknowledges the importance of the natural resources as not for utilization, but also its function of maintaining the ecosystem. Article 100 stipulates that all natural resources in Namibia are under the property of the state, unless it is otherwise legally owned (ibid.). It considers natural resource to be a common resource otherwise lawfully declared (Ruppel & Ruppel-Schlichting 2011).

6.3.2 Water Act 1956

The Water Act of 1956 was enacted under the South African colonial period and it is still remaining in force due to the fact that new WRMA is not yet enacted. This Act gives the Department of Water Affairs the power to ‘use, allocate, control and conserve Namibia’s surface and ground water resources’ (Government of South Africa 1956). The Act was criticized by the new government that it was used as a channel to ‘serve the water needs of the Apartheid State’ because it resulted in uneven distribution of the water source throughout the country (LAC & Stanford University 2009).

The notion of environment as a water user has slowly been introduced to Namibia only after Rio Summit in 1992 (Shirley Bethune et al. 2005). The Water Act was made before the term ‘sustainable use’ was started to be commonly used and there wasn’t any follow-up legislation to complement this aspect up to now. The Namibian independence in 1990 was one of the major trigger to pull the institutional and legislative reform (Sihrley Bethune 2003). The outdated Water Act who needed a serious modification was one of the subjects for reform.

Water Act recognizes private right of the water by differentiating private and public water. The private water is vested in the owner of the private property land where it was found. The individual doesn’t have the exclusive right to the common water, which is found on or derived from the public land. The permit of groundwater abstraction can be legally issued only to ‘subterranean water control areas’ and there is no specific qualification defined in giving the abstraction permit (LAC & Stanford University 2009). The landowner has the right to abstract the groundwater underneath his or her land as long as the water is not to sell commercially. Therefore, the law gives favored abstraction right to the private owner which somewhat contradicts to the constitution that acknowledge the natural resource closer to common resources (Ruppel & Ruppel-Schlichting 2011).

The Act identified water only as a resource for human, livestock, industrial and agricultural use. It did not recognize the natural environment as water user that enables to maintain the essential process of life in natural habitat (Shirley Bethune et al. 2005). One has to bear in mind that the Water
Act was written under South African colonization period that is not applicable to Namibia’s water condition. It does not acknowledge water as a scarce resource in arid condition of Namibia and doesn’t provide rigid tools to adequately protect water from overuse (MME 2011).

### 6.3.3 The Namibia Water Corporation Act 1997

This act has laid the foundation of NamWater, the parastatal institution that supplies bulk-water commercially to the municipality and industries. This was to separate the function of providing bulk water from DWA and operate the water supplying scheme in cost recovery manner. The company runs as other private enterprises, but the government is the only shareholder. The aim was to have full historic cost recovery after the first 5 years of operation for future investments in water infrastructure.

The Act vested NamWater to be responsible for sustainable use of water and its protection by considering the long term effect. To secure transparency, NamWater is reliable to keep the record and to share the information with public.

### 6.3.4 Water Resources Management Act 2004

Water Resource Management Act (WRMA) provides essential tools for water resource management to execute and support National Water Policy with its legislative framework. Even though the Act was approved by the Parliament in 2004 to replace the old Water Act of 1956, it has not been enacted yet. Since the final revision is not available to the public until it is being passed, the explanation of the WRMA in this chapter will be based on the first draft and information from the interviews.

The Act states that it should ensure every citizen equitable access to water resource and harmonize human needs with environmental ecosystems (Government Gazette 2004). In addition, it assured to improve decentralization of the decision making system to the lowest level possible (ibid.). Most significantly, it recognized safe drinking water as a basic human right in its fundamental principles. Regarding the ownership of water resource, it promulgated that the surface and groundwater in Namibia belong to the State (ibid.). This addresses the confusion between the old Water Act and Article 100 of the Constitution about the ownership of water resource. Water Act vested private ownership of water in land owner while Constitution declared that the State owns the natural resources of Namibia (LAC & Stanford University 2009).

The act provides the base of establishment of Water Resources Management Agency for execution of water resource management, Water Advisory Council to advise the Minister on policy and management issues and Basin Management Committees to represent the stakeholders of each basin. Water Resource Management Agency has responsibilities on pursuing integrated management
and on collecting, analyzing and sharing data of water resources. In addition, they have to guide and assist basin management committees.

Unlike the old Water Act, WRMA governs procedure and requirement in obtaining water abstraction permission. Unless the water abstraction is in bulk where it already supplies for domestic use, hand-dug well and other water extraction for domestic use are exempted from acquisition of an abstraction license. In order to apply for a license, the ministry should review the environmental impact analysis and refer the application to the BMC.

One of the main reasons that the enactment of the Act was delayed is because the draft was not applicable to the current capacity of government (interview #1, 3, 15, 16). An interviewee pointed out that the consultants that were involved in water sector review didn’t have practical experience in the ministry and they are grounded with foreign aid and receive advices from external consultant (interview #1). Another interviewee referred to sections in WRMA that are controversial to each other. Even though it was stated that the water utilization is a human right, the underlying principle of Act clearly showed that the right of natural resource is grounded by the government (interview #15). WRMA has been amended during the last 8 years to take into account practical aspects of implementation and was being reviewed by the Ministry of Justice in September 2012 prospecting to be in practice in March 2013 (interview #15).

### 6.3.5 Minerals Act 1992

The Minerals Act of 1992 regulates issuing permits for mineral exploration and mining activities in Namibia. The license can be given only when the minister is satisfied with the proposed operation plan that should ensure ‘adequate protection of the environment’. The applicant has the liability to list the probable environmental impacts of the mining activity and to mitigate these damages. Otherwise, the minister can require remedy for the environmental destruction.

Before the Environmental Management Act of 2007 that gives legal background of EIA was enacted, Mineral Acts gave legal tools of executing EIA for the mining projects (MME 2011). Similarly, in the absence of new Water Act, MME is responsible to prevent unsustainable abstraction of water from the mine for the stakeholders (LAC & Stanford University 2009). Yet, the ministry relies on MAWF’s mandate on water issues.

However, this Minerals Act is criticized for not being precise and restrictive enough in the issues of EIA and rehabilitation of terminated mines (Conde & Kallis 2012). Furthermore, there are only few people who are in charge of working on this environmental issue in the ministry, lacking the capacity of thorough review on environmental matters (ibid.). This weak regulation may attract foreign investments that are not able to be in operation in developed countries (ibid.).
6.3.6 Environmental Management Act 2007

Environmental Management Act (EMA) of 2007 is in power since the early 2012, after 5 years of preparation of Ministry of Environment and Tourism. It provides specific tools to the concept of optimal sustainable yield and inter-generational equity in the natural resources utilization that was stated in Article 95 (I) of the constitution (Ruppel & Ruppel-Schlichting 2011). It ensures the participation of all interested and affected parties to the decision and equitable access to environmental resources.

The most notable element that EMA contains is the legal requisition of detailed Environmental Impact Assessment (EIA). Actors who plan to conduct activities that have environmental impact such as transforming the land use and utilizing or disposing of water are required to obtain the environmental clearance certificates from the Environmental Commissioner. Environmental Commissioner was founded by this Act to review the EIAs and to consult outside expertise if needed before issuing environmental clearance certificate. Hence, the enactment of EMA is an important factor to protect the natural environment and health risk for the people living near the mining area.

The activities that have an impact on natural water resources are specified in EMA provide a detailed EIA such as abstracting ground or surface water, drilling boreholes, construction of dams etc., and the construction that might change the natural flow of water in a riverbed (Shirley Bethune et al. 2005). With the enactment, mining companies are ought to provide financial guarantee for rehabilitation of mine sites once all mining activities are ceased and this should be mentioned in EIA.
7 Case Studies – Local Impacts from Environmental Degradation

In this chapter, the three case studies that involved disputes over water problems driven from the mines will be illustrated. The history and the environmental degradation will be presented at the beginning and based on these findings, the conflict analysis tools will be applied. This will provide a thorough understanding of the case studies. The application of Political Ecology framework will be discussed in the next chapter.

7.1 Topnaar

7.1.1 History of the conflict

Topnaars are the indigenous residents who are spread out along the Kuiseb River for thousands of years. There are about 350-380 people living in 14 settlements (Werner 2003). They are in Nama ethnic group and their main occupation is goat farming and cultivating Nara, the particular fruit that is found in this region. Some of the villagers work in Walvis Bay or in Gobabeb Research and Training Centre. The land where they inhabit is occupied by the proclaimed Namib-Naukluft National Park that restricts them the use of resources especially for hunting.

Armstraat is one of the villages of the Topnaar community that is located in downstream of Kuiseb River. Until the early 70s, villagers of Armstraat used their hand-dug well that they have constructed to supply their domestic water. After noticing the significant water level drop of the aquifer, the Administrator-General drilled 10 boreholes in some of the middle-stream villages in 1979.
which contributed to more stable settlement of the Topnaar communities (Werner 2003). Submersible pump and solar panel were installed with the boreholes and this enabled the inhabitants to pump the water without additional energy. The installation and the water are basically provided in free of charge. However, Armstraat didn’t have the privilege to receive these supplies. Instead, the government installed a water tank at the entrance of the village to store the piped water from the aquifer. This installation was at no cost as well, but since the independence, people were asked to pay the water tariff (interview #5)

Villagers in Armstraat use this water for drinking, harvesting the Nara plant and raising cattle (interview #5). Until now, this community refuses to pay the water bill claiming that they can’t afford it due to the high unemployment (interview #5). Another reason for rejecting the payment is the fact that NamWater charges them the water price by community, not by household (interview #5). People use the water directly from the tank, like a common well, that makes it difficult for NamWater to distribute the cost individually. The expense is equally divided by household and the member of WPC has the responsibility to collect the bill. Interviewee showed the water bill in August 2012 and the debt was $N 13,680 (equivalent to 1,368 euro). They were charged N$ 100-400/month and the cost increases during the harvesting season of Nara plant, which the price fluctuates (interview #5). The income of the village is not fixed that made them difficult to estimate their monthly income.

Fig 13, 14 – Water tank in Armstraat community and solar panel in Salt River community
Gobabeb Research and Training Centre provide numerous training and workshops and Topnaar communities often take part in their environmental education. Learning through this channel that the mines were abstracting water of Kuiseb River aquifer and that can be the reason of groundwater level sinking, Armstraat villagers claim that the well dried up due to the over-abstraction of the Kuiseb Aquifer from the mine (interview #5). They prefer having their hand-dug well that is at no cost to being in debt to NamWater (interview #5). In fact, this village is located close to the Rooibank catchment which is one of the main abstraction areas of Kuiseb aquifer.

7.1.2 Environmental degradation and its effect

In the last hundred years, the water usage of Kuiseb River has changed. In the upper catchment, commercial farmers are spread along the river and obtain their water supply from 403 farm dams (Botelle & Kowalski 1995). The amount of runoff to the downstream has decreased by 21% from the construction these dams (Huntley 1985). Furthermore, DWA increased its quantity of water that is being pumped out of the aquifer at an increasing rate from the lower Kuiseb valley and delta to meet the growing water demand of the mines and towns. Consequently, combined with the drought, these factors lowered the groundwater level at Rooibank was 2-4m in 1970s, to 8m in 1988 and to 12.15m in 1994 (Ito 2005).

Although most of the water that was abstracted from the Kuiseb Aquifer is currently distributed to Walvis Bay (NamWater 2002), the rest of the water is piped to the Swakop Reservoir where it can be distributed anywhere, even to the mines (Interview #12). Rössing Uranium Mine’s water demand was approximately 10Mm$^3$/day (3.68Mm$^3$/a in 2011) before introducing their recycling scheme in 1980 and until the OMDEL aquifer was in full operation, Kuiseb River was the main source of water. At that time, their water demand of Rössing Uranium Mine was higher than Swakopmund and Walvis Bay combined consumption. Most of the water at that time was abstracted from Kuiseb Aquifer, so it could have been possible that the sudden increase of water demand has depleted the water level of the aquifer (interview #20). As shown in the graph below, the water demand has tripled from 1975 to 1977. That is why the water scheme in Omaruru delta was developed, to supplement the water supply of the coastal region.
In contrast to the argument of the Topnaar community, many experts claim that the mine’s water usage didn’t directly affect the dry-up of the well. The possible reasons that were mentioned were over-usage of the water of that particular area from the community (interview #1) and the low rain-fall at that period of time (interview #20). In addition, the water supply scheme has changed over the last decades, so it is difficult to prove the causal link between the water abstraction and dry-up of the well that happened more than 30 years before.

7.1.3 Conflict analysis

The conflict structure of Armstraat is complex due to its long history of water problem and involvement of diverse actors. Even though the villagers claim that the mining activity is the reason that their wells dried up, the main criticism regarding their water situation aims toward the water charge and NamWater. Hence, it is important to define from which point we consider the villagers’ anxiety has started growing in the case. On the contrary to the residents of Armstraat, people in villages such as Salt River and Narab, who received submersible pump from the Rural Water Supply, didn’t express any discomfort with their water supply (interview #6, #7). They also faced the water shortage in the 70s but after the water supply equipments were provided, they were satisfied with their water situation (interview #6, #7). Villagers from Salt River paid N$35-50/month at the
beginning of the installation and the ones in Narab are paying N$20-30/month per household until now to accumulate cost-recovery fund for future repair. At the moment, the ministry owns the equipments but it will gradually be handed in to the communities.

Therefore, one can say that the ‘feeling anxiety’ stage started when the villagers from Armstraat were asked to pay for the water price and it was crystallized when they learned about the water abstraction of the mines. They were suspicious that these actions and decisions by other stakeholders are damaging their livelihood and their emotional reactions were expressed during the interview. This stage has intensified when NamWater cut the water supply for two weeks few years ago due to the nonpayment. At that time, the traditional authority represented the community to convince NamWater to get pipe the water again to the village.

‘Debate and critique’ phase came along during ‘feeling anxiety’ stage. NamWater and the mines are criticized and accused for causing the change of their access to the natural resource. The villagers tried to bring the issues through Water Point Committee, traditional leader, press, researchers and KBMC to deliver their message. However, this didn’t lead to the next conflict level, ‘lobby and persuasion’. The condition that hinders the conflict to reach to the next level is mainly due to their remote location where it is difficult for the villagers to reach the institutions. The lack of resource that permits them to access to the city make them staying passive with these issues where they can only express their concerns when external actors visit the village.

Instead of looking at this example as a straightforward case study of local community against the government and mine, one has to recognize that the foundation of this case is more complex that what it looks on the surface. The fundamental lies on the different value of water between the local community and NamWater. The difference between the actors’ underlying value judgment is the main reason of this environmental conflict. Therefore, this case could be characterized as value conflict. The quote of a villager in Armstraat, ‘...we want the water for free...they want cost recovery’ (interview #5) reflects their view point. Therefore, the analysis should be emphasized on the major values

During the apartheid system before the independence, the heavy subsidies to large-scale agricultural development program were given to the white farm owners. In addition, the rural population was historically dependent on government’s strong subsidies that eventually created low-quality water sector (Bock & Kirk 2006). The rural communities received water free of charge that resulted in an underdevelopment of communal water infrastructure (ibid.). In that time, many users considered water as free goods that hindered them to perceive water as a scarce resource. This led to fast growth of mining and agricultural sectors in the 1970s to result to overexploitation of aquifer.

Recognizing that the sustainability of water supply depends on the ability of suppliers to
become financially self-sufficient, water policy gradually transformed toward using economic tools. This concept is used as a tool to achieve safe drinking water, which is stated as a basic human right in a long run as in WRMA 2004. For policy makers, it was important to place an economic value on water to enhance the efficient allocation of the scarce resource and that can eventually maximize the benefit to the societies. This could be a reflection of the foundation of NamWater who deals water supply by taking external costs and benefits into consideration. Thus, the concept of water has changed from free goods to economic goods.

Villagers of Armstraat perceive water as free goods as it was before the independence. The factor that hinders the diffusion of the concept of water as economic goods is the existence of tangible comparison in the middle reaches communities where they get free water. To what extent DWSSC is involved with Armstraat as part of their rural development program was, unfortunately, not investigated during the research.

Understanding that each stakeholder has differing perceptions of legal rights, the technical nature of the problem, the cost of solving it and the allocation of costs among stakeholders, providing reliable sources of information that is acceptable to all actors is important for any joint efforts. This enables not only water-sharing parties to make decisions based on a shared understanding, but also in building trust (Wolf et al. 2005).

Considering that Topnaar communities are in remote area where the closest city is approximately 40 km away, it is difficult for them to obtain information about their natural resources without external actors. These actors are the main driving forces of the conflict because they are the ones who informed the communities about the water abstraction of the mine, which is not identifiable if one is isolated. Gobabeb Research and Training Centre plays a vital role to the communities providing workshops and education to the people regarding diverse topics including water management in Kuiseb River Basin. Through these activities, villagers were able to understand the possible causal linkage between the two variables.

7.1.4 Institutional framework

Recognizing that the causal relation between the water problems and the mining activity is not clear enough and that the conflict is still in early stage, there is no institution that is moderating the case. However, KBMC could be the potential institution who has the ability to resolve the conflict because Topnaar communities are already taking part in the forum as one of the stakeholders as well as NamWater and commercial farmers in upper region. KBMC is an organization that is recognized by MAWF with infrastructural support and it is well institutionalized. One of its functions is to assist with conflict resolution that is happening in the river basin. Once this function is stabilized in BMC, it is
expected to be equipped with capacity of conflict resolution or even prevent the potential conflict. For instance, the consultants who conducted the EIA of a dam at a tributary of the Orange River went to Orange-Fish BMC for their comment before further complaint arise (interview #14).

Yet, there are still some factors that hinder BMC to become to conflict moderator of this case. First, one has to take into consideration that the villagers are not well represented in KBMC because there is no funding to support them to attend the meetings which they cannot afford it (interview #17). Another limitation of BMC that was pointed out was the insufficient effort to generate more information and knowledge such as the impact of the mines to the environment on specific communities (interview #17). In addition, since WRMA is not yet enacted, there is constraint in operation and in enforcement of law (interview #14). For example, even though a stakeholder from the BMC observed an activity that goes against the sustainable use of the river basin, there is no legal enforcement to restrict these actions.

One of the main concerns of Armstraat community was the lack communication with the governmental bodies. They feel that they are underrepresented in all the decision process even though the water is being pumped out from the groundwater under their ground (interview #5). They claim that they don’t receive enough feedback from their traditional authorities, KBMC nor from the researchers that they have been the subject of the research (interview #5). Thus, Regardless of environmental degradation existence, improving communication channel is important to prevent further potential conflict with Topnaar community.

7.2 Swakop Farmer

7.2.1 History of the Conflict

Along the Swakop River, there are farmers and people with plots that use the water from the aquifer with their private boreholes. Although Langer Heinrich receives most of its fresh water through the pipe from Swakopmund Reservoir (1 Mm³/a with 1.5Mm³/a of water abstraction authorization, Langer Heinrich Uranium 2009), certain portion of its water consumption comes from the upstream of river. It abstracts 0.05-0.07Mm³/a of Swakop aquifer for with the permission from MAWF of 0.5Mm³/a and planning to use the two additional boreholes.

In the late 2011 and early 2012, in spite of the flood in 2011 in Erongo, there was an inexplicably sinking of water level at farmers’ boreholes in upstream of the Swakop and Kahn junction. Furthermore, in June 2012, some farmers found Riverine Ana-trees turning black 13km above the abstraction pump of Langer Heinrich Mine (interview #22). So in the next month, the farmer requested Uranium Institute, an organization in Swakopmund funded by the uranium mines that has the attempt to advocate the issues that people are facing from the mining activity, for an investigation on whether the mining activity is the reason of these incidents or not.
With the leading of Uranium Institute, a committee that comprises of farmers, mining company, third party consultants in botany and geohydrology and some stakeholders was formed. From August to October 2012, three meetings were held including the scientific explanation from the consultants on the events in August 2012.

7.2.2 Environmental degradation and its effect

The two environmental degradations that the farmer is facing are the death of the Riverine Ana-tree and dry-out of the well. The Ana-tree, with the scientific term *Faidherbia albida*, is a native African and Middle-Eastern tree that is adapted to the arid environment. It is known for its ‘albida-effect’ that refers to the improvement of the growth of crops or herbaceous plants that are under its canopy by enriching the microclimate and the soil (Buresh & Tian 1997). It is as well relished by various herbivore including antelopes and giraffe which is the main reason that the game farmer is concerned about. The farmer claims that the drying out of the well and the death of this species must be related to water abstraction in Swakop River aquifer of Langer Heinrich.

![Fig 16 - Compartment of Swakop River catchment and the location of the farms and Langer Heinrich Mine (source: Uranium Institute)](image)

However, the arguments of the experts from the working group were different. They explained that there is little lateral flow in the river bed, considering the fact that the Khan and Swakop River’s alluvial aquifers are not homogenous and divided into out outcropping bedrock or narrowing of the river gorge (interview #12; MME 2011). Therefore, each compartment has only limited influence to the other and the dominant flow is in vertical direction mainly influenced by flood events and evaporation. Hence, it was argued that the pumping alluvial aquifer water in one compartment
doesn’t affect the decline of water level in the other compartment. In fact, the boreholes of the farmers are located in Husab berg compartment while the ones of Langer Heinrich are in Langer Heinrich compartment.

In short, it was asserted that there is no possible correlation between the water abstraction and drying up of the well. Furthermore, according to the groundwater model, Langer Heinrich compartment where the uranium mine abstracts its water, has the capacity to provide 500,000m$^3$/a to the mines (MME 2011). At the same time, it was noted that there might be a negative accumulative impact in case more mines abstract the water from Swakop River. However, only the Husab Mine is going to take place in Swakop River in the foreseeable future, due to the phase-out of uranium rush and the new mine is not planning to use the water from Swakop River (interview #12).

On the contrary, the farmer claims that the abstracting point of Langer Heinrich Mine is 800m above the sea level and the water should flow toward downhill gradient to the west coast (interview #22). So at the end, one compartment can eventually influence the other with this flow. She believes that the young Ana-trees developed only shallow roots during the good rainy season, but when Langer Heinrich pumps out the groundwater, trees without deep roots died (interview #22). The young trees were spotted dead in east and west of where the first pump of Langer Heinrich is located.

The experts proposed that a possible explanation for the dry-out of the well could be due to the Swakoppport and Von Bach dams in the upper Swakop River. As the groundwater resource in Khan and Swakop River is limited, the construction of these two dams in the 1970s exacerbated the water table. Literatures have demonstrated that the total groundwater recharge has dropped by 32% in
Swakop alluvial aquifer as a result of these dams (BIWAC and Institution of Hydrology Freiburg 2010). In addition, it is suggested to further investigate the possible infestation of Ana-trees by external parasite.

Fig 19 - Map of Swakop Catchment and dams in the upper stream (source: Uhlendahl 2012)

One has to bear in mind that this is not the first time that the farmers near the uranium mines raised their concerns about quality and quantity of groundwater. Since Rössing Uranium Mine reached its full production, the farming community raised its concerns about the quantity and quality of ground water. After the detection of anomalous uranium concentration in downstream of Rössing Uranium Mine, a Swkop River Farmers Working Group was formed in 2004. The purpose of this committee is to share information and for the farmers to address issues regarding the impact of the Rössing Uranium Mine. Although the farmer from this case study isn’t involve in this committee, it is perceived that this working group encourages the farmers to actively participate in keeping the surrounding environment under observation. As a result, Rössing Uranium Mine examined the reason of the event and shared the outcome with the working group and continues to notify them with information regarding the environment.
7.2.3 Conflict Analysis

The forms of conflict escalation shown in this case study are ‘feeling anxiety’ and ‘lobby and persuasion’. Once the farmer observed the deterioration of the young Ana-trees, she was concerned about the condition of the environment and suspicious about impact of the mining activity to the degradation of the trees. It wasn’t clear if she had an ‘intra-group’ discussion with the farmers due to the insufficient records of other farmers. She is in struggle to be in contact with other farmers as the statistics and records of farmers in that area haven’t been updated since the independence (interview #22). This is the reason that ‘debate and critique’ wasn’t observed in this case study. Instead, the farmer requested directly to Uranium Institute for further investigation of the event.

The fact that the farmer is an acquaintance of the head of Uranium Institute lowered the barrier to the next conflict level. Through this institution, the farmer was able to directly discuss the matter with the mines and to increase awareness of this matter. Each stakeholder has clear position supported with data that were collected individually. The interesting fact of this case study is that convincing other stakeholders who might have the same position occurred only after the stage of ‘lobby and persuasion’, not before. It seems that this is due to the accessibility to Uranium Institute wasn’t restricted for the farmer. Most of the commercial farmers near the Swakop River are white and relatively wealthy who own game farming or plots to plant vegetable such as olive and asparagus (interview #2).

Stakeholders differ from each other in perceiving the nature of the conflict. It is clear this conflict is characterized as vested interest since it is a struggle between the potential winners and losers in water management. Beyond this view, farmer recognizes this conflict as mistrust of expert knowledge while the experts perceive it as differential knowledge. The farmer recognized that without this working group, it would have been difficult to meet the representatives of the mines face to face and obtain information. At the same time, she expressed her doubt on the information that was given to the committee stating ‘...because the mine has so many statistics that are very convincing...I am actually fighting the mine with very little ability to get the statistics...’ (interview #22). Therefore, access to the next level of conflict manifestation didn’t necessarily lead to obtaining the right information.

This is mainly due to the fact that Uranium Institute, the moderator of this conflict, is not a genuine ‘third party’ that doesn’t have an interest to the case. The nature of the institute will be discussed in detail in the next section. As the experts are brought by Uranium Institute, the farmer realizes that industry’s scientists are capable of manipulating the information to support their employers’ position. This enhances the loss of credibility of the scientific material. To rebuild the trust, the conflict should be handled by an interest-free organization.
On the other hand, experts identify this case study as differential knowledge and consider that the root of the problem is the fact that people are not properly informed (interview #12). Unlike the farmer, experts consider themselves as independent third party consultants that are not directly linked to the mines and that they provide external credible facts. The underlying notion is that if the ordinary people are well informed as the experts, they will make the same judgment, and until the public knowledge reaches that point, experts are in better position (Dietz et al. 1989).

Compare to the villagers, farmers are more sensitive to water supply issues because they have to deal with it by themselves while the community gets their water supply by municipalities. Even though the water from Swakop and Khan River is saline, it meets the level that permits for the usage of livestock and certain farming. The farmers make their own boreholes to irrigate their farms, so unless they cultivate plants that are vulnerable to saline water, they use the water directly from their boreholes. Moreover, the concern about the future was emphasized as one of the driving forces of the conflict during the interview with the farmer. She believed that if the problem is not addressed at present, there will be no further chance to prevent the irreversible consequences (interview #22).

7.2.4 Institutional Framework

There are some advantages of having Uranium Institute as the conflict moderator. Since it is closely linked to the mine, it has the capacity to bring active participation of the mines to the conflicts. In this Swakop farmer case as well, the committee was formed within a month after the farmer requested further investigation. In addition, even though the objectivity of the information was being questioned, they can hire scientists with their access to the fund that can close the gaps of differential knowledge by providing scientific information to the farmers. Therefore, one could say that Uranium Institute stimulated the conflict to a higher level of Conflict Escalation Theory.

However, as it has an interest in favor to the mines, the limitation would be that it is difficult to expect them to convince the mine for change of activities. That is why its credibility as a third party is questionable. It is criticized that the government, who is viewed as an objective party, is not doing its share to inform the people with the information (interview #12).
7.3 Valencia Farm Owners

7.3.1 History of the Conflict

Unlike the previous case studies that involved dispute over present environmental degradation, this case is driven by the precautionary concern of water abstraction license of a uranium mine that is not yet built. The proposed location for the mine is on the western edge of the farm Valencia owned by a farmer, situated between Arandis and Usakos (Cooper et al. 2007). The farms was engaged to ecotourism with its considerable number of wildlife species (Supreme Court of Namibia 2011). There are other large farms that farmed livestock and some converted to game farming (interview #16). On the northwest of the site, there are small-scale livestock farmers on the land that is owned by the States (Barbour & Van Zyl 2007). Valencia deposit consists of low grade uranium that 117 million tons of mineral can be mined and it is projected that the mining life will be about 11 years (ibid.). Forsys Metal obtained its Exclusive Prospecting License (EPL) for approximately 700 hectares in 2007 (ibid.).

![Location of Valencia mines and surrounding commercial farms](Enviro Dynamics and ERM, 2007)

In 2007, Forsys Metals announced the intention to develop Valencia Mine and received the permit for using desalinated water 50Mm³/5years. Even though the initial plan was to receive water from the desalination plant, they obtained groundwater abstraction permit of 1000m³/day (0.4 Mm³/a) in Khan River and Palaeo Channel in 2008 from MAWF, without meaningful participation of stakeholders (LAC & Stanford University 2009). The farmers rely on the limited water resources as
this area is one of the driest regions in the world where they receive little rain. Palaeo Channel is an ancient underground reservoir that takes a long time to be recharged and which is known very little (interview #16).

In addition to the competition of water usage in this area, the process of issuing water abstraction permit from MAWF was also dubious. The initial request of water abstraction from Forsys Metals was 300m$^3$/day, but MAWF admitted to abstract in total 1000m$^3$/day of water in Khan River and Palaeo Channel (LAC & Stanford University 2009). This permit will be valid for 18 months to supply water during the construction phase (Reuters 2008). In the permit, the precondition of abstracting water from Palaeo Channel was not to compromise the sustainable use of downstream users. However, no evidence was demonstrated to meet this condition as there is no scientific data about how much water the channel contains (LAC & Stanford University 2009). It is also criticized that Forsys Metals didn’t meet the requirement to notify the stakeholders through the announcement in Gazette and in local newspaper that gives the opportunity to the farmers to file complaints in fourteen days (ibid.). This infringes the right of the neighboring farmers to protect their usage of natural resource that existed before the mine came.

To prevent a fatal situation, two affected farm owners in this region requested Forsys Metals to delay the abstraction and MAWF to withdraw water permission (ibid.). However, their petition wasn’t being preceded, so they applied to High Court with LAC, the Namibian legal NGO, as their advocate for an emergency interdict. However, the judge decided to dismiss the case because the permission itself didn’t meet the prerequisite condition. According to Water Act 1956 Section 28, the water abstraction permit could only be given in an area designated as subterranean water control area by the president (ibid.). As MAWF issued its permit in a place that no legal proclamation was promulgated, the water abstraction license is not considered valid. Therefore, the water permit was invalidated.

Furthermore, the Court decided to put the burden of proof of subterranean water control area to the farm owners, not to the ministry or to mine. As a result, the farm owners had the responsibility to pay the expenses of all parties. Concluding that this judicial decision is unjust, farmers appealed the judgment to the Supreme Court in late 2008, expecting them to give fair attention not only to the formalities of the law. However, as the appeal does not consider the sustainable use of water anymore, for LAC, continuing this case would only give ‘academic interest’ to the public (interview #16). Thus, in a way the appellant won the case but they didn’t reach to the initial goal, which was to change the law (interview #16).

Farm owners received the issuance from Department of Water Affair after the High Court case, that MAWF would withdraw the water permit (interview #16). In spite of the dispute, MME granted the mining license to Valencia Mines and they obtained water abstraction permit to extract 500m$^3$/day from existing boreholes in Khan River (LAC & Stanford University 2009).
Currently, Forsys Metals is reevaluating the feasibility of the Valencia Mine. Extracting low grade uranium as Valencia was economically viable only when the uranium price is maintaining its high price. However, with the decrease of the price put the company in position where they have to use their resource more efficient. Furthermore, the deposit itself is relatively lowgraded to be feasible to commercialize (interview #2). As a result, the company is developing a preliminary design of consolidation of milling from Valencia Uranium Mine with Namibplas deposit, which is located 7km northeast of the Valencia deposit, and reviews the possibility of it (Forsys Metal n.d.).

7.3.2 Environmental Degradation and its Effect

The main environmental degradation of the case is the possibility of dry-out of water channel that the farm owners were initially using. The claim of deterioration was based on the notion to prevent the fatal water situation that cannot be fixed after the abstraction activity. The result of the modeling conducted by BIWAC shows that the groundwater from Khan River in Valencia compartment can only support the short-term abstraction, limited to the construction phase of Valencia mine (BIWAC and Institution of Hydrology Freiburg 2010). To meet the full water demand of the mine, water from other location should be pumped to the location.

The Palaeo channel from the case is an ancient underground reservoir which goes back to ice age and it is very little known by the geohydrologist (interview #16). Usually, palaeochannels are formed from old riverbed and covered by young sediment. Therefore, the water is not flowing anymore that makes it is difficult for the water to be recharged compare to the riverbed aquifers. It is unclear how much water exists in this area. Hence, in case the mine uses up the groundwater from the channel, it is very likely that the water will dry out without being filled in. The prediction was that the mine would use as much as water in three years what the six farmers, who would have been affected, would use in 36 years (interview #16).

Regarding the case of Valencia Mine, there is little technical data available in literature. The existing literature is mostly focused on the procedure and the legal aspect of the court’s decision. This can be an implication that thorough geohydrological review wasn’t done sufficiently before or even after the event.

7.3.3 Conflict Analysis

The form of conflict manifestation that was demonstrated in this case is ‘feeling anxiety’, ‘debate and critique’, ‘lobby and persuasion’, ‘access restriction’ and ‘court’. ‘Protest and campaigning’ wasn’t shown due to the accessibility to a public interest NGO, LAC that made them possible to raise their concerns without using demonstrative means. Instead, they had the opportunity to go through the legal procedures.
The farm owners were concerned about the impact of the mining activity, most specifically the impact of the changing water situation to their farming community. Although they were invited by the mines for public meeting, it became clear that the mine was imposing its idea, not willing to change their original plan of water usage (interview #16). The interview data doesn’t clearly state if the farm owners conveyed their position in a structured way in this stage and already had a clear position as an alliance with other affected farmers. However, one can speculate that this has been done before they applied for restriction because defining stakeholders and having a convincing proof is prerequisite for legal procedure.

After failing in lobbying and persuading the mine, the farm owners decided to look for different options to protect their water right. They tried the emergency interdiction to access restriction. This implies that they had the capacity to consolidate their power before their resource is being destroyed (Yasmi et al. 2006). However, unlike the examples presented in Yasmi et al. (2006) that involved physical restriction or demonstration to the opponent, this farm owners used a legal procedure instead. Nevertheless, their effort didn’t change the situation. That is when they went to a further stage, to court with the assistance of LAC.

The characteristic of this conflict is perceived as \textit{vested interest}, because the underlying structure is the struggle between potential winner and looser from mining activity. It was clear that the farm owners wouldn’t benefit from the operation of Valencia Mine in employment or economic aspect. Instead, it is prospected that their game farm will be affected by the mine by not being attractive for tourism. Moreover, it will be a threat to the supply of water for the farm and there will be little options for the farm owners to obtain alternative source of water.

The fact that LAC was the driver of the conflict made the farm owners to reach the higher level of conflict escalation compare to other two case studies that were presented previously in this paper. Although they couldn’t achieve their primary goal and the possible environmental degradation through mining activity was recognized by the High Court, they at least forbad the mine using their water resource. This prevented global actors to infringe their existing right on natural resource. That is the reason that there was little necessity for the actors to go to the next level of conflict that can be undesirable with physical exchanges.

The other driver of the conflict is the water-scarce environment that limits the option of obtaining water and the concern about the future, who is going to pay for the future water price if the current resource is depleted. The absence of the governmental mandate to assess the possible environmental depletion before giving the permit and consult with stakeholders is another driver of the conflict. This implies that the current institution doesn’t guarantee the basic transparency and water right of the people.
7.3.4 Institutional Framework

In this case study, the Court and LAC were the institutional frameworks that the concerned party could access or ask for conflict resolution. These institutions use legislation as a tool to prevent or resolve the conflicts. Court has high legitimacy on its decision than any other institution since it is supported by execution that enforces the stated judgment that obliges all the stakeholders to participate. As it is part of the governmental organization, it also contains the ‘publicness’ characteristic that enhances authenticity of its ruling (Sarat & Grossman 1975). It is useful when the involved parties couldn’t reach to a consensus and the court steps in to command decisions as a third party. Although it may not always be the case, one can expect that the court will state fair judgment.

The existence of LAC helped the farm owners to reach to court. LAC is a non-profit law firm that was founded in 1988 aiming to protect human rights of all Namibians. It is based in Windhoek and takes only public interest cases that may have wider contribution on the society than ordinary individual cases (LAC n.d.). That is the reason why they took this case even though it is the farm owners are not viewed as marginalised group. They believed that this could be an opportunity to set a precedent of sustainable resource management as well as to change the current water legislation. All of their service is free of charge and same has been applied to the farmers. Besides advocating, they also publish reports about their carried out research and give legal information in HIV/AIDS, gender equality, human right and land, environment and development (LAC n.d.).

The nature of LAC, being an NGO that provides legal service, facilitates the procedure for the farm owners to go to the next stage of the conflict under lawful process without using any physical exchange. Furthermore, it enables to set precedent that helps to avoid the future prospective conflicts in similar situation.

Even though having LAC as one of the institutional framework that can prevent the conflict, there is some limitation in that aspect. Instead of emphasizing on conflict resolution or prevention in early stage by using consensus or deliberative methods, it actually stimulates the polarization of actors. This is due to the fact that it doesn’t represent all parties, but only one. In addition, courts generally emphasize on procedural regularity than other institutions (Sarat & Grossman 1975).
8 Discussion

8.1 Limitation of the Methodology

Although the research has reached its aim, there were some limitations in the methodology. The present study was designed to analyze the existing water conflict in Erongo and to evaluate the political implication in the local level by scrutinizing the marginalized groups. However, the case studies were chosen through expert interviews and literature review and this allowed examining only the local communities or the farm owners who were already well recognized. Therefore, only the conflicts that already received certain level of interest were dealt in the thesis. The unknown conflicts that are not exposed publicly, which may involve concerned stakeholders who were being excluded in decision-process, weren’t tackled in this thesis. Furthermore, the farm owners that are involved in the case studies of Swakop River and Valencia farm are relatively wealthy and do not rely on the income from the farms they hold. This limitation makes the application of Political Ecology framework that focuses on marginalized group questionable. Nevertheless, the last two case studies showed valid results on how a defective legal environment and lack of institution can cause dispute over water right that thus, justifies the selection.

One of the aims of the study is to verify the existing environmental degradation coming from the mine with the belief that the accessibility to the ontological truth could resolve the conflict. However, the verification process wasn’t simple. Most of the water degradation is happening underground that required modeling with quantitative data from the flow of the mines which made it difficult to prove the cause and effect of water dry-out during limited time of research. The dry-out of the well can happen from diverse factors such as natural run-off of the water and pumping of the specific area. This is mainly attributed to the fact that groundwater is in direct contact with the earth and that it is vulnerable to anthropological change of the land. However, due to the lack of quantitative data to examine the environmental degradation, the causal relationship between the mining activity and dry-out of the wells couldn’t be fully proven.

Another limitation of the methodology is the fact that not enough stakeholders are represented in Valencia case study. Only LAC who advocated the farm owners was interviewed. Even with the attempts to complement the missing part of the interview with literature, capturing the perception of all parties might have restricted.

8.2 Political Implication to the Result

Since the independence, Namibian government sought to improve the political condition in water supply focusing on equitable distribution that wasn’t addressed during the colonial time. It was the minority of the population that were benefiting from the previous water policy with the means of subsidies. After the independence, the policy changed toward benefiting of all Namibians
that promoted sustainable use of water. The attempt of improving the quality of life of the people and decentralization of decision making is steadily in progress. Water reform is improving the governance status of Namibia from being highly centralized in Windhoek to having decentralized institutional frameworks by implementing BMC. Furthermore, the concept of sustainable use of water was introduced in various field of legislation. Nevertheless, the performance is still questionable due to the lack of implementation of the government to govern a large area with low population and the delay of enactment of WRM Act 2004 is holding back its initial objective.

The Valencia farm owners’ case is a good example of how defective legislature and policy can influence the local water management. It showed that the absence of government’s mandate to assess environmental impact of mining activity could lead to a destructive influence to individual. Full implementation of WRMA would have been more favorable to the farm owners to claim about water right. Since the outdated act that doesn’t consider sustainable consumption of the natural resource is still in practice, the Constitution was the only legal document that could support the argument of the farm owners. Farm owners argued based on Article 95 (i) that the ministry has the liability to provide the protection the sustainable use of environment. However, instead of focusing on whether the water permit infringes the sustainable use of water resource or not, the Court emphasized on procedural matters and formalities.

Even though the desalination plant was considered as one of the solution of water shortage in Central Namib area, the government’s reaction is belated for a long time. For instance, the negotiation of price between NamWater and AREVA is still going on while AREVA’s desalination plant was inaugurated in 2010. The plan for the second desalination plant in Swakopmund that is lead by NamWater is also being continuously delayed to 2015. For the mining companies, water supply is crucial factor to start their operation and under this uncertainty, they hesitate on giving their final mining exploration plan. This goes back to NamWater who cannot decide on the desalination plant without being secured with water demand. The desalination plant was until the water supply from the desalination plant is secured, the threat of mining companies to use the adjacent water bodies will continue.

Furthermore, at the time when the case of Valencia farm owner was filed, the EMA wasn’t in place yet, so there was little regulation regarding the EIA. Environmental Assessment Policy was the only acceptable practice in that matter. One of the major concerns is that EIA of Valencia wasn’t properly done and the mine didn’t put enough effort to integrate the concerns of the stakeholders. Before EMA was enforced, the legal binding for conducting EIA for the mining projects was weak without precise procedure and criteria. It is expected to be improved after the enactment of the act and the establishment of Environmental Commissioner. However, before the EMA was enforced, the administrative capacity of MET was weak to review the submitted EIA thoroughly that the approved EIAs are criticized by civil societies (Conde & Kallis 2012). For instance, Earthlife Namibia raised its
concerns about the EIA that Paladin Energy published when they first constructed Langer Heinrich. They doubted the preciseness of the report and requested to verify the EIA report to Öko-Institut, a research institution in Germany (interview #9). The review showed that there was insufficient consideration on its impact on groundwater especially from tailings disposal.

However, it is still questionable that the situation would be improved when the new acts are enacted. One of the main reasons was due to the lack of government’s executing capability from high fluctuation of the people. During the investigation, most of the obtained data were coming from the mines or uranium institute, but not from the government. The mines write reports annually to DWAF and MET including their water sampling results. It is recommended in SEMP, a list of recommendation that was provided in SEA to the government to fulfill, that geohydrology department of MAWF should monitor 18 monitoring boreholes twice a year (interview #12). And it is said that the mines and MAWF compare the monitoring result from the same boreholes (interview #12). However recently, there wasn’t any report from the government reporting (interview #12).

Under the circumstance where mine promoting policies continue without improvement of government’s capacity being improved, the politically marginalization of certain group will be intensified. It is arguable to identify the affected stakeholders of the three case studies as marginalized. First, their environmental impact from the mine wasn’t totally proven. Second, farm owners in the Swakop farmer and the Valencia mine case do have economic power to be considered as a marginalized group. Furthermore, unlike the Topnaar community, they had access to the next level of conflict escalation where they had the chance to raise their voice although it is difficult to generalize that it was due to their wealth. However, it is clear that the three concerned actors can be the potential looser from mining activities can worsen their water security. Moreover, under the weak mandate of the government, they are the one who can advocate environment itself.

As mentioned previously, the mining company is coming to the global south where weaker regulation and policy favorable to the mines are found. For example, Rio Tinto is a British multinational company and Paladin Energy is an Australian company. This improved the prosperity to Namibia by providing jobs and paying taxes. However, none of the villager or the farm owners from the three case studies any kind of benefit from it. They are not really winning from this situation, but rather losing. The redistribution of the mining will be discussed in the next section more in details.
8.3 Accessibility to Information and Institution

Environmental problems become complex where uncertainty is underlying. This applies in Namibia as well where the water is mostly found underground that makes it more difficult for the people to grasp the causal relationship. Therefore, seeing the direct impact from one mine to a certain community is not simple. This makes the compensation and taking responsibility more complicating. Therefore, the access to sound environmental information or to an institution that can provide that information is crucial in order to prevent this situation. Although it cannot be generalized, the three case studies show that institutions do play a role to alleviate the conflict to the next level. In the case studies of Swakop farmer and Valencia farm owners, the actors were able to reach to the next steps of the conflict manifestation due to the existence of Uranium Institute and LAC respectively compare to the case study of Topnaar.

Having governmental institution that resolves the conflict will be ideal since it has legitimacy, however, this is difficult to expect when the government is not having enough capacity. Although it seeks to decentralize its body, its accessibility from the locals is still questionable. Especially in case of a sparsely populated country, the monitoring cost will exceed its benefit. In addition, the performance of institutions that are from the states or legitimized by the states in Topnaar community case doesn’t show a positive outcome as agricultural extension office and KBMC weren’t active in the conflict resolution.

At the same time, mines are also being keen on bringing public participation through farmers working group and through foundation of Uranium Institute. This gives the ability for the concerned farmers or community to raise their awareness and to participate in discussion. However, the primary purpose of this institution is to save mining companies’ face by means of corporate social responsibility. For that reason, some farmers question the objectivity of the data that these institutions provide as they are formed to fulfill their own benefit.

The three case studies weren’t able to give the definite answer on environmental degradation. Regardless of that, as Yasmi et al. (2006) described, environmental conflict did emerge and it was mostly driven from actors’ own interpretation of the situation and attribution to other relevant actors than the actual facts. In other words, other factors such as different perception of legal rights and understanding of the nature problems can be more influential as a driving force of water conflicts than the actual environmental deterioration.

Thus, the struggle of having secure water supply is associated to the access to information and to relevant institution that can set discourse of stakeholders and that has the ability and authority to resolve the conflict. Once the access of these are secured and institutionalized, potential water conflict in the future could be prevented.
8.4 Post-Mining Economy

The mine cannot be the economic backbone of the country for centuries as minerals are resources that are not renewable. Due to long mining history of Namibia, some minerals already started to be exhausted from previous extraction. The main copper mines closedown in 1998 and on-shore diamond reserves have been depleted (Lange 2003). Fortunately, the economic path of Namibia is demonstrates the rise of other economic sources. Contribution of the mines has been reduced from producing 41% of GDP in 1980 to 11.4% in 2011 due to growth in other sectors such as tourism and fishery (CSO 1998; van Wyk et al. 2011).

Mining brings prosperity to the country by receiving compensation from taxes and royalties of minerals they are selling in exchange of growing environmental risk that might appear after generations. Moreover, the mineral market fluctuates according to the global market value that doesn’t permit room for long term prediction. In case the price of commodity goes down, the mineral extraction could be halted without benefiting from environmental degradation.

This is happening also in the uranium market that the uranium price is going down from global recession. The mines that were planned in the time when the uranium price peaked are reconsidering on whether they should continue with their operation or not. There is also a concern of possible environmental degradation from the remaining uranium that wasn’t extracted during the operation can happen after closure of the mines (interview #2). Until now, there hasn’t been any closure of uranium mine in Namibia. The risk might be high especially when MAWF is not monitoring the radioactivity.

The preparation of post-mining phase is also insufficient in planning the desalination plant. It takes at least 20 years to pay off the cost of constructing the desalination plant and in case the mines disappear in time shorter than that, the country will be sitting with the huge capital cost which they wanted to distribute the cost over long period of time to the population (interview #12). At the end, the people who are living in Erongo before the mining started its operation might be the one taking the burden that was left behind the mines (interview #1).

Namibia concentrates on the contribution of the mine limiting in stated owned enterprises, development of certain region and in improving employment, while its neighboring country, Botswana, has a distinct policy in reinvesting mineral revenues in public infrastructure and human capital (Interview #3; Lange 2003). This is one of the reasons that the people don’t feel the tangible benefit from the mining activities. For going toward long-term sustainability, the national wealth that is received from the mine should be reinvested in improvement of the people's livelihood. Moreover, national policy that takes into account of long-term development of post-mining is needed.
9 Conclusion

Under the fluctuating global uranium market, Erongo, the ‘uranium province’ of Namibia, faces opportunities in accumulating wealth and challenges in water supply at the same time. Considering that Namibia is one of the most arid regions in sub-Saharan Africa, water supply was always a restriction for development. Recognizing that there is little research done in the context of local water conflicts driven from the mineral extractions in Erongo, this thesis has the attempt to contribute in improvement of understanding of what are the factors that initiate or enhance the conflicts. This has been done by analyzing the conflicts of case studies of Topnaar community, Swakop farmer and Valencia farm owner that involved different concerned group; local communities and game farmers.

Each case has been developed in specific path of conflict history and actors that are involved. Nevertheless, the three case studies demonstrated common key aspects. First, it showed that conflicts can emerged from actors’ distinct interpretation of the situation than the actual facts. Conflicts can occur from struggles of legitimacy of resource as value conflict or effort in obtaining information as mistrust of experts. Second, mining activity and water distribution are correlated to the political situation. It is clear that the government is keen on promoting mineral extraction inviting foreign investment in the absence of rigorous environmental regulation. Water Act from 1956 is still in power and the over abstraction of OMDEL aquifer is carried forward. Monitoring and disseminating information is also weak in operational aspect that creates asymmetric access to data. This enhances the marginalization of the people. Last, it is shown that the role of institution was essential in conflict development and resolution. Institution could provide relevant information to the stakeholders who might have been negatively affected by environmental threat or moderate the conflict by bringing stakeholders who are associated with the situation. Thus, access to water could be institutionalized by ensuring access to information and to institutions.

As a result, the thesis has given insight of correlation between external factors and the environmental conflict. What the research has not made clear is how the environmental conflict develops under the premise that actual environmental degradation happens. Further research is needed to clarify the actual environmental degradation in these case studies and how the arguments of water problems are used to from each stakeholder. Moreover, as the WRMA is expected to be implemented in the near future, it would be interesting to assess its effects to the local community.
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