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A multi-stakeholder and perceptions based analysis of water governance: the case of water points in Fada N'gourma, Burkina Faso

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1. Introduction

In 1989, forecasts maintained that two-thirds of the African population would face severe water scarcity within several years to come (Falkenmark et al: 1989). As of 2016, Mekonnen & Hoekstra (2016) estimate that two-thirds of the world population face water scarcity for at least one month per year. These numbers are likely to worsen in the future, as the demand for freshwater is projected to rise by 30% until 2030 (Institute for Public Policy Research, 2010).

The lack of water has far-reaching impacts. Next to the necessity of freshwater for human survival, the lack of it can increase the incidence of water-borne diseases and reduce productive capacity, amongst others (Sullivan, 2001). In light of this, the connection between water and human as well as planetary well-being has long been established, as for instance by UN-Water (2013) which argues that “it is safe to state that investment in water security is a long-term pay-off for human development and economic growth”.

However, not only the consequences of water scarcity are multi-faceted, but also the reasons for it. Indeed, water scarcity can be a result of multiple factors. Simply put, “water scarcity can mean scarcity in availability due to physical shortage, or scarcity in access due to the failure of institutions to ensure a regular supply or due to a lack of adequate infrastructure.” (UN-Water, website). While the former situation is described as physical water scarcity, the latter is defined as economic water scarcity. Within sub-Saharan Africa, in particular, economic water scarcity is the dominant reason for water scarcity triggered by governance failure and infrastructure problematics (UNESCO, 2014).

In light of this, several researchers have argued that the human dimension in water resources (therefore referring to economic water scarcity) ought to play a leading role in discussions and research (van Rijswijk et, al 2014) (Jiménez & Pérez-Foguet, 2010) (Pahl-Wostl & Kranz (2010) (Mehta, 2011) (Ingram, 2011) Rogers & Hall 2003). Most drastically and bluntly phrased is the problem by Cosgrove & Rijsberman (2000) saying that “there is a water crisis today – tough this crisis is not about a lack of water to satisfy our needs, but about managing water so badly that billions of people – and the environment – suffer badly”. At the same time, however, the human dimension oftentimes does not find recognition in debates about water resources, being overshadowed by physical and natural science approaches to water (Pahl-Wostl, 2002) (Ingram, 2011).

As the human dimension plays such a significant role for water scarcity the pressing question for academics is how we can study it? Being aware of the issue, wide-ranging approaches have emerged, which discuss human organization of water resources under different headings, as for instance by using the terms water scarcity, water security or water governance. This paper will reflect upon the different approaches and highlight their shortcomings. Notably, it will be argued that current approaches for studying the human dimension in water scarcity oftentimes 1.) fail to

include all relevant stakeholders, 2.) focus on proxies instead of perceptions, 3.) are apolitical frameworks and 4.) create a distance between researcher and study participants. In light of these shortcomings, a new framework that focuses on the perceptions of multiple stakeholders will be proposed. This approach shall be placed within the realm of political ecology.

The case for applying this research framework is the town of Fada N'gourma in Burkina Faso. This case has been chosen for several reasons. One of the issues concerning economic water scarcity is the problem of dysfunctional water infrastructure. With reference to this, Banks & Furey (2016) conducted a comparative analysis of 11 countries mainly situated in sub-Saharan Africa and found that on average 22% of water hand pumps were non-functional. Burkina Faso exemplifies the average with 20% of non-functional water handpumps. Besides this, the city of Fada N'gourma has a wide range of ethnic groups, varying from Normads to the Mossi and the Gourmantché people. It is therefore an interesting case to study whether this ethnic diversity impacts water governance. Furthermore, it is a rapidly growing small town, which has doubled in population size between 1985 until 2006 (Institut national de la statistique et de la démographie, 2017). This trend of rapid urbanization can be found in various African cities and it shall be interesting to investigate how these dynamics influence water governance.

The paper will be structured as follows: After having articulated the research questions, a literature review will investigate as to how current assessment frameworks examine the human dimension in water resources debates. The concepts emerging from this literature review will be explained and operationalized thereafter. To complete the conceptual foundation political ecology will be selected as an overarching theory. After this, the study location will be described and research practicalities, such as the data collection and analysis tools are being discussed. This research proposal concludes with considerations concerning ethics and positionality.

2. Research Questions

Leading research question: How can a multi-stakeholder analysis focusing on perceptions help to understand the human dimension in water resources problematics and opportunities in Fada N'gourma, Burkina Faso?

Subquestions:

- How can lessons from critical geography, in particular community mapping, contribute to understanding the perceptions of water point users towards water access?
- What is the value of combining traditional water governance assessment frameworks with political economy approaches for analysing the perceptions of water point management actors?

3. Literature Review

It has been established that the availability of water resources is influenced by physical conditions (physical water scarcity) as well as human influences (economic water scarcity). Within sub-Saharan Africa, the unavailability of water resources can mainly be attributed to human factors. Since the human dimension plays such a significant role, it appears significant to analyse what options the academic community offers for studying and understanding this phenomenon. Accordingly, the question arises as to how do we study the human organization of water resources?

In order to assess this question, the following section reviews the current state of thinking and practice. It appears logical to assume that human organization of water resources is discussed within the realms of the term water governance, due to the fact that the very term 'governance' implies human involvement. However, debates surrounding the interplay of water and humans have been conducted on bases of various conceptual terms. Therefore, to gain a comprehensive picture of current debates, also the literature surrounding the concepts water security and water scarcity have been analysed. It is aimed that through looking into these three key terms the vast majority of literature will be captured. In this vein, the following section analyses the debates concerning water security, water scarcity and water governance to understand how human organization of water resources is currently studied.

a. Water Security literature

To start, the first section will consider the literature surrounding the term water security in order to see what lessons this debate holds for studying human organization of water resources. It must be stated, however, that the term water security is difficult to pin down and has been described as a "popular but contested concept" (Pahl-Wostl et al, 2016). Indeed, while it is hotly debated across disciplines, little agreement has been found concerning its meaning and contents (Cook & Bakker, 2012). In light of this, a large amount of literature about water scarcity is concerned with debating its very meaning and with trying to establish common themes (Grey and Sadoff, 2007), (Lautze & Manthrilake, 2012), (Cook & Bakker 2016). One reason to explain this lack of clarity can be traced back to the fact that the debate is generally young, having emerged in academic circles in the 1990s, while the vast majority of academic literature referring to water security has been published since the 2000s (Cook & Bakker, 2012).

While the literature appears to be focusing on conceptual issues, Cook & Bakker (2016) find that half of the studies including the term water security are in fact empirical studies. Although empirical, governance-related indicators and dimensions still remain largely absent in these studies. Indeed, most studies emphasize the following four themes: 1.) water availability, thus focusing on water quantity in relation to the population; 2.) human vulnerability to hazards, calculating the degree to which a

population is at risk of being subject to a hazard and which parts of the population are vulnerable; 3.) human needs, which, oftentimes relates to food security as threatened by water scarcity and inundation and; 4.) sustainability, which puts a focus on the interplay between human needs as well as ecosystem needs (Cook & Bakker, 2016). As can be seen, these four dimensions consider how water resources impact humans, but not vice versa. The human dimension is accordingly not considered.

However, exceptions exist. For instance, the approach by Norman et al (2013) aims to “integrate governance and freshwater indicators”. For this purpose they developed the Water Security Status Indicators Assessment approach. Notably, the approach facilitates participation of the community and furthermore focuses on translating research results into policy. A closer look reveals that their analysis concentrates on natural science indicators (water quality and water quantity) and accordingly does not scrutinize the human dimension. One reason to explain the absence of governance-related indicators in the water security literature may be the fact that only a small fraction of water security literature is published within the social sciences (Cook & Bakker, 2016).

Accordingly, the debate surrounding water security is relatively new, having emerged in the 1990s. Based on this, several articles discuss the very meaning of the term and are of conceptual nature. Empirical studies deal with varying issues while not specifically putting a focus on how humans organize or influence water resources.

b. Water Scarcity literature

With regards to water scarcity, several assessment frameworks have been developed. The most prominent water scarcity frameworks have been identified by Zeng et al (2013) as well as Liu et al (2017) and are the following four: the Falkenmark Index, Criticality ratio, IWMI indicator and Water Poverty Index. When comparing the four indices it becomes clear that the indicators are usually geared towards understanding the physical nature of water scarcity. Indeed, the Falkenmark Index considers two components: the volume of water for a specific area and the number of people for that same area (Falkenmark et al, 1998). The Criticality Ratio, in turn, relates the amount of water used with the amount of renewable water resources (Alcamo & Henrichs, 2002). These two ways of measuring water scarcity accordingly focus exclusively on physical factors and do not consider the human dimension. This reveals the reliance on natural science indicators, as echoed by Mehta (2011): “the scarcity of water and drought are complex phenomena that can be analysed differently from social, political, meteorological, hydrological and agricultural perspectives [...] There has been the tendency to direct attention to the lack of supply of water due to natural forces rather than looking at human-induced land and water use practices and at socio-political considerations”. Accordingly, factors that relate to the influence of humans through governance have not been considered in these two approaches.

This is quite different for the remaining two approaches. To start, the IWMI indicator has been described as including physical and economic water scarcity (Liu et al, 2017),

as it accounts for physical factors while also incorporating one socio-economic factor, namely the current state of water infrastructure within a country (Seckler et al, 1998). The Water poverty index takes it a step further. It was developed in an attempt aimed at “linking indicators of water and human welfare” (Sullivan et al, 2003). The result reveals indicators relating to the resources base and overall natural environment as well as water access, human capacity and water use. Compared to the other works reviewed so far, this framework is highly sensitive to socio-economic factors influencing water resources. Still, shortcomings can also be identified in this approach.

Firstly, the approach solely looks at the population (how do they use water, what capacity do they have, how can they access water) and lacks considering all relevant actors. This view echoes Verweij & Thompson (2006) argument that one will gain an incomplete picture of society if only one way of knowing reality is considered. Also Mehta (2011) stresses the importance of considering different perspectives through arguing that in water resources debates “It is also important to distinguish between the biophysical aspects of scarcity that are lived and experienced differently by different people”.

Secondly, the indicators usually are proxies, for instance considering education level to determine human capacity or time spend collecting water for measuring water access. Challenging this practice, it could be useful to consider the perceptions of research participants directly, since “community members not only have greater access to information but are also better able to express their needs, priorities and goals” (Cochrane et al, 2014). In addition to this, evaluation of different water studies showed that “the barriers are largely socio-institutional rather than technical, reflecting issues related to community, resources, responsibility, knowledge, vision, commitment and coordination” (Brown & Farrelly, 2009). These issues relate, for the most part, to the perceptions of people underlining the relevance of this topic.

In conclusion, it has been argued that natural science indicators and approaches are favoured to study water scarcity and water security. Empirical studies on water security also feature themes, which look at the impact of water resources on humans (for instance human access to water and human vulnerability to hazards) but not vice versa. For studies that focus on water scarcity, in turn, the picture is a bit more complex. Some approaches fall short in examining socio-economic factors altogether, as in the case of the Falkenmark Index (Falkenmark et al, 1998) and the Criticality Ration (Alcamo & Henrichs, 2002). While the IWMI indicator takes the state of infrastructure into account (Seckler et al, 1998), the Water Poverty Index considers several socio-economic dimensions namely water access, human capacity and water use (Sullivan et al, 2003). Despite this comprehensiveness, two shortcomings of this approach have been identified: 1.) solely looks at the population (how do they use water, what capacity do they have, how can they access water) and lacks considering other stakeholder groups and 2.) mostly proxies are measured and not the perceptions of study participants. In this vein, it has been argued that proxies may not accurately capture the perceptions of study participants.

c. Water Governance literature

The literature on water governance deals with different dimensions. While some articles may circle around the best ways of how to organize human organization of water resources Biswas & Tortajada (2010), others may provide frameworks to identifying alternative options for water governance (Salgado et al, 2009). While these have a problem-solving character, the following section aims to examine the literature concerning water governance analysis.

Most strikingly, the literature on water governance starts from the assumption that the socio-economic domain of water has often been neglected in the past. It is noted that in the past water resources management was largely shaped by an engineering approach featuring technological fixes with socio-economic systems considered to be an external condition (Pahl-Wostl, 2002). In addition to approaches focusing on the natural sciences they have also been criticized as applying universal remedies to complex and diverging contexts (Ingram, 2011). In line with the argument of being focussed on technical and universal solutions, it is especially articulated that water resources management requires a focus on politics. Indeed, water resources discourses have been described as “politically tone deaf” and the necessity to include them on politically agendas is highlighted (Ingram, 2011). In a similar vein, Araral & Wang (2013) point out that “many prescriptions for improving water governance [...] are naïve about the political dimensions of the problem. Indeed, water governance, to the extent that it involves conflict in the allocation and use of an increasingly scarce and valuable resource is an inherently political subject”. If the prescriptions are not considering politics, it appears useful to ensure that the analysis of water governance considers political structures and dynamics.

Besides this call to include politics into water governance, we shall first see what current water governance frameworks do in fact consider. Accordingly, frameworks have been developed by Bressers et al (2013), the OECD (2018) and Rijswick et al (2014). These frameworks have common dimensions as well as diverging dimensions. For instance, all frameworks consider the instruments and policies of water governance to be an important aspect. In addition, also resources in terms of financial resources or human capacity are highlighted as necessary for analysis. What they fail to recognize, however, is indeed the political dimension. Oftentimes, the focus remains within the water structures, not questioning the overall political and economic structures. This brings us back to the earlier argument that water governance assessments were often criticized as being too technical (Ingram, 2011) (Pahl-Wostl, 2002). Indeed, this reveals that water governance assessments have fallen victim to what is called as “rendering technical” (Li, 2007). This term has been coined by Tania Li and maintains that in development work professionals identify problems in a way that the skills the expert has to offer will be identified as solutions. In this sense “the identification of a problem is intimately linked to the availability of a solution” and “the lands of intervention that experts have to offer” (Li, 2007). On this broader level, it can be found that current water governance assessment frameworks fall victim to rendering technical. Indeed, a rhetoric underlining “good governance” or “desirable characteristics of governance” (Bressers et

al, 2013) in current assessment frameworks shows that the process of investigation is not open but restricted to lead to the identification of specific problems, which can then be addressed through a pre-established set of interventions.

Rendering technical consists of two dimensions: the first dimension is concerned with the fact that rendering technical reinforces the boundary between trustees and subjects (the former diagnosing and proposing a solution while the latter being subject to the opinion of the expert). In fact, current water governance assessments fall victim to this dimension. For instance, the OECD (2018) attached a list of questions to be used for interviewing. Oftentimes, these questions ask whether certain mechanisms or policies are in place, without including follow-up questions focusing on whether the informant regards them as necessary. This creates the described division between the trustee and the subject. A focus on perceptions, as has been established before, would be necessary in order to reduce this boundary.

The second dimension of rendering technical includes the following: “questions that are rendered technical are simultaneously rendered non-political” meaning that “experts tasked with improvement exclude the structure of political-economic relations from their diagnoses and prescriptions” (Li, 2007). This argument of apolitical water governance has been pointed out by Araral & Wang (2013) before. It also has been argued before that the current water governance assessments for the most part rely on technical questions (e.g. concerning resources or strategies) and do not consider the wider socio-economic conditions. Efforts have been made in this direction, notably by Stein et al (2011) who conducted a social network analysis of the water governance sector in the Mkindo catchment in Tanzania. This framework considers the interplay between actors but ultimately lacks in highlighting the interplay within institutions or in relation to the overarching political and economic structures. This is a critical issue, which shall be considered in the proposed research framework.

Taken these arguments, would it be useful to focus on political structures only? Clausen (2010) argues against this. He refers to Li and argues that for a comprehensive analysis it is necessary to combine both approaches: technical as well as broader dimensions focusing on the overarching political and economic structures. This appears logical, as solely considering the capacity of actors involved is not sufficient. Not considering it, however, would potentially veil a critical element in the water governance structures. This perspective will therefore be adopted when attempting to establish indicators for this research project.

To conclude, this section dealt with the current thinking and practice in water governance assessment. It has been highlighted that current water governance analysis frameworks have been rendered technical, as they are apolitical and create divisions between the trustee (researcher) and the subject (study participant). To overcome these issues, a framework shall be established which also considers the wider socio-economic structures and a focus on perceptions shall be adopted. The following section will lie out a framework for this purpose.

4. Concepts

Following the literature discussion, the following issues were identified: it has been established that water scarcity and water security studies largely disregard the human dimension to water resources. If it was included, oftentimes governance aspects of water issues were disregarded. The most comprehensive framework was identified to be the Water Poverty Index, while also problems with this approach were identified: firstly, not all stakeholders were included in the analysis and secondly proxies were used instead of gathering perceptions of the relevant stakeholders. The discussion of water governance literature revealed that current assessment frameworks are in fact “rendering technical”. This means that the frameworks are apolitical, and create a boundary between the trustee (researcher) and subject (research participant). To conclude, four issues emerged: 1.) neglect of including all relevant stakeholders, 2.) focus on proxies instead of perceptions, 3,) apolitical frameworks, 4.) distance between researcher and study informants.

Firstly, in order to address the neglect of relevant stakeholders, this framework shall apply a multi-stakeholder analysis. This can be realized by choosing two concepts, which focus on the different groups of stakeholders: water management bodies and water users. Indeed, considering multiple stakeholders in water governance is necessary, as “the governance of water resources is an inherently complex process. Complexity stems from the interconnected nature of the hydrological cycle and consequently the many actors and sectors that influence water resources at multiple scales” (Stein et al, 2011). Who these different stakeholders are will be highlighted in the section concerning the unit of analysis below. Secondly, the proposed framework shall focus on perceptions. Thirdly, indicators that relate to the political and economic dynamics shall be addressed. Fourthly, to reduce the distance between the researcher and the study informants participatory methods shall be included which allow the research participants to actively be part of the research process. In addition, focussing on perceptions of the study informants also helps to diminish this boundary, as their opinions are taken serious. This leads to a multi-stakeholder and perceptions-based analysis of water governance.

The two concepts chosen to analyse this are “water user perceptions” and “water management perceptions”, as relating to the two different stakeholder groups. The following section will aim to operationalize these two concepts.

a. Water User Perceptions

Water user perceptions, by itself, have been studied before. For instance, Kumasi & Dawurah Agbemor (2018) analysed the ‘user satisfaction’ of water services in rural northern Ghana. They used the indicators accessibility, quantity, reliability and quality of the water points. These indicators deliver valuable insights for this study. However, in addition to this, other studies for instance focusing on water scarcity perceptions have

been considered to identify relevant indicators. The following paragraphs will explain where the indicators have been derived from and why they have been chosen.

The operationalization plan in Table 1 (see below) has been developed in a deductive manner in that firstly the variables and indicators were selected from the sources mentioned above. Afterwards, variables and indicators were placed into common themes that emerged. Academic literature served as the prime source for identifying variables and indicators.

To start, when considering the indicators gathered, it appeared that they either relate to the water point specifically or relate to the larger environment of the water point. Accordingly, these two have been chosen as the two dimensions for this study.

The indicators concerning functionality (1.1) and accessibility (2.2) have been inspired by Batchelor (2013), who puts a focus on studying water infrastructure through assessing the accessibility and functionality of water sources. The study showed that although water infrastructure may be in place, the water points may be dysfunctional or some areas have limited access to water as water points are far away. As the infrastructure concerning water is an aspect that can be perceived by people, this was included into the operationalization scheme.

Furthermore, a study by Gyampoh et al (2008) noticed that a coping strategy to lack of water scarcity is the purchase of sachet water in Western Africa. This ultimately inspired the indicator concerning the affordability of water services (2.4). This is relevant in the case of Fada N’Gourma, as it is required to pay before accessing water from the water points.

Also conflict between actors over water has been included as an indicator for water scarcity in the form of the indicator “actors using water point” (2.1). This is derived from Westerhoff & Smit’s (2009) finding that water accessibility was hampered in their study area in Ghana based on conflict with local herdsman over resources. Although this case was revealed in Ghana, it may be possible that similar conditions can be found in Burkina Faso.

In addition to this, seasonality (1.4) of water availability is another prominent feature which was included as a variable. This means that water may be available in certain months while lacking in others. This indicator was inspired by Liu et al (2017) call for water scarcity studies to take notice of this phenomenon.

Indicator 2.3, which relates to obstacles in the landscape, has been derived from Hohenthal et al (2016). They found that certain objects in the landscape may restrict access to the water point (e.g. enhanced erosion) or the fact that other objects in the landscape have an impact on the water quality of the water point (e.g. impacts of deforestation on water points or pollution through fertilizers). Therefore, these two issues have been combined into the indicator ‘obstacles’. In the same study, it has been considered for what purposes the water is used, which is represented in this study through the indicator 1.2 “usage”.

In their community evaluation methodology, Pouw et al (2016) integrate a dimension to uncover the historical perception of study participants. Asking participants to remember as far back as they can about the development of a certain intervention helped to understand whether changes occurred. In addition, it is argued that a look into

the past “leads to a comprehensive and collectively shared understanding (intersubjective) of how the current situation has come about” (Pouw et al, 2016). In this vein, the indicator 3.1 (historical perception) has been added.

The three remaining indicators (1.3; 2.5 and 3.2) have been added by the researcher. Variable 1.3 refers to whether at certain times of the day it is perceived easier/more difficult to access water, while variable 2.5 inquires whether the water users know who manages the water points and whether they have relations with the managers of water points. Lastly, indicator 3.2 shall give study respondents the chance to voice additional issues they would like to highlight. Kindly refer to the operationalization table in the excel file to see how each variable is operationalized into indicators.

Concept	Dimensions	Variables
Water User Perception	1. Water points	1.1 Functionality
		1.2 Usage
		1.3 Daytime
		1.4 Seasonality
		1.5 Reliability
		1.6 Water quality
	2. Larger Environment of water points	2.1 Actors using water point
		2.2 Distance/Accessibility of water point
		2.3 Obstacles
		2.4 Affordability
		2.5 Management
	3. Relating to both dimensions	3.1 Historical perception
		3.2 Anything else the research participants would like to mention

Table 1

b. Water management perceptions

Having described the different dimensions and indicators of the first concept, the following part is concerned with the second concept: “Water management perceptions”. The focus hereby lays on the perceptions of those stakeholders, which are managing the water points or are in other ways involved in water governance. As we have established above, current water governance assessment frameworks fail to take political realities

into account. However, referring to Clausen (2010), it has been maintained that current water governance assessment frameworks do have value and should not be disregarded altogether. In this vein, the dimensions and indicators featured in current water governance assessment, notably from Bressers et al (2013), OECD (2018) and Rijswick et al (2014), have been combined to produce a new framework. Taking these indicators together from these different sources, the first three dimensions of the operationalization table 2 (see below) were established. The first dimension refers to the policy and strategic policies, the second dimension to the actors and how they cooperate, while the third dimension examines resources and capacity. A detailed account about how these dimensions translate into variables, indicators and questions is given in the detailed operationalization scheme in the excel file. These three dimensions feature the building blocks of current water assessment frameworks.

The following two dimensions have been added based on the lacks that have been identified in the current assessment frameworks. The first of these two additional dimensions deals with the “external environment”, in order to capture perceptions concerning the overarching political and economic structures. Interestingly, organizational assessment literature has valuable lessons for this. Indeed, assessment frameworks such as the Burke & Litwin Model (Burke & Litwin, 1992), the IOA model (Lusthaus et al, 2002), the six box model (Hamid et al, 2011) all acknowledge that the external environment plays a significant role. In this sense, aspects from these frameworks have been incorporate in this dimension. For instance, Lusthaus et al (2002) underlines how the economic, political as well as the ecological environment impact organizations (or in this case the whole water governance sector). In addition to this, theories of political economy hold valuable lessons for water governance (Araral & Wang, 2013). For instance, Clarke and Xu (2004) use political economy to study water utilities privatization and find that political willingness is a key factor. In this vein, one of the questions to be posed to research participants is whether it is perceive that water provision is a priority of politicians. In this sense, another interesting question is also that of authority. For instance, it shall be asked as to which actors have the authority to allow or demand the construction of new water points. Including these kinds of questions the perceptions concering political and economic structures shall be analysed.

The second of these two additional dimensions, in turn, deals with the “additional personal judgement” of the research participants. This dimension puts an additional focus on the perceptions of research participants to also give them the space to voice aspects, which have not been addressed by the interview questions. It also looks at the motivation of research participants concerning water management.

Concept	Dimensions	Variables
Water management perception	Policy and strategic framework	Strategies & instruments
		Checks & balances
		Priority perceptions
		Goal ambitions
	Actor involvement and cooperation	Levels & scales
		Actors & cooperation
		Roles & responsibilities
	Resources & capacity	Human capacity
		Financial capacity
		Knowledge capacity
		Material resources
	External environment	Economic
		Social/political
		Ecological
	Additional /personal judgement	Additional perceptions of research participants concerning water point monitoring and maintenance
		Necessity of water point monitoring and maintenance for water security
		Individual needs & motivation
		Individual & organizational performance

Table 2

5. Theoretical framework

a. An overview of political ecology

In general, political ecology has been described as a theory with differing definitions and applied in various disciplines, amongst other also in development studies (Robbins, 2011). Despite this inclusive nature of political ecology, Forsyth (2003) finds that “it is widely accepted that debates concerning political ecology refer to the social and political

conditions surrounding the causes, experiences, and management of environmental problems.” Oftentimes, concepts as such are well explained when looking at their opposite, namely apolitical ecology. One concept, which can be regarded fitting within the framework of apolitical ecology, is that of ecoscarcity (Robbins, 2011). Ecoscarcity focuses on the increase of human population triggering the scarcity of environmental resources. If one views the natural environment through this lens the politics and economics involved in environmental resources are ultimately neglected. This example therefore clearly shows the difference between apolitical ecology and political ecology or “between viewing ecological systems as power-laden rather than politically inert” (Robbins, 2011).

Especially in the context of the Global South, political economy has been regarded as a valuable framework to investigate questions such as “What are the political and economic obstacles to the resolution of the Third World’s environmental problems?” (Bryant & Bailey, 1997). This approach, termed “Third World Political Ecology”, is accordingly aimed at analysing specifically the political and economic structures to understand environmental problems of the global South (Bryant & Bailey, 1997).

b. Political ecology and water resources

After having reviewed the basic contents of political ecology, the question arises as to how this framework fits into the established research framework? On the whole, political ecology aims to explain four issues, of which one is “environmental conflict and exclusion”, which deals with issues relating to “access to the environment and conflict over exclusion from it” (Robbins, 2011). As this research framework also attempts to consider the access to water, this research project can be placed within this strand of political ecology.

Specifically concerning urban water and political ecology, Swyngedouw et al (2002) argue that oftentimes “the environment is defined in terms of a set of ecological criteria pertaining to the natural milieu [...]. Political-ecological perspectives start from a radically different position”. In this sense, the earlier critique of limited social science perspectives and an abundance of natural sciences approaches is also inherent in the political ecology agenda. It is maintained that political ecology includes, amongst others, that “environmental and social changes co-determine each other” (Swyngedouw et al (2002)). It is this focus on linking ecological processes (water availability) and socio-political structures (the management of water) which is also aimed in this study.

Furthermore, when looking more precisely at studies of water ecology, one finds that also here the focus on perceptions of populations is valued. For instance, applying a political ecologist lens, Mehta (2011) asks whether “are there different and more locally appropriate ways to view and address water scarcity?” In this sense, the emphasis on the perceptions is also represented in political ecology.

Additionally, political ecology has been used in the realms of participatory ecology. As Hohenthal et al (2016) show, participatory mapping results reveal valuable insights into social meaning and historical socioecological perspectives. As the variables

used have been informed by Hohenthal et al (2016), it shall be ensured that political, social and economic structures can also be captured through this research framework.

To conclude, the political ecology agenda links to the research framework in several ways. Firstly, it critiques the lack of social science perspectives in water governance. It also addresses the lacks of current approaches such as the neglect for considering perceptions of research participants. Moreover, academics using political ecology have embraced similar methods as proposed for this study, notably that of community mapping.

6. Epistemology & Ontology

The previous parts identified and justified the chosen topic and provided theoretical underpinnings as well as the practical operationalization. Building on this, the following section sets out to establish the guiding ontological and epistemological standpoints of this research project.

The question concerning what constitutes reality (ontology) in light of this research project is answered by adopting a constructionist ontological stance due to the chosen paradigm of political ecology. Indeed, constructionism maintains that aspects such as an organization or culture are a negotiated process. Therefore, the social order in specific entities such as organizations or cultures are not pre-determined, but highly influenced and continuously negotiated by the actors involved (Bryman, 2012). Culture is therefore not rigid and not pre-determined but shaped by its actors. This is not to suggest that adopting a constructionist ontology means that cultural norms do not influence humans. Indeed, Becker (1982) argues that constructionism also acknowledges that cultural norms can shape the perspective of humans. On the whole, therefore, a constructionist view means that actors' decisions are influenced by cultural norms, but that they also have a degree of autonomy. This position stands opposed to an objectivist ontology, which maintains that culture must be viewed as external to social actors and dictating their behaviour (Bryman, 2012). Following this idea, actors have no own agency and their decisions are based on cultural norms only.

As this project aims to focus on the different perceptions of the stakeholders to water management, this project clearly acknowledges the agency of each actor. Accordingly, this project shall adopt a constructionist ontology. In this view, the organization of water points is not determined by the external environment alone, but also by its actors. This appreciation of the agency of actors can also be found within the theory of political ecology.

With regards to the questions of what constitutes valid knowledge (epistemology), this research project subscribes to an interpretivist epistemology. Interpretivism maintains that there are multiple realities out there, which are created through each individual through her/his senses. Therefore, "reality is individually constructed; there are as many realities as individuals" (Scotland, 2012). For the researcher, it is therefore of interest to capture these multiple realities out there. As this

research project attempts to study perceptions of individuals, an interpretivist ontology is well-suited, as it underlines that different understandings towards an issue can exist and that it is crucial to study these. Rather than having an explanatory character (*erklären*), interpretivism aims to understand (*verstehen*) (Raddon, 2010). This stands in contrast to positivism, which includes that only one reality exists, which can clearly be measured and quantified. In this vein, objectivism clearly focuses on “discovering the absolute truth about an objective reality” (Scotland, 2012). Discovering an absolute truth would not be beneficial for this research project, as the organization of water points is a process created and influenced by many factors, which all have their independent truth. It is essentially of interest for this research project to understand how these different perceptions interact.

To conclude, the question concerning what is reality (ontology) is answered in that entities (including water governance) do not exist external to its actors. In this sense, water governance is inherently shaped not only by the provided structures but also by the actors operating within it. This underlines the established focus on the human dimension in water resource management. The question concerning what constitutes valid knowledge is answered by stating that not only measurable outcomes are valid knowledge but perceptions as well, due to the fact that multiple realities exist as laid out by an interpretivist epistemology.

7. Study location

In a world-wide study on the causes of water scarcity, almost exclusively countries in Sub-Saharan Africa have been categorized as facing economic water scarcity, thus water scarcity stemming from socio-economic rather than physical factors (UNESCO, 2014). As this study aims to study water governance, focussing on a country in that region appears logical. The specific issue within water governance to be investigated has been described as the governance of water points.

When considering this issue within Africa south of the Sahara Burkina Faso emerges as a country with specific significance for this study. This can be seen when we consider the study conducted by Banks & Furey (2016) on water points. They compared 11 countries mainly located in sub-Saharan African and found that on average 22% of waterpoints are non-functional. Since Burkina Faso registers 20% of non-functional waterpoints, this shows that Burkina Faso can be seen as a typical case. The strength of a typical case is the following: “The typical case exemplifies what is considered to be a typical set of values, given some general understanding of a phenomenon. By construction, the typical case is also a representative case” (Gerring, 2008). In this sense, Burkina Faso is average with regards to the percentage of dysfunctional water points and therefore representative for this phenomenon.

Burkina Faso is a landlocked country located in West Africa, bordering to Mali in the North and West, Côte d’Ivoire, Ghana, Togo and Benin to the South as well as Niger to the East. When considering the country’s history, Englebert (1998) writes that “old societies make up young Burkina Faso”. Indeed, while around sixty ethnicities resided in

modern-day Burkina Faso several centuries ago, the Mossi kingdoms emerged as the largest entities from the 15th century until colonization (Englebert, 1998). Also today, 52% of Burkinabé belong to the Mossi, followed by the Fulani (8.4%), the Gurma (7% and the Bobo (4.9%), making the Mossi the largest ethnic group (CIA, 2010).

During the pre-colonial era, customary law entailed that water is regarded as a collective right and users may access water as long as sufficient amounts are left for other users (Opoku-Ankomah et al, 2006). To ensure water conservation, chiefs and priests commonly acted as custodians of water resources. Regulatory mechanisms, such as fixing times and spaces for fishing practices and water collection were enforced. Moreover, however, water played a sacred role and “was the fundamental element to beseech the blessing and forgiveness of the ancestors” (Opoku-Ankomah et al, 2006: 4). Based on the authority of local priests and chiefs, governance occurred within the community scale.

By 1904, the territory of today’s Burkina Faso was completely conquered by the French colonial administration, incorporating it into the colony of Haute-Senegal-Niger. Eventually, the colony was divided and Upper Volta (today’s Burkina Faso) was created in 1919. The above described water governance structures of community ownership largely prevailed during the colonial era. Indeed, the colonial legal system laid out the coexistence between customary law and colonial legislation. After independence in 1960, the countrywide application of one indigenous water governance system was neglected as a viable solution. This was the case since local forms of organisation differed largely from each other, as for instance the formal organization of the Mossi in comparison to the “chief-less” Lobi-Dagari villages (Opoku-Ankomah, 2006). In conclusion, Burkina Faso adopted a water governance system similar to that of its former colonial power France. In this sense, a range of public authorities were established for dealing with water governance. In present-day Burkina Faso, the primary public authority responsible for water governance is the Ministry of Agriculture, Water Resources and Fisheries. On the hydrological basin level, also the “Basin Management Committees (BMC), the River Basin Agencies (RBA) and finally the Local Water Committees (LWC)” are involved in water management (Petit & Baron, 2009). With reference to these institutions, Petit & Baron (2009: 56) argue that “one can question, however, the real functioning of such institutions, particularly at the local level”. Accordingly, this proposed research project aims to look at these local governance structures with regards to water monitoring and maintenance.

Within Burkina Faso, the town of Fada N’gourma has been selected as study location. First of all, the decision to study on the scale of a town and not an entire country rests on the finding that country comparisons are valuable, but hide intra-country variability (Cook & Bakker, 2016). Furthermore, to study an urban instead of a rural context is based on the fact that urbanization is and has been an important topic for the African continent. Indeed, from any regions in the world, the urbanization rate has been the highest in Sub-Saharan African between 1960 and 1991 (Simon, 1997). This is not to say that rural water governance is not critical in sub-Saharan Africa. However, studies focusing on water governance oftentimes already focus on the rural scale (Jiménez & Pérez Foguet, 2010) (Hohenthal et al, 2017) (Batchelor, 2013). In

addition to this, Tortajada (2010) established a priority research agenda for water governance, which states that future-oriented governance research shall take drivers for change into account, such as “rapid growth of small-to-medium-size cities”. Within the city of Fada N’gourma the population doubled from 20,857 inhabitants up to 41,785 inhabitants between 1985 until 2006 (Institut national de la statistique et de la démographie, 2017). Based on this figure, it appears promising to understand how (and whether) water governance evolved within these last decades and how the residents of the city perceived this evolution.

Geographically, the town is located in the southeast of the country around 200 kilometres from the capital Ouagadougou (see map 1). It falls within the semi-arid Soudano-Sahelian climate zone, which is one of three climate zones within Burkina Faso. The rainfall patterns are as follows: lowest in the North (arid landscape) and highest in the South (sub-humid climate zone). Being in the Soudano-Sahelian climate zone, Fada N’gourma falls between the two zones (Newborne & Tucker, 2015). The town is frequented by travellers as the important highways N4 and N6 pass through the town, which connect the capital Ouagadougou with Niger. In addition to this, the town is subdivided in eleven sectors.

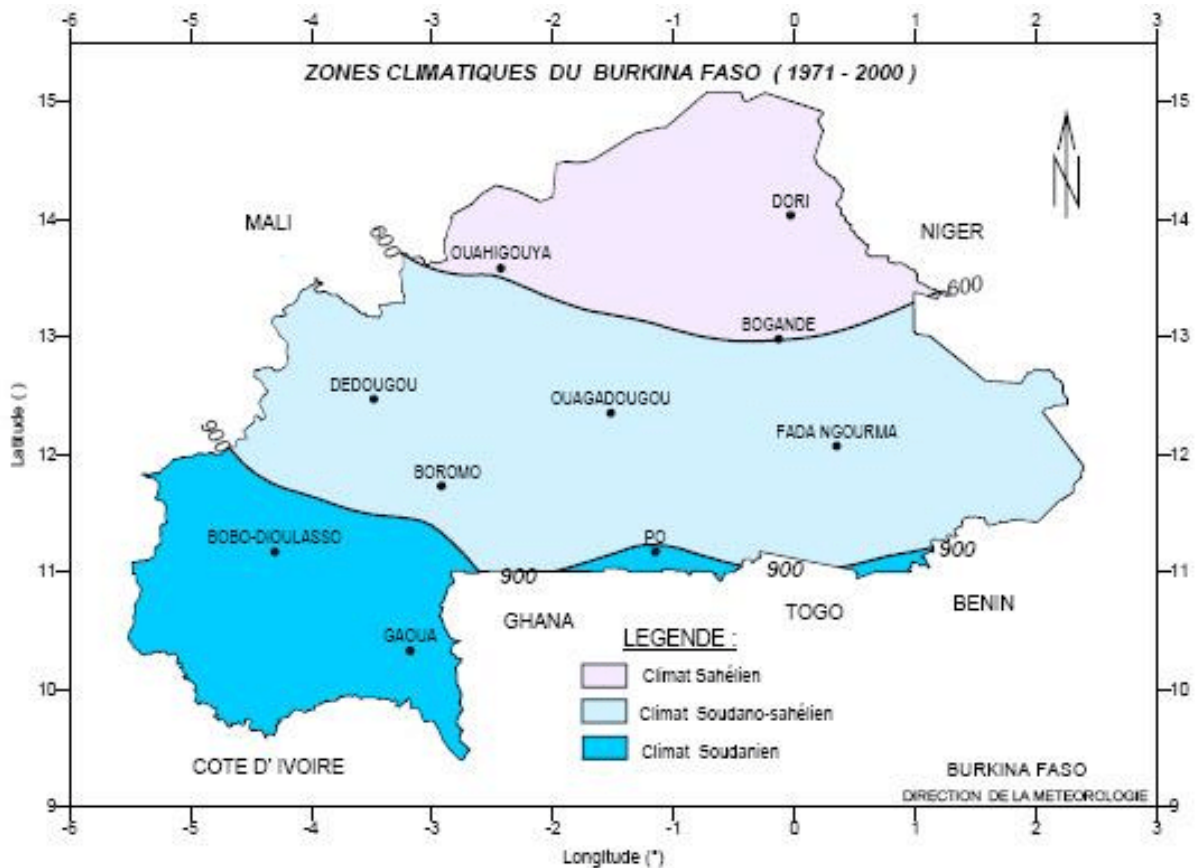
The dominant population group within Fada N’gourma are the Gourma. Indeed, the capital of the Gourma kingdom is the city of Fada N’gourma with the king of the Gourma also residing in Fada N’Gourma. Still, the countrywide dominant population group of the Mossi are also located in the city as well as the Fulani, which is a nomadic ethnic group. As each of these groups has its unique language, most of the residents in the city are trilingual and therefore speak French, Gourmantechba (language of the Gourma) and Morré (language of the Mossi).

As in all urban areas within Burkina Faso, the L’office national de l’eau et de l’assainissement (ONEA) is responsible for the delivery of drinking water services in Fada N’Gourma. ONEA serves the population either through private taps to individual homes or through so-called “borne fontaines”, which are connected to the water system of ONEA. The private taps to homes are only used by a small fraction of the households meaning that the majority of residents in the city use public water sources. In total, eight types of public water point structures exist within the city of Fada N’gourma:

- 1.) Traditional wells, which are dug by hand and have a small diameter;
- 2.) modern wells, which have been constructed using modern construction devices, are surrounded by a concrete structure and are larger in diameter compared to the tradition ones
- 3.) P.M.H. (pompe à motricité humaine), meaning a manually operated pump
- 4.) P.M.E. (pompe à motricité électrifiée), meaning an electrically operated pump
- 5.) P.M.E. solaire, which are the same as usual P.M.E. except that they are fitted with a solar panel
- 6.) open wells which were converted to pumps
- 7.) AEPS (Adduction d’eau Potable Simplifiée), which are small distribution systems

- 8.) standpipes, which are connected to the ONEA water supply system (borne fontaines)

How and when the different water points were constructed is not documented. It is however known, that oftentimes NGOs active in the area established the different water points. Stakeholders recall that especially Swiss Cooperation used to be active in this domain as well as the National Office of Wells & Boreholes, which has been dissolved by now. The actors that created water points oftentimes also formed water point committees, which were delegated with the task of monitoring and maintaining the water points. Water point committees usually have around five members. In addition to this, the EPCD (l'Établissement Public Communal pour le Développement (EPCD) has been tasked by the municipality to be in charge of water provision in Fada N’Gourma. This body regulates water points and was initially created by Swiss Cooperation. Besides the former engagement, the Swiss Cooperation Agency is presently not active in the area. Besides the public authorities, as of September 2017 solely two NGOs are working in Fada N’Gourma: Initiative Eau, which mainly focuses on monitoring water quality and making it available to the public as well as the Barka Foundation, which mainly establishes new water points in rural areas surrounding the town.



8. Unit of analysis & sampling strategy

In the sections before the two main concepts have been identified which relate to different stakeholders. The first concept refers to the perceptions of those stakeholders that are involved in the management of water points (water management perceptions). These are in Fada N’Gourma primarily water point committees. They are delegated with the task to monitoring and maintain water points. As has been stated before, water point committees usually consist of five members. It is assumed that each member of the committee is responsible for a specific task. Therefore, the members of the water points can be considered the unit of analysis, as the perception of each is valuable due to the fact that they fulfil different functions. It has also been argued before that eight different types of public water infrastructures exist. Accordingly, eight water point committees will be selected for the purpose of this study. The sampling procedure to be applied here is that of purposive sampling. In this vein, water point committees are selected on basis of the following criteria 1.) each type of infrastructure is represented; 2.) water points must be located in different sectors of the town. Secondary to the water point committees it has been argued that institutions such as the EPCD (l’Etablissement Public Communal pour le Développement (EPCD) also play a role in the delivery of water services in Fada N’grouma. Also they shall be interviewed to understand their perceptions. As it is difficult to receive a full image of the different actors that are involved in the water governance sector, snowball sampling will help to overcome this problem. This method includes that research participants name other relevant research participants and so forth. This technique is useful in this instance, as only those involved in water monitoring and maintenance can determine which actors could be useful to engage in this study.

The second concept relates to the perceptions of those using a particular water point (water user perception). Their perceptions concerning the distance towards the water point, the functionality of a water point or conflict between them and other users as well as other aspects are being analysed. For this it is necessary to invite those people, which are using the water points. In order to find and select these the members of water point committees will be asked in advance who uses their water points in order to ensure that all different groups using the water point are invited to participate in the study. Generally, it is assumed that those residents living in close proximity to the water point use such water points. As also nomadic people frequent the city of Fada N’gourma as well as travellers on their way to Niger, it could however be the case that not all users of a specific water point live close to the water point. On the whole, this part of the research shall acknowledge that there are “aspects of scarcity that are lived and experienced differently by different people” (Mehta, 2011). Once the different groups using the water points have been identified they shall be invited to participate. It must

be ensured that the selected participants equally represent the different groups using a water point.

9. Data collection

The last sections have established the concepts and indicators as well as reviewed the study location. On basis of this, it is possible to look at the ways that the theoretical framework can be translated into research instruments.

As has been discussed before, participatory mapping has been used before by academics applying political ecology studies (Hohenthal et al ,2016) . The first concept, water management perceptions, mainly deals with perceptions concerning policies, resources or feelings towards politics. As these factors do not have a spatial dimension, mapping cannot be used for this part of the research. Instead, it appears useful to conduct in-depth open-question interviews. An open-question interview provides the room for each research participant to explain their perceptions towards these issues. Accordingly, column F in the operationalization scheme relates to the specific questions, which can be posed for each indicator. After having conducted the first interviews it shall be determined whether it is possible to frame the questions in a survey. For example, if the interviews reveal that most questions are answered using specific answers, it could be possible to form questions and possible answers for a survey. This way more research participants could be reached and data triangulation could be enhanced. Whether this is feasible, however, is not possible to determine at this stage.

Studying the second concept, namely “water governance” can be done through conducting a community mapping exercise. The indicators concerning the distance towards a water point or the obstacles on the way towards a water point can be visualized through a map. Such mapping exercises have been conducted before, as for instance by Hohenthal et al (2016), from which some indicators have been retrieved. Accordingly, community mapping exercises with water users shall be organized. At least two of those exercises shall be conducted, while it is attempted to hold four in total. For reference, this research process is visualized in figure 1. Accordingly, the interviews with water point committees are conducted first, as the information from these interviews determines the participant selection for the mapping exercises. Simultaneously, however, interviews with other management stakeholder such as the EPCD will be conducted.

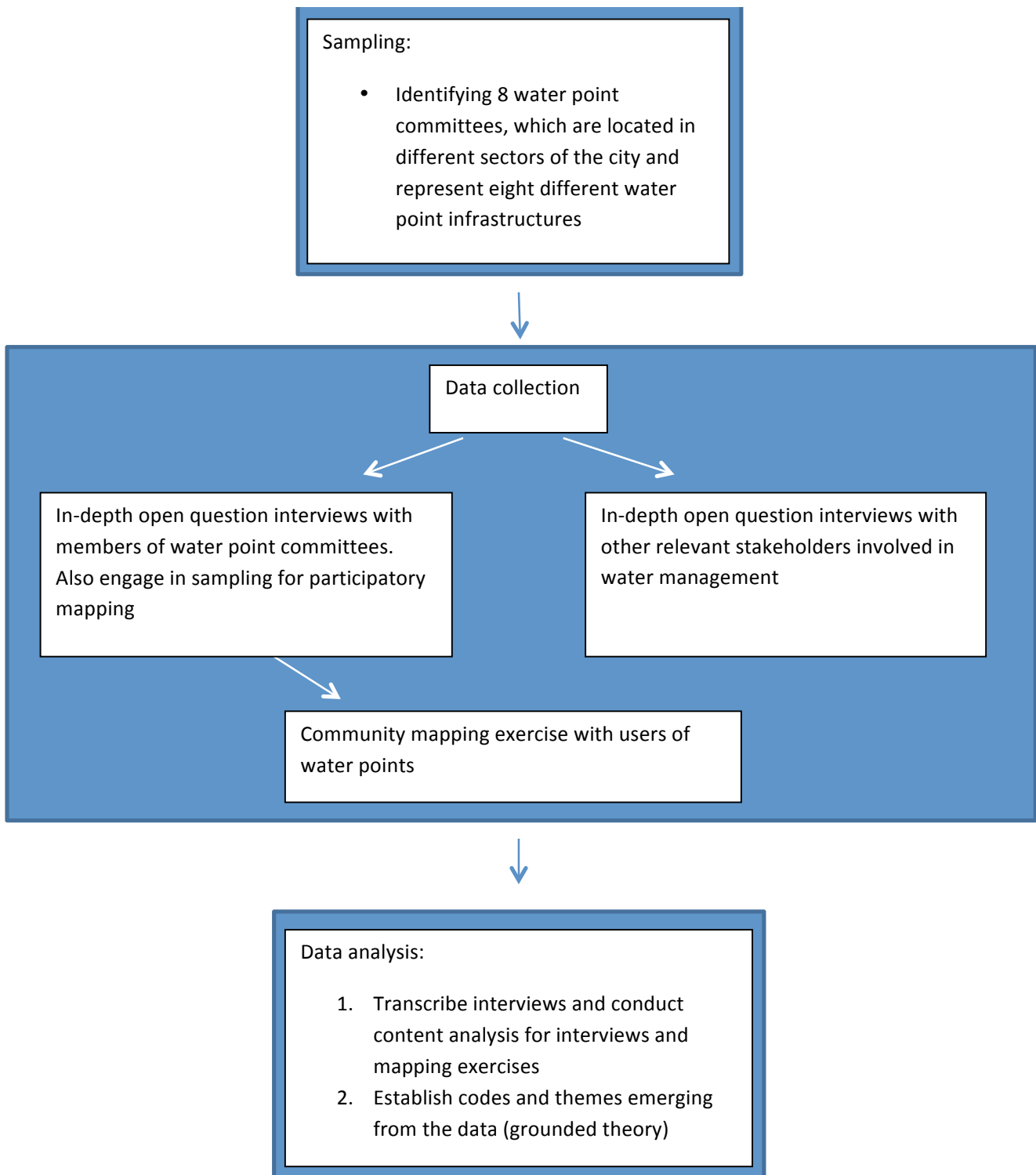


Figure 1

10. Data analysis

Once the data has been collected a content analysis will be conducted. Indeed, content analysis has been used before in the realms of water governance, for instance in the study by Boix Fayos (2002) that examined conflicts about water in Kenya. In this sense, data shall be analysed for emerging codes from the interviews. For instance, when a range of interviewees name similar problematics or opportunities, a code will be created. If several codes refer to a specific topic an overarching theme, which reflects this topic, can be established. It must be stated that not only similar views but also opposing perceptions may create a specific code or theme. Therefore, a grounded theory approach is applied, which stresses an inductive nature of theory generation as laid out by Corbin & Strauss (1990).

The results of the mapping processes are preferably visualized during the exercise. If this proves impossible for an unforeseeable reason, the researcher shall visualize the results afterwards. The results of this exercise will then be compared with those of the interviews. The comparison of the perceptions of water point users and the perceptions of water point managers will reveal whether the views of these groups align or oppose each other. As before, opposing or aligning views will create specific codes that can later be placed in overarching themes emerging from the data.

11. Ethics & Positionality

This section serves the reflection of the researcher, meaning my own background and how this affects the proposed study. Furthermore, the methods applied will be analysed in light of ethical considerations. Especially in the domain of social research, these considerations are crucial, since social research oftentimes aims to obtain personal information of the participant and requires that this information is shared with others (Babbie, 2010).

To start, it must be pointed out that I am a white and male researcher aiming to study the perceptions of people who I am not familiar with within a context that I am not familiar with. These aspects lead to several ethical issues, which I acknowledge and try to approach in a sensible manner. For instance, I aim to study the perceptions of residents accessing water through water points. As I am unfamiliar with the experience of accessing water through a water point, the choice has been made to use participatory methods for this part of the research project. As Bergold & Thomas (2012) explain: "Participatory research methods are geared towards planning and conducting the research process with those people whose life-world and meaningful actions are under study". In this sense, research participants become co-researchers in an endeavour to create a research process beneficial to both parties (Bergold & Thomas, 2012). Next to

empowering the community and making sure that the opinions and perceptions are accurately captured, this technique allows to balance the power hierarchy that may exist between me, the white researcher, and research participants. This technique therefore attempts to compensate for the perceived distance that research participants may experience towards me.

Furthermore, it is important to create a safe space for research participants. In light of this, participants will be explained before any stage of the research process that they may halt or exit the research situation and that their responses will be treated confidentially and can be withdrawn at any point. As Babbie (2010) points out, a researcher may guarantee anonymity, meaning that neither the reader nor the researcher can identify the participant, or confidentiality, meaning that the researcher can identify the participants but not the reader. In the situation of participatory research anonymity is not possible since engagement with participants, and therefore being able to identify them, is required. The same applies to in-depth interviews.

Besides these mechanisms, informed consent shall be applied which shall include the aspects as outlined by Babbie (2010). This can be considered as one technique of ensuring a 'no harm policy'. However, the topic of water scarcity is a critical topic. Although it may not cause direct harm, it may create discomfort since respondents are asked to reveal how they experience a lack of water, which may seem demeaning. Therefore, I will aim to be as sensitive as possible to clearly articulate that this research is not about humiliating individuals but about identifying problems jointly. In addition, the questions and procedures of the research shall be reviewed with a local beforehand in order to ensure that the questions are not posed in a manner that could be considered offensive in a local context.

It must however also be clear, that researching water point monitoring and maintenance may trigger enthusiasm by research participants and hopes that the research may improve the situation. While this is the clear ambition of this research project, it is also important to manage expectations and to clearly outline what the research project attempts to do and what the possible outcomes may be. This will be included in the informed consent form.

In addition to this, one research technique involves the creation of maps. In this vein, one must be mindful of the fact that the process of mapping is an act of power, in which certain aspects are purposefully revealed/hidden through the intentions of the map creator (Kitchin, 2009). Indeed, maps are regarded as revealing the truth and actually "provide selective stories while denying their selectivity" (Kitchin, 2009: 9). This must be borne in mind and the final report shall mention the selective nature of the mapping process and the mapping outcomes. The aim of the mapping process must be to represent the perspectives of research participants accurately.

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