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Supervisor: Ester Barinaga

FROM DEVELOPMENT TO EMPOWERMENT: How a Borehole Gave Agency to The Community

A CASE STUDY OF THE PROJECT WATER FOR ALL IN BOLE, NORTHERN GHANA

Melitka Križman

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Content[1]

[1]On the front page photo (**Picture 1**): Borehole in Kakiasi community and a student at the Tinga primary school. All pictures used are property of the thesis's author.

ABSTRACT

The present study takes a point of departure in Bole, Northern Ghana, where it investigates the socio-technical network and dynamics between the borehole and community and the processes of economic and social change deriving from such association. The question about what things do or can do directs the attention of the research towards an important phenomenon, namely the agency of the network between objects and humans. Conducting qualitative group interviews with a comprehensive list of stakeholders in three communities in Bole, this study found that material objects (i.e. new technology such as a borehole) induced social and economic change due to the success of emancipation embedded in the borehole by the social actors. However, the study also showed that the scope of change varied among the communities and largely depended on the problematization phase. When the human actors perceived the borehole's water as a long-term commodity for resolving some of their broader societal considerations, they were more likely to cooperate and financially contribute to the activities in exchange for water. The implication of the latter for the external interventions in rural parts of Northern Ghana is that when objects are required to sustain society's emancipatory potential, they are more likely to become actors. Hence, if the supply of services does not match the local demands, the private or public investments may become inefficient in prospering the processes of social and economic change. As the present study found, when demand and supply are in equilibrium, the objects are more likely to induce interactions with human actors and the agency of such associations formed between objects and human actors is more likely to result in community empowerment.

1. INTRODUCTION

The purpose of this thesis is to analyse the topics of technology and community empowerment on a case study of the Water For All project (WFA). The study will focus on Bole, Northern Ghana, where it will examine how a borehole as a newly obtained technology formed relationships with the community members living there and how this association is related to achieving social and economic change in Bole.

Specifically, the study will compare and contrast processes of network formation between the borehole and the community, as well as benefits among all key stakeholders in the WFA's three communities in Bole, Northern Ghana with a specific purpose to understand the interplay between the provision of boreholes to the primary schools and the socio-economic change in the communities. These stakeholders include students, teachers and parents, as well as IBIS's[2] local Ghanaian staff and the national educational authority, Ghanaian Education Service[3]. The three communities[4] were selected because they represent the institutions that took part in the WFA project, initiated in Bole in 2011 and funded by the Lauritzen Foundation[5].

The theoretical basis for this work presents The Actor Network Theory (ANT), developed by Michel Callon (1986), John Law (1986), and Bruno Latour (1987). One of their principal ideas, applied in the present thesis, is that no entity is significant in isolation. Instead it attains meaning through its numerous and changeable relations to other entities. These multitudes of relations are called actor-networks and constitute the foundations of the theoretical tradition known as ANT. Hence, ANT focuses on analysing the processes of "how actors define and distribute roles and mobilize or invent others to play these roles" (Law & Callon, 1988, 285).

ANT acknowledges these networks as hybrid, which means that they consist of both material objects and humans. Therefore, ANT's images revolve around the dichotomy between two fundamentally distinct types of elements: culture and nature. Moreover, as

[2]IBIS is a Danish international Non Governmental Organization (NGO), operating among other regions in Africa and in Ghana.
[3]Further referred to as GES.
[4]The initial number of the communities selected for the Water For All project was four, however in one, drinking water was not found within the school distance (i.e. 50 meters) despite few geological research attempts.
[5]Lauritzen Foundation is a parent company of J. Lauritzen A/S, DFDS A/S and LF Investment ApS. The Foundation describes their business model as "a commercial foundation our tasks are divided into two parts: we have to run our businesses and support humanitarian and social projects."
http://www.lauritzenfonden.com/gb/om-fonden.asp#sthash.gE6ws9Wm.dpuf (May 2014)

Latour (1999) argues, the networks are also without any real inside and outside boundary. Hence, these associations, in turn, can be used to describe how some networks can come to be larger and more influential than others, how they come to be more durable through enrolling both social and material actors, but also where power comes from and how it is exerted.

Namely, the networks contain the agency, or ability to act, which can be interpreted as a collective power to produce according to the Latour's work. As opposed to deterministic social theories, which aim to uncover hidden power structures that work over a set of relations, the goal of ANT is to describe the way certain relations are stabilised and made durable and how they induce social or economic change, i.e. empowerment. Therefore, to explain power we need to examine how collective action comes about, how actors come to be associated, and how they work in unison. Furthermore, this combination also helps us understand what binds actors together and identify potential risks for failures in development projects, which forms an important body of knowledge for the corporate or public actors wanting to invest in rural parts of Ghana or other Sub Saharan African[6] rural areas with a similar socio-economic outreach.

The present work differentiates between empowerment and development. My motivation derives from the interpretation of the word development and its practical applications for the local recipients in Africa. Namely, the problem with development is that, in the ontological sense, the term often seems derogatory to Africa because it implies they are *underdeveloped* or as *a society in lacking* in contrast to the *modern West* in terms of economic progress. ANT however deploys a quite radical view by focusing on *what is not* since ANT is focussed on performance (Law 1986, Law 1997, Law and Singleton 2000) and power that is productive in nature (Latour 1986) and *always there*. Moreover, Latour enables object agency by radically disavowing the subject-object dichotomy, claiming that humans have never been modern, and thus we have no business claiming an ontological advantage over non-human entities, nature, objects, or any other realm.

Because of the above-mentioned reasons, I instead refer to the term empowerment as an on-going process of social and economic change with the prerequisite that the individual(s) or society in question exercise their agency or ability to act[7]. Hence, by focusing on community

[6]Sub Saharan Africa is a very general term and refers to all the countries on the mainland continent plus six island nations of Cape Verde, Comoros, Madagascar, Mauritius, Sao Tome and Principe, and Seychelles. It excludes the Northern African countries of Morocco, Algeria, Tunisia, Libya and Egypt, and South Africa. However, the present thesis is of particular interest to the rural parts of the Sub-Saharan Africa of similar economic conditions as Bole in Northern Ghana.

[7]The ability to act is defined as a self-determination, volition, or free will.

empowerment, we are focusing on the ability of a group of people living in a small geographical area like a community, to influence something they want to influence and investigating how they can gain more power in the process to take control of their own economic and social lives.

The first challenge in relation to this thesis, and community empowerment, is whether and how material actants (e.g. objects) can give agency back to the human actors. The most distinctive feature of ANT is its agnosticism as to the nature of actors, which are taken as potentially including non-human entities made up of an agency. As Callon puts it, "agency denotes sociotechnical arrangements when they are considered from the point of view of their capacity to act and to give meaning to action." (Callon in Hardie and MacKenzie 2006, 3) The second challenge, however, is how relationships between objects and humans develop and evolve into something as a process of social and economic change.

Project Water For All acts as an appropriate case to explore these two dimensions because it was designed to provide three communities with a borehole, a technology used to bring water from the ground by pumping. The reasons this project, implemented in the Bole district of Northern Ghana is interesting to look are fourfold. First, Ghana's recent economic growth of 13,5%[8] was one of the highest in the world. However, the majority of capital was distributed among the South, while the North still suffered from severe resource poverty. For instance, this poverty affects primary school provision in terms of lacking sufficient infrastructure, qualified teachers, learning materials, and even basics such as food and water. For an individual, the poverty level transcends as a struggle to acquire one meal per day.

Second, Bole was subjected to external intervention by IBIS, a Danish NGO with an aim to improve access and quality of primary education in the region. Among other activities, IBIS partnered with the WFA project in 2011, with the expectation that it would further increase both. Third, the WFA intervention in Northern Ghana is analyse when considering the synergy between the demand and supply of development projects. The issue here is whether these interventions meet the local needs as defined by the local stakeholders, or whether they supply something that at the present is neither demanded nor necessary.

Lastly, the Bole case was intriguing from a personal point of view because I was involved in all stages of the WFA project as its designer and visited Bole for this and other purposes three times between February 2011 and October 2013. Because the project's model has been described as an innovation and there have not been any similar studies conducted previously

[8] http://www.indexmundi.com/ghana/gdp_real_growth_rate.html (March 2014)

on this subject, I took the opportunity to explore this field, learning more about the processes of social and economic change and community empowerment in this Northern Ghanaian district.

RESEARCH QUESTION, OBJECTIVES OF THE STUDY AND STRUCTURE OF THE THESIS

Studying empowerment and the process of social and economic change, this thesis aims to surmise **how a borehole as a material actor contributes to social and economic change in three communities in the Northern Ghanaian district of Bole.** Searching for these answers, this thesis explores the link between borehole and community as shown in Figure 1 to determine whether the relationships had been established, as well as the outcomes of these network alliances. The main objectives of this study are to explicitly map out the formation of the borehole-community network and its economic and social gains. The contribution at a local level is to map local organizational processes and dynamics, while the wider point of view is to provide real-world data to assist in fulfilling future applications of investments in community empowerment in similarly deprived areas of Africa.

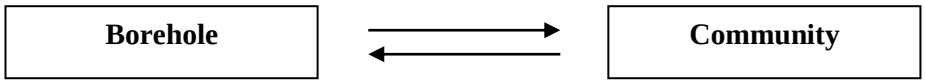

Figure 1: Working Model of Borehole-Community Network

The work begins with introducing Ghana, the Water For All project, and how it was developed followed by the theoretical breakdown of the Actor Network Theory. Next, the methodological section provides details on how the study was conducted and how data was processed by applying grounded theory approach. The final chapters include analyses of each three cases under observation structured according to ANT and concludes with comparison of all cases and the implications of the thesis. By examining the findings, this thesis aims to propose an action framework applicable for corporate or public investments that target the communal development field in hopes of increasing value for themselves and for their ultimate beneficiaries – their recipients.

2. **CONTEXT:** GHANA IN PERSPECTIVE

"We face neither East, nor West, we face forward."
(K. Nkrumah, first president of Ghana, 1957)[9]

Ghana is a tropical country lying on the west coast of Africa with an estimated population of over 25 million[10]. Life expectancy is estimated at 56 years for men and 57 years for women, while the adult literacy rate (age 15 and above) stands at 65%.[11] The government is considered a presidential democracy with a reputation of being one of the best democratic practices[12] across Sub-Saharan Africa.

In 2011[13] Ghana was classified as a middle income country with $3,100[14] GDP per capita[15] and having one of the highest economic growth rates in the world. The big proportion of their economic growth, which in 2011 hit 14, 2%[16], came from the newly started oil industry[17]. Additionally, Ghana has a strong cocoa production industry, being the second largest exporter of cocoa in Sub-Saharan Africa. Ghana also has a small formal capital-intensive gold mining sector and a growing informal mining sector[18].

Since independence in 1957 Ghana has majorly progressed in the attainment and consolidation of economic growth. One of its largest remaining challenges is the inequality between the rich South and the historically unprivileged North. Despite evident economic growth, the Human Development Report (2009) ascertained that Ghana's Human

[9] http://www.academicjournals.org/Ajest/PDF/pdf%202009/Oct/AJEST-%20Editorial%20-%20October.pdf
[10] http://www.worldbank.org/en/country/ghana
[11] http://www.undp-gha.org/site/docs/GhanaGhanaMDGReport-2010.pdf
[12] One of the recent events supporting this claim was the sudden death of the Ghanaian former president John Atta Mills, who died at age 68 in July 2012. Only a few hours after his death, the former vice president of Ghana John Dramani Mahama was affirmed by the parliament as the new president of the country. He became one as written in the Ghanaian constitution, according to which in the case of sudden death of the president, the vice president continues the presidency.
[13] http://www.worldbank.org/en/news/2011/07/18/ghana-looks-to-retool-its-economy-as-it-reaches-middle-income-status
[14] http://www.indexmundi.com/ghana/gdp_per_capita_(ppp).html
[15] Gross Domestic Product (GDP). The estimation is already based on purchasing-power-parity (PPP), which means that it is adjusted for differences in the prices of good and service between countries.
[16] http://www.worldbank.org/en/country/ghana
[17] The first oil field in Ghana was found in 2007, while the oil production there has started in December 2010. However, during the time of my second visit there a second oil field was found in Ghana.
[18] I was introduced to the illegal gold mining Kui community in Bole district during my second visit of Bole in 2012 and revisited it also in October 2013. The community was established in 2008 due to the gold resources found there. The current population living there is estimated to be approximately 10,000 people. The illegal gold mining has various consequences at both local and national levels. On a national level the state does not collect the taxes, while the local people working there have no legal rights, are underpaid, and also exposed to mercury, since it is used on a big scale to separate gold from other stones. The latter will also have devastating long tern consequences for the soil fertility. The community also does not have any primary school since if the government were to build one, this would mean a public affirmation of the community's existence.

Development Index rank had declined and inequality remains high. Thus the high growth rate has not necessarily been consistent with improved human development indicators as the country continues to face challenges with health and other social services. In addition, disparities in regional and district poverty levels remain high.

Bole is a small district in the northern region of Ghana much like other districts in Africa; a mixture of rural and urban settlements. The majority of people's everyday lives revolve around agriculture and trade activities mainly limited to personal consumption or local market trading. What is interesting about this town however, is that is one of the districts in Northern region and thus a concrete presentation under observation of a great inequality within one state and a living case of a severe resource poverty.

A consequence of this inequality is reflected in the distribution of schooling. While net primary school enrolment in 2009 was 77%[19] for the entire country of Ghana, the northern region, being substantially worse economically than the Ghanaian South due to the colonial prohibition of education, had the lowest total enrolment nationally. Equally important, a child's chance of completing primary education is "barely 50% compared to the national average of over 74%."[20]

Another result of this inequality is also the provision of safe water in northern communities. Although Water.org[21] claims that "more than 80 percent of people in Ghana have access to safe water," 7 million of the rural population living in Ghana is lacking access to it[22]. Specifically, half of the population living in the northern region is unable to access safe water and none of the twenty primary schools that IBIS works with in the Bole district had water in their schools prior to 2011.

The government's expenditure, as well as international donors' money spent on improvements in primary education in the northern region, has increased over the last decade because of the adoption of the Millennium Declaration. Namely, at the turn of the century in September 2000, Ghana, along with the other 189 United Nations member countries committed to the Millennium Development Goals (MDGs)[23], setting a goal that by 2015 all children in Ghana will be provided with access to primary education. Moreover, the

[19]http://www.unicef.org/infobycountry/ghana_statistics.html (January 2014)
[20]http://www.equip123.net/EQ_Review/docs/fae-ghana.pdf (January 2014)
[21]http://water.org/country/ghana/ (December 2014)
[22]http://water.org/country/ghana/ (February 2014)
[23]According to the Millennium Development document, the following eight goals are important in order to build a better world: eradicate extreme poverty and hunger, achieve universal primary education, promote gender equality and empower women, reduce child mortality, improve maternal health, combat HIV/AIDS, malaria and other disease, ensure environmental sustainability, and develop a global partnership for development.

Millennium Declaration also promoted global partnerships between developed and developing countries in order to meet two of its ultimate goals: universal primary education and improved sanitation.

Among many such partnerships was formed between IBIS, a Danish international NGO and Ghana Educational Service, the Ghanaian national education authority. The momentum of IBIS's arrival to Northern Ghana not only coincided with the publication of MDGs, but also with the Millennium Declaration's aim to achieve universal primary education. Yet, in harmony with the Declaration's initial sole focus on ensuring all children in Ghana are provided with primary education, IBIS was further concerned that access to schools is not enough – they must also learn something.

2.1 FROM INTERNSHIP WITH IBIS TO WATER FOR ALL PROJECT

"**For industry to settle in a country, you first need electricity;**
for electricity, you need some trained workers;
for trained workers, you need some schools;
for schools you need some money;
for money, you need some economy."
(Evan Davis)[24]

My engagement in Bole began by becoming an IBIS intern during February and May 2011 in IBIS's Bole office. Figure 2 illustrates an intervention model[25] showing what IBIS does in 120 primary schools in Northern Ghana. IBIS's main occupation is training provisions in learner-centered teaching, as well as gender methodology training in relation to two specific parties: Ghanaian Education Service (GES), with whom IBIS partners; and the forty teachers of the twenty programme primary schools in Bole. As Figure 2 shows, IBIS provided most of the activities to primary school teachers indirectly, either through training of the GES staff with the expectation they would transfer newly gained knowledge to primary school teachers, or through training of primary school head teachers and one additional teacher from each programme schools anticipating they would pass on the knowledge to their colleagues.

[24] http://www.brainyquote.com/quotes/authors/e/evan_davis.html (March 2014)
[25] Krizman 2012.

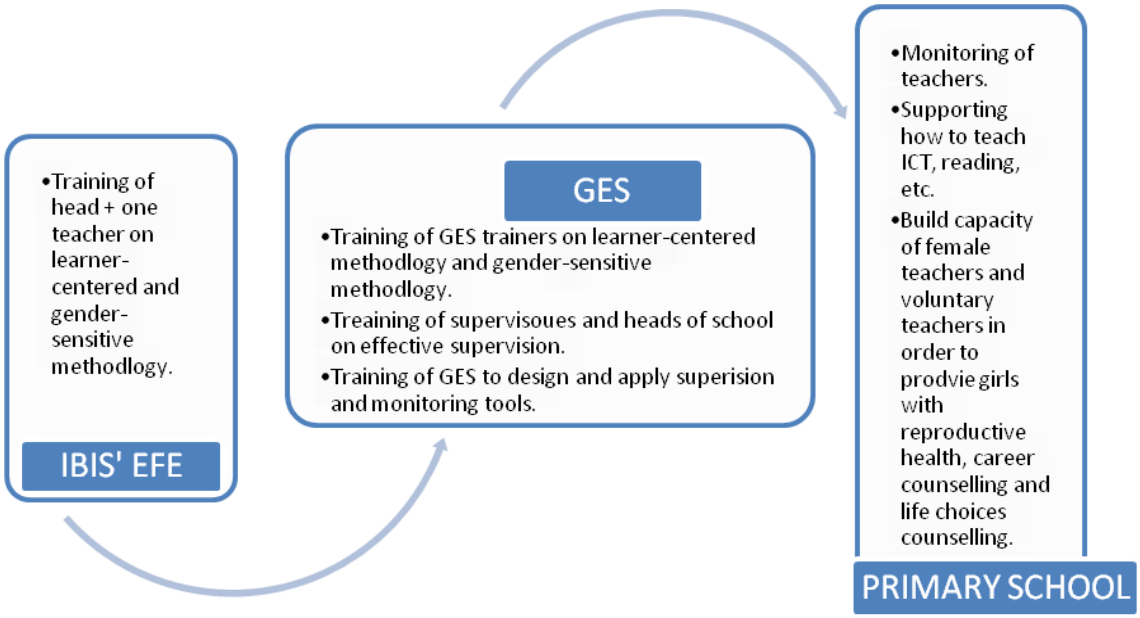

Figure 2: IBIS's intervention model in Northern Ghana

The purpose of my IBIS internship was to monitor and evaluate group interviews with students, teachers and parents on whether IBIS was meeting the objectives in the Bole district. Although IBIS appeared to be an appropriate case study of a developed country's organization doing things the right way, the field engagement highlighted very serious issues. The study revealed, in contradiction to learner-centered and gender-specific skills, that teachers, parents, some of the GES's, and even IBIS's Ghanaian interviewees appeared to demand mainly practical skills such as cooking, building, basketry, carpentry, and especially agriculture in order to improve their schooling. Integration of practical skills in the school curriculum played an outstanding role for local stakeholders since they believed it would lead to economic empowerment of individuals by increasing the rate of return from investments in their primary education, and consequently economic development of the local community.[26]

In summary, low educational output in terms of attending and completing primary school in Bole appeared to be associated crucially with school poverty such as student-teacher ratio, teacher accommodation, school materials like books or computers to teach ICT, and water or feeding programmes. The output did not appear to be associated with the teacher's skills. The provision of water and feeding programmes were found to be remarkably important for

[26]As one of the teachers remarked, "one major and fundamental issue we all need to ask ourselves as Africans is the type of education we want to build for our children and what value system do we want to inculcate in our children as we prepare them towards a competitive world environment. Is it the wholesome Western type of education or an educational system that is built on our cultural values as African while taken inspirations from the Western style of education?"

student performance and attendance, and virtually all sample groups reported negative consequences of not having them. Absence of a feeding programme in school was especially significant because most of the children's families were not able to provide more than one meal per day to their children. Subsequently, some children would be forced to drop out to earn money for food, and teachers reported students falling asleep during lessons[27] or not being able to participate and focus due to low nutrition.

Finishing the internship with IBIS and returning during the charming Danish summer, I continued to be preoccupied with one particular impression from the field engagement: a mismatch between supply and demand in relation to access and quality of primary schooling. Then the Lauritzen foundation[28] presented the following philanthropic proposal:

> *February 22nd we received an unusual and very kind e-mail from you where you thanked us even though we failed to meet your funding needs. That's not something you see every day when working at a foundation! We were very moved by your well-written and inspiring letter describing your internship in Ghana.*
>
> *We want to ask you how much money it would take to fix the water pump in Bole? Would it be possible to direct the application for funding through IBIS? I'm saying this because it's always an advantage applying for funding through a well-known and respected organization contrary to applying as a private person. Sadly that's just the way foundations like ours has to think.*
>
> *If it's possible for you to move forward with this and apply through IBIS then the Lauritzen Foundation would be more than happy to receive your application. The next deadline is July 20 and you can expect an answer in the beginning of September.*
>
> *We would love to hear from you again!*

The email above served as the basis for the Water For All project, while the email below set its framework:

> *Dear all,*
>
> *I will like to suggest that * and Melitka meet as suggested on the 16th June to discuss how Melitka and IBIS do this project together.*
>
> *I would also like to suggest that ** provide some technical and professional inputs regarding the issue of the need for clean drinking water/water pumps in Bole district.*
> *Best wishes*
> *** "

[27]This was also personally observed during my fieldwork in Bole.
[28]Lauritzen foundation was one of the addresses to which I sent an application for the internship grant with IBIS. After they had sent me a rejection letter, I thanked them for their time and energy, attaching one of the letters I wrote to my friends and family and few IBIS's colleagues describing my own struggle with no water situation during my stay in Bole.

As highlighted above, IBIS's requirement in initial stage of the project was to link access and quality of primary education to the provision of water.[29] Opposed to IBIS's specifications, my main primary thought in relation to designing a water project for Bole was *not* how many people will drink water in school today, *but* rather what kind of income generating activity will occur after we leave? With the latter, my aim was to build an income generation model to ensure the schools and their communities would be able to grow beyond provision of a borehole as a source of safe drinking water.

Hence, the Water For All project had two main goals and three key principles. The latter included simplicity, community involvement, and flexibility, while the former involved the provision of safe drinking water and sustainability of the project. The main selection criterion for communities was the absence of safe water, not only in the selected primary schools, but also in the communities where the schools were located. The reasons were first that the project aimed to extend the scope of beneficiaries beyond primary school children to cover the whole community, and second, that the project aimed to ensure its sustainability for communities to perceive water as a source of income for their primary schools through selling it to improve access and quality of their education with provision of the feeding programme, and/or purchase school materials such as books and pencils for the children.[30]

Nevertheless, what remains to be proven is whether the project's stakeholders in Bole benefit from the Water For All project objectives, which were financially supported by the Lauritzen foundation and implemented in 2012, which ideas are shared between WFA project's model and its recipients, and which resisted. What form of power exists, how it operates, and how is divided among actors in a network of object-human associations emerging from the borehole? In order to answer these questions I decided to pursue the case study of the Water For All project in three of the project's communities in Bole, applying Actor Network Theory (ANT) approach to conceptualize and discuss what object as borehole can do in combination with the humans.

[29]In the stages which followed, IBIS's concerns were exclusively accounts related and IBIS required 7.5% of the total budget to cover its administrational costs of the bank transfer. The total amount applied for to cover all the costs and received by the Lauritzen foundation totalled 200.000,00 DKK.

[30]Since a borehole is the most common technology used in rural Africa to provide water, this technology was chosen accordingly. In addition, the borehole was constructed by the Northern Ghanaian company, not only to directly benefit the Ghanaian GDP, but also to use the technology that has already been tested in the field. Secondly, the company had to be within a reasonable distance from Bole in order to assist the communities experiencing any technical difficulties with the borehole. Lastly, this company was to do pre-geological research to test water quality and safety in order for it to be drinkable and thus adding value to the community.

3. THEORETICAL PART: ACTOR NETWORK THEORY AND CONCEPTUALIZATION OF SOCIO-ECONOMIC CHANGE

"Truth and falsehood. Large and small. Agency and structure. Human and non-human. Before and after. Knowledge and power. Context and content. Materiality and sociality. Activity and passivity…all of these divides have been in work undertaken in the name of actor-network theory." *(Law 1999, 3)*

The theoretical part of the thesis contains a breakdown of the Actor Network Theory (ANT), which presents a theoretical framework for understanding agency of material objects referred to as actants and human subjects specified as actors. This will be applied later to map out socio-economic configurations in a series of practical experiences from the Water For All project in Bole, Northern Ghana in relation to socio-economic change or community empowerment. Doing that, the thesis takes a micro perspective on human actors (i.e. community) and material actants (i.e. borehole), addresses links between them from the ANT perspective, and studies the power arising during the network formation and through such associations.

3.1 ACTOR NETWORK THEORY: CONCEPTUALIZATION OF ACTORS AND PROCESS OF TRANSLATION

A fundamental idea that ANT suggests is the premise that various physical entities or things are beings in the world alongside other beings such as humans and should be thus treated with the same importance. Thus, ANT provides a more egalitarian attitude to the way we perceive materiality and culture and binds both in a material-social network where they co-habit. This co-habitation does not imply or reduce everything to the sameness, but rather stresses the idea that these symmetrical associations share the capacity for making "a difference to the world." (Harman 2002, 167) As Latour (1997) summarizes it:

> ANT has been developed by students of science and technology and their claim is that it is utterly impossible to understand what holds the society together without reinjecting in its fabric the facts manufactured by natural and social sciences and the artefacts designed by engineers. (Latour 1997, 3)

Hence, ANT deals with the processes of how things and humans interact and become associated and what (facts) they produce as the result of a series of interactions between them.

The terminology of ANT defines an actor or actant as something that provides impulse to action. To illustrate this, Latour (1992) gives the example of a traffic speed bump. Once the speed bump is designed and put in place, its specific design influences how other actors interpret it. The speed bump has distinct features to achieve an outcome embedded with design: to help make drivers slow down their vehicles. Under this view, both parties, the speed bump as a non-living being and drivers as living, are acting and establishing a relationship defined by a series of intermediaries like ideas, texts, technology, laws, human skills, or, in short –knowledge as Callon (1991) puts it.

However, to form the relationship or network between the speed bump and drivers, actant and actors, the actors must agree that the network is worth building and defending. The network alliance is built based on the specific conceptualization of object (or idea) by one or several actors and accepted by the others. This process, generally referred to as the core concept of ANT is called translation and according to Callon and Latour includes "all the negotiations, intrigues, calculations, acts of persuasion and violence thanks to which an actor or force takes, or causes to be conferred on itself, authority to speak or act on behalf of another actor or force." (Callon and Latour 1981, 279)

The concept of translation, used in ANT research in describing the establishment of actant-actor networks comprises four moments of translation (Callon 1986):

1. **Problematization** or obligatory passage point (OPP) during which actors select and define focal actor (or a group of them) and interests that consist a mutual reason for associations among the subjects themselves and between objects and subjects. However, the selection of the focal actor is not a necessary part of negotiations as (s)he can be self-nominated.
2. **Interessement** is the second moment of translation, which refers to a process of convincing other actors to accept the definition and interests of the focal actor(s). According to this stage of translation, successful networks can be created through enrolment of other actors and the integration of their interests so that they are willing to participate in particular ways of thinking and acting. While the selection of the focal actor and definition of the interests are the most important elements of the OPP, to persuade, convince, or force other actors to accept the problematisation are the key features of the interessement.
3. **Enrolment** as the third moment is the constitution of strategies in which the initiators seek to agree on terms and conditions of how to use the object and allocate roles to other actors.

For this stage to succeed, actors must accept their assigned roles and the terms of use, or the enrolment fails and the process of translation returns to the problematization phase.

4. **Mobilization** is the final moment of translation, where all actors are aligned and play their assigned roles. If successful, this phase completes the process of translation and a network between the material object and human subjects has been established based on a certain conceptualization of the object.

Callon's concept of translation provides valuable insights into the organization of particular social entities such as organizations or communities. Since translation is a social act of negotiation and persuasion, by which a focal actor or group gains support for its specific conceptualization of an object or idea, Latour (1986) claims that conceptualization is affected by (and affects) the values endorsed in the local context. Studying conceptualization and translation as social processes can thus reveal cultural patterns in a specific society. This level of analysis can indicate whether the process of translation is democratic, such as enrolling many and different categories of actors based on age, gender, or other variables. It can also reveal the scope of interests, delving into the degree of how this scope is representative, like including interests of different groups of actors. Additionally, it can evaluate the narrowness of the OPP in terms of the number and nature of the focal actors and the scope of interests and to examine whether the quantity plays any significant role for the overall outcome of the actant-actors network.

Although ANT is egalitarian in its approach to treat non-living and living actors as autonomous and of the same importance for the analysis, the process of translation acknowledges the power relations and power struggles that take place during its various stages and recognizes that some actors may yield more power than others. Yet, its strength is that it does not believe that reality is given and imposed on the actors, but defined by them and subject of change. ANT stresses that the construction of reality is an ongoing, dynamic process that is reproduced by people acting on their interests, values, interpretations or knowledge. The constant interaction between actors with different viewpoints means that conceptualizations of ideas like social change, or objects like new technology, are continuously developed and demolished. A certain definition may become more stable or 'black-boxed' if an actor is able to persuade a wide base of other actors to support its viewpoint and keep the support over time.

Consequently, ANT does not deal or aim to uncover hidden power structures as characterized in other social theories like Marxism. As opposed to macro approaches to social phenomena, its focus of analysis is on the micro level actor who is not determined in his (or

hers) actions by the wider, macro structures. By perceiving social reality in terms of a network between things and humans, ANT features the change that derives from constant interpretation and re-definition of the relationships between both. Hence, ANT is a constructivism at the micro-level, aiming to understand the ways in which individuals and groups participate in the construction of social reality. It alters looking at how social phenomena are created and institutionalized, while proposing that it is inevitable to understand what binds actors together without incorporating the material artefacts as their integrative principle. As Callon (1991) richly suggests, "the telephone creates a common space that integrates just as much as Durkheim's religion or Bourdieu's habitus." (Callon 1991, 157)

3.2 AGENCY

The unique aspect of the ANT is to equate non-living objects with human subjects, hence giving both the ability to act, influence, and change, gained through successfully passing stages of translation and establishing a network of things and humans. As Callon and Caliskan (2005) put it, "agencements denote sociotechnical arrangements when they are considered from the point of view of their capacity to act and to give meaning to action." (Callon and Caliskan 2005, 24) However, neither actants nor actors have a fixed meaning or inherent properties such as agency. Their features are invented, constructed, and materialized during the process of conceptualization and translation.

To devote agency to the objects, just as much as to people, has become one of the biggest controversies of the ANT. For example, Sayes (2014) and Alcadipani and Hassard (2010) refer to the ANT as a controversial social theory because of the role it gives to non-humans, while Söderberg and Netzén (2010) go so far as labeling it anti-human by charging Latour "against sociology." (p. 97) Aware of the critiques, Latour, in his work on Reassembling the Social (2005), admits that the problems arise due to ANT's proposed commonality of things and humans, yet, he insists on the powerful character of the things. As he writes:

> When 'social' begins to mean a type of material, as if the adjective was roughly comparable to other terms like 'wooden', 'steely', 'biological', 'economical', 'mental', 'organizational', or 'linguistic'. At that point, the meaning of the word breaks down since it now designates two entirely different things: first, a movement during a process of assembling; and second, a specific type of ingredient that is supposed to differ from other materials. (Latour 2005, 11)

Due to the above mentioned critiques, it is necessary to specify the limitations of the agency for non-humans as the ANT's phenomenon. The theory does not *intentionality* attribute to non-humans, and its conceptualization of agency for the material object does not suggest that the objects *can* act on their own. ANT locates agency neither in human subjects nor in non-human objects, but in associations (i.e. network) between them. As Latour, in response to the question of "who is pulling the strings, puppets or puppeteers?" replies that, "the puppets do, in addition to their puppeteers." (Latour 2005, 60) Here, interactivity or the stage of constituting the roles and establishing relationships is crucial.

Recalling Latour's example of the traffic speed bump, interactivity in design entails that the design is not a mere object to be contemplated by subjects such as drivers. It is the entity that must realize itself in interaction with the drivers, which happens in the phase of interactivity when the roles of material objects and human subjects are constituted. Thus, the design becomes a traffic speed bump only once the drivers agree to and actually do slow down. Hence, the work of design acquires a kind of actorship by taking over our contribution to it.

Based on Latour's examples, it is hard to accuse ANT of being anti-social, since sociality is the essence of this theory and humans exist everywhere in it. Although Söderberg and Netzén (2010) urge us to maintain our 'commitment to the human,' they overlook that ANT is not anti-human, but rather a neutral theory since it stresses that objects and subjects *can* or *cannot* act and that the agency of material objects such as technology depends on our attributes we give to it. Arguing this, ANT demands humans as it demands objects to form a network with each other. For ANT, society cannot be about only humans because humans are always surrounded by non-human entities. To think in terms of sociology or how and what constitutes society is necessarily to think other than human.

In terms of ANT, society is described as a network of human and non-human entities and the point of the ANT analysis is to shift from a certainty about action to an uncertainty about action. As Yim (2009) summarizes, material objects have three main abilities. First, they mediate interpersonal interaction. Second, they define relationship and context, and third, they affect individual behaviours and actions. ANT can be thus characterized as the sociology of relations used to explore collective sociotechnical processes of how relations between objects and people are formed. Actants enter into networked associations, which in turn define them, name them, and provide them with substance, intention, action and subjectivity. Yet, it is essential to undertake the challenge of exploring further when and why objects acquire agency

and stimulate people to act. Specifically, the dilemma is whether objects have limits in relation to their function and performance, not from technical point of view, but from a social point of view.

3.3 FROM AGENCY TO POWER AND SOCIAL ORDERING

The process of translation with an ultimate goal of defining and distributing the roles among the actants and actors in a network, in theory, simultaneously provides them with agency. Yet, distributing agency is a conditional, local, and variable process. The important outcome of this process is that it implies potential for a transformation. Hence, once actants and actors gain their ability to act, they can use this capacity to create or change social order. As stressed in ANT terms, social order is not given, but rather is constructed, since ANT highlights the dynamic nature of relationships. In reference to social order, ANT is particularly interested in how the socio-technical network is constructed and organized and what determinates the stability or falling apart of the ties among actors in a network.

In this fashion, Latour (1986) differentiates between power in potenia, when nothing happens and power in actu, when power becomes performed. According to him, the real value of power is not related to how much power something or someone has, but to the numbers of actors involved (so the size of the network) in this composition and how much is actually produced. Nevertheless, one of the most important feature of Latour's power is that power is productive in its essence. Similar to Foucault, he takes a more positive stand on power. As Foucault argues:

> We must cease once and for all to describe the effects of power in negative terms: it excludes, it represses, it censors, it abstracts, it masks, it conceals. In fact power produces; it produces reality; it produces domains of objects and rituals of truth. The individual and the knowledge that may be gained of him belong to this production. (Foucault 1995, 194)

Genuinely, ANT demonstrates how the creation and destruction of actor-actant networks is essential for the processes of social change and recreation of social order. ANT focuses particularly on describing how networks emerge in interaction between the actors and materiality and the social change process can then take shape, yet, it is a not a static description of nodes. As Latour (1990) claims, strength does not come "from concentration, purity and unity, but from dissemination, heterogeneity and the careful plaiting of weak ties."

(Latour 1990, 51) Hence, ANT suggests that social ordering has to be studied in action, focusing on the dynamics rather than on the stability of the relationships.

Another important aspect related to the power potential of socio-technical networks is durability, since ANT proposes that durability of a socio-technical networks is enhanced by the installation of objects in a society. The main reason why durability of networks is important is related to the effectiveness and efficiency of the socio-technical networks. Namely, one can conclude that the more durable the networks, the more powerful they become due to increased production. Power thus becomes an outcome of collective action. Therefore, to explain power and trace its geometry, we need to examine how collective action comes about, how actors become associated, and how they work in unison. Within this perspective, the analysis of power becomes the study of associations. By doing this, we can define the power held by individual actors as the power that comes from the actor's ability to align other actors with its interests (Callon 1986), or a collective power specified as power in actu and how much has been actually produced. (Latour 1986) Employing translation, we can analyze both the degree of agency and the power relation.

Nevertheless, one way to look at the process of translation is as a political process. As Glegg (1989) claims, during translation self-interests of actors and the power struggles take place between actors with differing viewpoints before certain conceptualization is established and stabilized. Keeping this conceptualization stable is an ongoing and political process. In this sense, there are always interactions among actors within the network who must keep their alliances and ensure members support their conceptualizations and definitions. Yet, again this power in terms of ANT, should not be seen as forceful or deterministic as Marxists perceive it. As said before, the aim of ANT is not to discover hidden power structures that work over a set of relations, but rather to describe the way certain relationships are stabilised and how certain asymmetries are formed. Power in ANT terms provides freedom to act and freedom to resist. Objects as technology provides impulse, yet it is the actors who decide to act upon or not, and then in coalition interpret the object and use it for the purposes they decide themselves.

3.4 SMALL SCALE – LARGE SCALE

When looking at the social ordering, one can argue that ANT displays an approach to analyze micro networks as opposed to macro theories exploring macro concepts such as

nation state and global economy. Subsequently, another common criticism of ANT is that it is repeatedly focused on the local situation and local causes, and because of this tendency, no general principles can be derived from it. As Nehrlich (2006) furiously states, "How can Latour even claim to be scientific if there are no general principles?" Yet, ANT has a flat ontology, meaning that both the micro and macro are observed in the same way since it perceives reality as flat, underling there is no real bottom or top. According to Callon (1991), macro entities can simply be defined as a sum of the micro ones, but to differentiate between what is the bottom and the top of society is replaced by the notion of network and its scale. Moreover, Latour responds to Nehrlich in relation to the validity of ANT:

> Can we obtain some sort of universal agreement? Of course we can! *Provided* you find a way to hook up your local instrument to one of the many metrological chains whose material network can be fully described… No discontinuity allowed, which is just what ANT needs for tracing social topography. Ours is the social theory that has taken metrology as the paramount example of what it is to expand locally everywhere. (Latour 2005, 228)

Based on Latour's quote, it is possible to conclude that ANT's network notion deploys a deeply different social theory: it has no *a priori* order of relations and makes no real distinction whether a specific locus is micro or macro. ANT introduces the notion of networks to follow the transformation of poorly connected elements into highly connected ones and back. Hence, a network notion is appealingly suited to follow the change of scales and to examine whether a network between elements A and B, once successfully established, influences any entity larger than itself. The type and number of connections, the scale, is left to the actors themselves.

The issue of a model looking at large power structures is that an individual is often perceived with little or no power or agency to act, hence being determinated by them. Although a question of small-large scale is no doubt an important one, Latour's (1999) response is that a network is all boundary without any real inside and outside boundary. The only question we can ask is whether or not a connection is established between the independent actants and actors, and whether a local socio-technical network influences any larger entity than itself. Hence, ANT's networks can grow or shrink as other actors join or depart from them. Instead of needing to choose between the micro and macro view, the notion of network enables us to think of a macro entity as a highly connected one, but which remains continuously micro in action.

3.5 CONCEPTUALIZATION OF SOCIAL AND ECONOMIC CHANGE

There have not been many studies conducted on the topic of boreholes in relation to social and economic change, but De Laet and Mol (2000) provide a rare case of such work on The Zimbabwe Bush Pump.[31] They argue that the pump (i.e. borehole) "doesn't simply serve communities, helping to hold them together. It promotes something else as well. As it helps to distribute clean water, it also builds the nation." (p. 235) By focusing on the participation, examining which types and how many community members were associated in a borehole-community network, De Laet and Mol (2000) show how technology can have considerable effects on society by changing it. Moreover, they illustrate how micro networks can grow, increase political participation, and make a larger number of people be included in public decision-making processes.

Based on the above example, we propose that objects like borehole can shape and influence how a community is organized. As they have transformative abilities in relation to the social order, they can change the economy as well. If actors define objects as having economic value, the objects can affect patterns of consumption, the distribution of incomes and wealth, the way in which people behave (both in terms of purchase decision and the way in which they choose to spend their income), and improve the overall quality of life. Hence, this level of analysis addresses the connection between borehole and community issues like social development and poverty reduction by adopting ANT's perspective that all elements in a given situation are equally important, the non-living actants and living actors, when considering social or economic change. Hence, the definition of a network can be extended to the point that it is constructed in response to challenges arising in debates on how actors define and use certain technologies to improve the quality of their social and economic life.

Furthermore, social and economic change can be seen as another network analogy since it can be defined as a space of interaction where actants and actors perform on two scales: the establishment of sociotechnical network and the organization of everyday life. Similarly to defining the objects; to resolve certain problem, certain actors must first select and define them, propose solutions, gain support, and distribute the roles among the community members to pursue the negotiated common goals. Hence, social and economic change can be treated as socially constructed area of public life where actors negotiate, evaluate and

[31]Besides De Laet and Mol's (2000) research in the field, I was not able to find any other examples that would examine this topic undertaking ANT perspective.

(re)define gender roles, economic or education system, or even communal political organization .

From the ANT point of view, material objects such as technology can add substantial social and economic value to a society in principle. Lacking intentionality, they alone have no value if not successfully connected into socio-technical networks through the process of translation. The real social or economic value of technology can thus be traced not only by looking at how much has been actually produced with new technology, but also how stable and durable the socio-technical association has been formed. Hence, the ultimate outcomes of studying socio-technical associations in this thesis aims to understand first, how actants and actors gain through the socio-technical integration their agency. Second, how social processes are set up to defend a specific goal such as community revitalization. And third, to trough light on the ways actor distribute the roles among themselves, how they establish partnerships to defend their consolidated goals, and what challenges they face during the process.

3.6 FINAL REMARKS ON ACTOR NETWORK THEORY

Although not typically applied in the field of development studies of examining external interventions in 'developing' countries like Ghana, ANT presents a vivid approach to look at the process of community empowerment or social and economic change induced by technology and achieved by successfully passing moments of translation to form a socio-technical network. The great economy of thinking, allowed by the notion of networks, is that ANT enable us to focus on a single socio-technical network. It allows us to look at how actors in a community, understood here as a geographical category of smaller amounts of people living in the same place, form relationship with the objects, and how this alliance, in turn affects the community's social or economic ordering. Nonetheless, as ANT teaches that socio-technical associations are dynamic and changeable, they can be also expanding, which implies that targeting a community may mean just as well mean targeting a state.

Most eminently, ANT provides a novel view of looking at the power of local rural communities in Northern Ghana by arguing that power in potentia is always there, the only question is how much of it transforms to power in actu and to what degree. According to ANT, local actors have power to make decisions, set local agendas and influence the course of events. Of particular interest for this thesis is the question of whether the borehole can increase people's agency and lead to their empowerment. To validate the agency and power of

networks, the ANT perspective considers the interaction among actors and things as a whole. Networks are thus based on and framed by non-human objects, material innovations, scientific knowledge and technology, as well as subjective perceptions and opinions of the community members, attitudes, economic models, cultural patters, informal institutions and local know-how. To evaluate the power of network, ANT suggests to study these dimensions in interaction and how much of their power in potentia realizes in power in actu.

Lastly, looking from epistemological perspective, ANT can be compared to the grounded theory, a methodological approach presented in the next section, and used to precede the case study of the Water For All project since it does not wish to add social networks to social theory, but to rebuild social theory out of networks. Due to the latter, one could argue that ANT is really a method. Yet, ANT works in reverse compared to many other approaches. Instead of starting from universal laws, social or natural, it starts from unconnected localities, which then sometimes end into larger connections. For the ANT, universality is not the rule but the exception. Subsequently, ANT does not exclude the possibility of universality, but shares distrust for such vague and all encompassing sociological terms and rather aims at describing the fractions and their nature as a constitute part of the whole society. Analyzing socio-technical networks add information on the relations of humans in a social and material world and these studies, no matter how largely criticized, concern themselves with the social relations of individual human actors, their frequency, distribution, durability and capacity.

4. METHODOLOGY: GROUNDED THEORY APPROACH TO DATA PROCESSING AND ANALYSIS

"What you do (to provide better aid is) you shut up. You never arrive in a community with any ideas." *(Ernesto Sirolli)*[32]

This field study took place in October 2013 in three communities in the Bole district taking a grounded theory approach, an inductive qualitative methodology. In contrast to a deductive way of thinking, when we make assertions upon already existing theory, the aim of a grounded theory approach is to generate new theory that is grounded in the data and then to present the processes occurring in the field of study (Glaser 2005). The choice for this qualitative research method however, was determined by the research question and the nature of the phenomena studied. Qualitative studies aim to provide illumination and understanding of complex societal issues and are most useful for answering "why?" and "how?" research questions. Subsequently, the qualitative grounded theory approach was applied to surmise *how* a borehole becomes part of the community, *why* a community participates in giving agency to the borehole and *how*, the agent is, in reverse, giving back to the community. This approach thus offers a deeper and broader explanation of the borehole-community network as an embedded phenomenon.

Moreover, qualitative research captures the construction of natural and social world from the lens of local participant. As Liberman (in Ezzy 2002) claims, "the craft of a qualitative sociologist consists not of an objective methodology, but of hermeneutic practices that permit the researcher to understand the indigenous world close to the way that it appears to the people themselves." (Liberman in Ezzy 2002, 12) Since meaning, action, and interaction are central to a grounded theory research objective, which gives a conceptual account of how the participants resolve their main concerns, this approach complements the case study objectives well.

Grounded theory is an approach that allows the researcher to "develop a theoretical account of the general features of the topic while simultaneously grounding the account in empirical observations of data." (Martin & Turner 1986, 141) Reflecting on these tenets, Urquhart (2001) emphasizes two key steps of grounded theory, the first, that the researcher

[32] http://www.ted.com/speakers/ernesto_sirolli.html (January 2014)

has to set aside theoretical ideas and second, that the concepts are developed through constant comparison.

Based on the first of Urquhart's (2011) steps, theory, concepts, categories and themes were identified and developed throughout the research project in Bole. In consonance with the second step, however, the comparative method of these three case communities (Kakisi, Bale and Tinga) and their adaptation of the Water For All project provided some diversity and aimed to observe underlying uniformities. According to Glaser and Strauss (1967), founders of the grounded theory approach, this comparison facilitates the generation of "theories of process, sequence, and change pertaining to organizations, positions, and social interaction that correspond closely to the data since the constant comparison forces the analyst to consider much diversity in the data." (p. 113-114) Yet, once the process between borehole and community was modelled and patterns identified, the role of the current literature became very important to acquire sensitivity and knowledge on grounded concepts as socio-technical networks between the objects and humans.

The selection of a grounded theory approach was also supported by Glaser's (1987) argument that grounded theory, as a method, fits well with case studies. Moreover, Eisenhardt (1989) asserts that using case data to build grounded theory has three major strengths in relation to the validity of the research:

1. Theory building from case studies is likely to produce novel theory because "creative insight often arises from juxtaposition of contradictory or paradoxical evidence." (Eisenhardt 1989, 546) Furthermore, the process of reconciling these accounts using the constant comparative method forces the analyst to use a new, reconstructed thinking, producing theory "with less researcher bias than theory built from incremental studies or armchair, axiomatic deduction." (p. 546)
2. Due to the close connection between theory and data, it is likely that the theory can be further tested and expanded by subsequent studies of the constructs "that can be testable, readily measured and hypotheses that can be proven false." (p. 547)
3. The "resultant theory is likely to be empirically valid" (p. 547) because of the level of implicit validation performed by constantly comparing and questioning the data from the start of the process. As she concludes, this "often produces theory which closely mirrors reality." (p. 547)

4.1 DATA GATHERING: GROUP INTERVIEWS

Group interviews were the primary technique to collect data for this project. In contrast to tightly structured questionnaires producing quantitative data, where participants are commonly provided with multiple choice answers to illustrate their experience, qualitative group interviews contain questions that are much more open-ended. Since the ultimate objective of this study was to understand how a borehole forms associations with the community and vice versa, and how these associations affect social and economic outreach of community, the semi-structured questionnaire was built upon three main dimensions in order to explore the relationships between the borehole and community.

First, the direct economic impact of the borehole was measured by posing an open-ended question aimed at discovering how much money had actually been generated; how was the money generated to identify various models and the most effective one; and, lastly, how was the money governed and allocated[33]? The topic was supported by discussions about the main obstacles the community was facing regarding the Water For All project's income generating activities.

The indirect, social impacts of the borehole were examined in a similar manner, discussing water as a newly obtained natural resource (commodity) and its impact on the community organization. Giving special attention to the gender, the attendees were asked to evaluate how females and males interact in the distribution of water, how they organize its delivery, and how they make decisions of water and the income that was generated.

Last, engagement in the community was studied by inquiries about the ways different sample groups interact with each other, and the degree of their involvement in the Water For All project. Additionally, the topic also included more specific questions of how the local community perceived water as a material mean and natural resource, how to govern and preserve it, and how to form and enforce social arrangements for the common property to not be misused.

In addition to group interviews with samples of parents, teachers and students, individual interviews with IBIS and GES were also obtained as another method of data collection. All interviews were recorded anonymously with a tape recorder and their duration varied. The longest interviews were with the parent groups, all three lasting approximately three hours each, while all other interviews lasted approximately one hour each. All interviews, except

[33]Who collects the money and how is it done, where is it kept, who decides where to invest it, where has it been invested so far?

with the teachers, IBIS, and GES were accompanied by a translator. Entering the field included informing the potential participants in each community about my research intentions, gaining their approval, and negotiating the date and time for group interviews. After entering the field, however, access was unrestricted, and three days were spent in each of the case communities.

4.2 SAMPLING

The process of sampling is a fundamental issue of debate between qualitative and quantitative approaches to studying social phenomena. While the most common approach within quantitative discourse is to use random, or probabilistic sampling, studying such a sample is usually not an effective way of developing an understanding of complex issues related to the organization of the society. Nevertheless, there are also practical reasons, in addition to these theoretical grounds, that make studying social phenomena through random samplings in communities like Bole difficult, less valid and unreliable. For a truely random sample, the characteristics under study of the whole population should be known, yet, this is rarely possible in societies such as Bole since there is no existing population census that would capture such information.

However, since the aim of this qualitative research was to gain an indepth understanding of the process for a borehole and community to establish, maintain, or resist actant-actor network, the sample included representatives of all stakeholders of the project. Segments of the whole community were purposely chosen for a sample to be representative; hence the sampling strategy was maximum variation sampling. With this strategy, in each of the Water For All communities, three groups of participants in group interviews were selected in addition to IBIS[34] and GES in Bole to discover central themes, core elements, and/or shared dimensions that cut across a diverse sample while at the same time offering the opportunity to document unique or diverse variations:

- teachers,
- students, and
- their parents.

[34]IBIS's sample included IBIS's Ghanaian staff implementing IBIS's primary education strategy in Northern Ghana. All interviewees were male because during the time of the field work, IBIS did not have any female programme staff.

The size of each group varied, except for the students. The student group always had eight participants, of which, five were females and three were males.[35] The teacher group included all the teachers present on the actual day of interview, which was three in Tinga, four in Kakiasi and five in Bale, whereas the parent group ranged from eighty to one hundred participants[36]. The parent sample group was large in numbers, similar to those in a quantitative study, although it was not a requirement. However, this adds credibility to a sample. Nevertheless, all participants in the research were largely selected based on a snowballing sampling method.

In practice, this meant that each group was asked to nominate the actual interviewees who they believed possess specific experiences in relation to the Water For All project. The head teachers in each school were asked to invite upper class students (from primary class four to six)[37] to nominate three boys and five girls among them to participate in a group interview. The reason for upper class students only was that students from primary class three or lower rarely spoke English, since the first three primary classes are taught in one of various local languages in the region[38].

The head teachers in each school were then asked to discuss this matter with their teachers and nominate their representatives. The size of the teacher group varied from school to school, yet in all the schools, all of the teachers present on the day of the actual interview participated. The size of the groups varied between schools for two reasons. First, many schools were suffering from understaffing, and second, not all of the teachers came to school on a regular basis and were present at the day of the actual interview.

The selection procedure for the parent group was through an announcement by the teachers on my arrival a day, in addition to inviting the chief to nominate community members to participate in group interviews. Since each community has its own representatives as chief, upon my arrival, the research protocol included meeting him[39] and requesting the key community members related to the WFA project to participate on a voluntary basis in the field research.

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[35]The reason for this is explained in the next chapter.
[36]The local estimate (IBIS Bole office) is that each community has around 1000 members.
[37]To classify primary education children by age, as often done in Western countries, would not be appropriate in cases like Bole because children of very different ages go to primary school. For example, one can find in primary class four, children of ages ten or fifteen, since enrollment age varies substantially.
[38]More than 100 languages and dialects are spoken in Ghana deriving from a vast array of tribal areas. In view of these linguistic and associated cultural differences, and, as a result of the country's colonial past, English has become Ghana's official language. Bole's largest and most historical group is Gonja, There is also Dagaare, which is spoken in the surrounding villages, plus other minor languages found elsewhere in the district, including Mo, Pantra, Lobbi.
[39]The chiefs, as a traditional type of authority in Northern Ghana, are always male.

4.3 METHODOLOGICAL CHALLENGES AND LIMITATIONS OF CASE STUDY OF THE WATER FOR ALL PROJECT

As a researcher, I played a role as IBIS's intern for the period between February and May 2011 and designed the Water For All project. While this position provided some unusual opportunities for data collection, issue of objectivity and validity could be major concerns and are the key challenges to conducting any rigorous qualitative research. However, the most complex challenge relating to this study's objectivity concerned my status as foreigner, and – as some of my Ghanaian male colleagues pointed out –a young, unmarried woman, speaking English. The main item that threatened the data gathering process was the cultural gap[40] between "me" and "them," which needed to be smaller.

Specifically, Wedgwood and Hammett (2005) in their work entitled *Methodological Challenges of Research in Africa* claim that research in and on the African continent "continues to experience a strong Northern influence," which leads "to a spatial disconnection between students' 'home' and 'field' locations; between Northern offices and Southern localities. This can isolate the student from the reality and experiences of the system and environment which they are studying." (p. 4)

To lessen the gap, Blumer (1986) and Ezzy (2002) suggest a greater level of researcher involvement so that the researcher inspires trust. Because of this, I consider my internship position as an advantage because I was able to live and be present in the research environment for a longer period, be involved in people's everyday life in Bole district, and be exposed to living under similar conditions as everyone else there. This ethnographic approach created a space of mutual interests and conversations, and could then increase the level of trust. Additionally, I noted a significant difference between every next fieldwork throughout the period of three years in line with Blumer's and Ezzy's arguments.

For example, my initial presence in the communities would typically cause significant attention among the people living there. When I would enter the primary school, the students would react enthusiastically, trying to talk to me, touch me, establish a close contact, and usually 'run all over.' By contrast, during my visit in October 2013, the children seemed to be less interested in me as a foreigner and referred to me as "hi, Madame, welcome back" without paying notable further attention. Similar instances were also documented during the

[40]A cultural gap is a systematic difference between two cultures including the values, behaviour, education, and customs of the respective cultures. It can relate to religion, ethnicity, age, social class, or gender.

community walks accompanied by the translator. When visiting households in October 2013, people would invite me into their homes, which had never occurred before. Moreover, they were more willing to talk about topics such as estimates of numbers for their economy, previously not discussed since they would only respond to this question by being "poor."

The distinction here was not only the richness, but also the validity of data or how congruent the findings are to reality. However, the latter issue is two-dimensional because it considers the field-workers, and how they translate the world they examine into comprehensible unity and the participants. As Grudens-Schuck & Larson (2004) argue, participants in qualitative research are allowed to say or do anything they would like, the only question that remains is to what extent they really do that.[41] Additionally, Noelle-Neumann (1974), author of the spiral of silence theory, argues that individuals always fear the possibility of social exclusion or isolation in qualitative group interviews. "It is human's tendency to be accepted and to please. To do that the individual carefully observes which opinions and values are dominating in his or hers society and then acts according to them," she writes. (Noelle-Neumann 1974, 45)

To resolve this fear, the decision to form an uneven ratio between the boys and the girls was made. When testing the questionnaire, the student group consisted of an equal number of both genders, but the result was that the boys were the only ones answering questions. In the best outcome, the girls only responded by smiling. The result of my sample groups having a higher ratio of girls to boys was that the girls' response rate increased, hence this being the reason why each of the students' group always included three boys with the five girls.

Furthermore, validity was enhanced through the development of interview protocols and the discussion of the data collection instrument's specifications with my former Ghanaian colleague in Bole. These protocols also included making contacts and discussing plans with the schools' head teachers and community representatives as chiefs in relation to the most appropriate time and place of the actual interview in addition to informing about the field research goals, consent and confidentiality. Importantly, the data collection protocol was flexible and allowed for changes in data collection plans to fit in the schools' and communities' everyday life.

[41]To illustrate with an example from the group interviews, a participant may confirm another participant's view by saying: "I agree!" The researcher must not assume that one's affirmation of the other's thinking is automatically one's final opinion on the matter. It can just as well be that his or hers affirmation is rather a consequence of the group pressure and tendencies to belong and not to be excluded from the group.

For example, the head teachers and chiefs requested the parent group interviews to take place in the morning, at 8 am because people would usually go to their farms after. Moreover, the date of the interview had to be adjusted to market days because each community has one day per week when people would sell or buy goods. This day was most often on Friday, however this can vary among the communities. The research plan also had to consider religious days and prayer times[42]. If the interview protocol failed to meet these everyday organization of the social life in Bole, this would not only affect the parent sample representativeness, but also the validity and richness of the data obtained.

The interview protocol also included a language problem because the majority of parents did not speak English, but rather the local language. To overcome this challenge, there was always an accompanying translator during the interviews with the parents or during my visits of their communities and homes. In every case, the translator was one of the teachers, always self-nominated and male[43], and the validity and completeness of the interviews aimed to be enhanced through tape recording of all interviews. Even with high quality translations, an issue of conceptual equivalence can remain when a word in one language and cultural context carries meanings and inferences that are not captured by the equivalent word from another language. However, as Wedgwood and Hammett (2005) suggest, language as an objectivity barrier can be decreased "when research involves researcher's familiarisation with a very different culture." (p. 6) Subsequently, I considered my previous presence in Bole as a further advantage.

The last, but very important, methodological challenge that needed special attention was the generalizability of the research findings and the ability to make a representative statement about certain phenomena, in additional to applicability once done. As Zainal (2007) points out, case studies are about exploration and investigation of contemporary real-life phenomenon through detailed contextual analysis of a limited number of events, individuals and their relationships as the subjects of study within a small geographical area. Hence, the issues are properties of reality, doubleness of research findings, and application of newly gained knowledge to wider body of knowledge on the certain social phenomenon.

These questions take a point of departure between science and the study of humans and society. In science the body of knowledge is deep-rooted in an object, whereas in qualitative studies, humans and society as the body of knowledge is deep-rooted in a subject. A subject is changeable and connected to the real world in relation to *a context* (Liberman in Ezzy 2002,

[42]The majority of the population in studied communities practice Islam.
[43]To note, it was not my requirement to be so.

Flyvbjerg 2001, 2004). As Flyvbjerg (2004) argues, "In the study of human affairs, there appears to exist only context-dependent knowledge." (p. 421) According to these perspectives, a case study method allowed the gathering of rich data on the development of borehole-community relationship in Bole and the understanding of "the indigenous world close to the way that it appears to the people themselves." (Liberman in Ezzy 2002, 12) Second, the findings can be used for future applications in different geographical locations in Africa with similar socio-cultural context.

Since objectivity is an ultimate goal of any research, I had an obligation to control the risks of not achieving it and I believe that my prolonged presence in Bole, and increased collaboration through participatory action research aiming to establish a sense of familiarity and inspire trust, positively correlated with it. Yet, as a final point of being aware that one can both see and not see what is. As Strathern relates, "you will register the colour, texture, know it is a shell, might have to be told the vase is made of bark, just as one might interpret the contours of an ultrasound scan or the colours of a costume or figures on a graph. But can all really offer a total understanding and complete understanding?"[44]

[44]http://www.qualitative-research.net/index.php/fqs/article/view/374/815 (March 2014)

5. THE CASES AND THEIR CONTENTS

The chapters on the empirical results of the Water For All (WFA) project in Kakiasi, Bale, and Tinga explore the modes of organization for borehole-community networks. They trace the process of translation in each of them to initially identify the focal actor(s) and their characteristic. Second, they establish an analytical model of how and what type of facts were produced through establishment of the borehole-community associations. Third, they classify success criteria and risks in relation to the durability of socio-technical association between actant (borehole) and actors (community members). Based on topics that emerged during the interactions between the borehole and people, the empirical data is used to create an analytical framework of social (gender and social inclusion) and economic (income generation and future investment) dimensions. Besides conducting group interviews with a comprehensive list of stakeholders in each community, the results section also includes interviews with IBIS's and GES's representatives to further understand the project with a special focus on the small-large scale magnitude.

Picture 2: Photo of a wall in Kakiasi primary sample school.

5.1 KAKIASI COMMUNITY

Kakiasi is a rural community of approximately 800 members geographically located next to the main road between Northern and Southern Ghana. The main occupation and source of income for people living there is presently small-scale agriculture. Although it is difficult to accurately measure income in rural communities due to the informal nature of their markets, most households in Kakiasi are estimated to earn between 100 and 300 GHS (300 and 900 DKK) per year.

5.1.1 DEFINING ACTANT AND ACTORS: BOREHOLE, COMMUNITY MEMBERS AND THEIR ROLES

At the beginning of the new school year in September 2012, the existing Parent Teacher Association (PTA)[45] in Kakiasi organized a meeting for all the parents of primary school students in Kakiasi, where they aimed to define objectives and terms of use for the borehole. As the parent sample group phrased it, they wanted to work *"in coalition"*[46]. The established overall role of the borehole corresponded exclusively with the object's ability to provide clean water, supported by the argument, as one of the participants in parents group interview phrased it, that a *"Community where there is no water, that community cannot survive. There cannot be human beings, because if you don't have water, how you survive?"* Hence, the Kakiasi community successfully began the translation process caused by the borehole with the problematization phase, during which the actors, in consensus, attributed a specific function to the borehole and constructed its role.

During this event, the parents also defined and established roles among themselves and set the terms of use for the borehole by deciding how much each household would contribute for repair costs for the borehole if it were to break. To collect those fees, the community formed a focal group called *"The Water Community Group,"* which consisted of three women and one man. To select the focal actors group, the human actors behaved strategically in order to optimize group performance. As they explained the process, every community member had a

[45]Parents-Teachers Association (PTA) is the association of parents or guardians in primary schools in Northern Ghana who have their children in a particular school. The organization has its chairman and treasury (i.e. secretary) who are elected by the members. The memberships is free to join and every teacher or parent can become a member. The objectives of this association is to foster unity between parents and the teachers in identifying and discussing peculiar problems of the schools as they arise and finding solutions to the problems.

[46]All the quotes obtained during the interviews and used in this thesis are in italic to differentiate them from the quotes referring to the scholars.

right to nominate a person to become part of this group, yet proposed members needed to have one particular quality: they needed to be active in their previous engagements in Kakiasi. When forming the network, the community relied on their knowledge and skills to a high degree, which is a common characteristic of network formation according to Callon. As the parent group stated: *"Those that they can actually do the work for the community and were active in community before."*

The Water Community Group had two main roles: to inform other community members, who were not present, about decisions at the meeting in September and to collect money from the community. Income obtained from the collection of borehole fees was kept with the only male member of the Water Community Group, who was appointed as its secretary. In addition, as the parent sample group explained, Water Community Group had a responsibility to share information about the borehole's financial outcomes to a larger network, which included all the parents and teachers. Hence, the Kakiasi community did not only display a high degree of collaboration in defining borehole-community network, but also a high level of transparency on financial matters and collective decision-making.

5.1.2 ECONOMIC IMPACTS OF THE BOREHOLE

The economic impacts of the Kakiaski borehole can be divided into two main benefits: short-term direct financial revenue and indirect short- and long-term improvement in the quality and access to primary education in community. Referring to the former, the community collected 65 GHS[47], but the contribution varied by gender. Specifically, women contributed 1 GHS while men 2 GHS because, *"women do not have work. If we would say that women should contribute equal to men then we would put more burden on woman then"* as a male participant in the parent group interview clarified.

However, although Kakiasi successfully passed the problematization and interessement phases by defining a borehole and the terms of its use was collective, which alerted the enrollment and mobilization phases, it was found that the network progressed shortly. The community members participating in the research reported facing a challenge in terms of agreed contribution since *"not all of them paid."* As the parent sample group explained, the reasons for refusing to pay the fees for the borehole water varied. While some would say, *"I*

[47]GHS refers to the Ghanian currency – the Ghana Cedi. The exchange rate at the time of the research was 1 GHS (Ghanaian Cedi): 3 DKK (Danish Krone).

don't have money," others asked for additional time, *"we don't have money but we'll bring it when we do."* After inquiring whether the latter actually happened, parents responded that *"yes, some actually did bring money."*

With reference to other short- and long-term economic benefits, all sample groups felt that the borehole directly improved the quality of primary education by decreasing student absenteeism through the provision of safe drinking water. As illustrated by one parent, "*It helped the school a lot because when this water was not there, then the students would come to the community, look for water and stay in the community. So, when this water came the students stayed in school."* The borehole also seemed to improve access to primary school through the optimization of its security since some parents expressed that they were reluctant to send their children to school because of the high risk of children being hit by cars when crossing the road[48] to search for water during school hours.[49]

Moreover, interviews with parents created an impression that the borehole directly increased the health situation for both school and community. As one female parent explained, *"you get good water from the borehole. When we used to drink dump water or other water, we got bad germs from the water and were sick all the time."* In addition, the community health clinic, located approximately two hundred meters from the borehole location, reported a significant change for the clinic since they could use the water without fear of infections, which they claimed was especially important *"for the pregnant women."*

The Kakiasi primary school also obtained a regular feeding programme[50] for the children in school because of the direct availability of safe drinking water to be used for cooking one meal per school day for the children. As one student expressed her view on the borehole, *"It's better this year. We have food this year."* The student sample group felt that this was especially important since half of them claimed to have only *"one meal per day,"* usually *"in the evening."*

The last reported gain was a garden established by teachers and students located next to the borehole for irrigation.[51] As the teacher group argued, the main benefit of the latter was not the provision of food for the students, since the garden was too small to provide them with sufficient amounts of it, but for the provision of agricultural cultivation skills. By establishing

[48]The primary school in Kakiasi, as is in Tinga's WFA project community, is located approximately one hundred meters from the main road. This particular road, however, serves as the main link between Wa, the second biggest city in the Northern region and Kumasi, the second biggest town and commercial center in Ghana.
[49]As the parent group put it, *"the children would cross the road and vehicles are passing, but now that the water is here, they do not cross the road."*
[50]However, this is the only primary school in a project that obtained a regular feeding programme.
[51]Maize and okra were grown, typical vegetables used in the Ghanaian rural culinary.

the garden, the quality of education may be enhanced by modifying the school curricula in favour of agricultural skills, which reflects the rural labour market demands and rural lifestyles. This way the investment in primary education may become analogous to returns on education and positively affect the primary education function or the ration between investments in primary education and their outcomes in Kakiasi.

The overall significance of the above mentioned traits is that they may have an important influence on the durability of the new borehole – community network in Kakiasi since the social actors constructed a set of borehole's abilities to resolve some of their community challenges. By providing water at the school, the borehole successfully distanced the dangerous road from the school (at least during school hours), which increased school security. Additionally, the direct provision of water to the school resolved one of the largest challenges that students faced in their primary schools, the feeding programme. These factors may strengthen community members attitudes towards the borehole in return for taking care of it, which could stabilize the new socio-technical network over a longer period if human actors will take a defensive stand to protect the quality of their surroundings.

5.1.3 SOCIAL IMPACTS OF THE BOREHOLE: GENDER AND SOCIAL INCLUSION

One aspect of the research looks into gender dimension since, during my previous engagements in Bole, men and women's social roles have often been problematized as unequal and negatively affecting females by various parties, including the community member's themselves. Culture, in general, tends to reinforce social attributes associated with being a woman or a man in a particular society. Yet, looking beyond the cultural content and cultural expectations for men and women, one needs to question a function of such cultural predispositions before considering the possibilities of changing them.

Discussing water fetching, all sample groups in Kakiasi identified children and women as the water fetchers. Yet, after questioning the gender of children, their answer was *"the girls."* Nonetheless, this depended on the social situation. As one female parent explained, *"When you go to the house the girls fetch and then they give water to the madame [mother]. The boys would only fetch for teachers but not for mothers."* Inquiring further about the fetching arrangements, a male parent responded by saying that *"this is our tradition. The boys, they help in the farm and girls do the housework."*

Elaborating on the inclusion of all sample groups in the decision-making processes in relation to how to organize the borehole, primary school students were, to a large degree, excluded from them. Yet, their exclusion was associated with the cultural arrangements of parents being responsible for making decisions for their children. As a male parent described:

> *If you go to the house, you have a landlord and you have children, and if there is a problem is a landlord who should get up and solve the problem. So, the same way is in the school. You have parents-teachers community, who is in charge of the school so they will sit down and they will say about the water.*

Similar to the students, teachers were also excluded, although all those participating in the group interview argued that they believed the entire teacher team should be included in the Water Community Group since *"the water belongs to the school."* Despite their evident dissatisfaction with their exclusion, the parents claimed that the teachers' frequency of transfering to other schools and communities was too high. Hence, to optimize operation of the Group, and minimize its disruptions, they decided that teachers could not be part of the group. Although teachers and students, as human actors, displayed their limited active role in the decision-making processes, it is possible to argue, based on the findings, that the whole community, including institutions such as primary schools or the health clinic, was being assembled in the new socio-technical network, in which the borehole was central. However, the teachers' and students' roles in the network changed over the time, after a sudden and critical event had occurred in Kakiasi – the borehole's breakdown.

5.1.4 CHALLENGES WITH THE BOREHOLE OR HOW THE BOREHOLE-COMMUNITY NETWORK RE-CONFIGURED

Half a year after September's meeting, the borehole in Kakiasi broke down[52], hence losing its primary function as defined by the community members. Nevertheless, an interesting monument in this event was the community's response to it. The latter provides important insights into the community's ownership of the borehole in relation to taking care of objects that large members of society have prescribed with a common value.

A key person became the community's chief, who on his own initiative organized its repair three days after the breakdown. Moreover, he covered the cost of repair totalling 195 GHS. Hence, the initially collected 65 GHS were spent to repay him, while the difference

[52]The main reason for breakdown was according to the parents and teachers too high pressure on the borehole since *"so many people wanted to use water that it spoiled."*

remained owed. Once the borehole was usable again, a discussion and many disputes of *"who owns"* it among the members of the community emerged. Does it belong to the community because *"the borehole is for all of us*?*"* Does it belong to the chief because *"when it spoiled he took care of the water and then the community did not have time and some refused*?" Or does it belong to the teachers because the borehole is "*next to the school*?"

To set new terms of use, including the pricing of borehole water, the teachers decided to take the matter *"in their hands,"* as they phrased it. Hence, teachers constructed new rules and became an important element in relation to the borehole. To inform community members about their resolutions, teachers called for a collective parent-teacher meeting, where they announced:

> *If you are in a community and you want to fetch, you have to bring 20Gp*[53] *for one fetching and pay it to the school. And the borehole is opened only during the school day hours, from early morning until 1.30 pm.*

As explained in group interviews, more tensions and power struggles at the meetings evolved. Parents and teachers no longer felt that the borehole was just to provide drinking water, but that its role should be expended to include a provision "*of income generation for the school"* since they heard that *"this is how they do it in Bale."* The importance of the latter is that the link between two independent elements (communities) suddenly established and actor network of Bale and Kakiasi became connected which complements well the ANT's idea of how socio-technical networks can become larger and influence something bigger than themselves.

But parents disagreed that teachers should have exclusive control over the borehole. Parents defended their point of view against the teachers by saying *"This is not all that good. Everyone can go for the water, people from the community and school."* Finally, an agreement was reached to re-establish the Water Community Group, which should include newly (s)elected community members, and all primary school teachers, to ensure fluency of information in case of their transfer. An important novelty in the re-configuration of a social network around the borehole was the parents' and teachers' decision to include student representatives in the borehole's related meetings, which signals that the actor network reconfigured according to Callon's translation phases, and its second attempt became even more all-encompassing.

[53]20 Gp (Ghana Pesewa) equals approximately 0,6 DKK (Danish Krone).

In addition, the actor network in this process relayed the knowledge gained from its first attempt in relation to income generation activities. The actors renegotiated the price of the water and decided that everyone who comes to fetch water, except children and teachers, was to give *"something small,"* which was set at a standard price of 10 Gp per basin[54] after negotiation whether the price should be per basin or per day. In relation to the latter, parents and teachers stated one additional issues they faced; the question of how to maintain a clear overview of who has paid and who has not. They felt the income generated in the beginning was not proportional to the number of users.

Based on the argument that community is *"too large,"* which may signal that the actor network may be a higher risk to malfunction, parents decided that the new Water Community Group was to establish a list with the names of the entire community divided into sections. The significance of such a list was that it would be the first document of its kind since the community was established. To form the list, the Water Community Group would go *"from a house to house and write down all the names."* The reason parents and teachers felt such a document was important derived from their consideration of how to improve monitoring and ensure constant inflow of funds for the borehole water. Even though the latter implied a strengthening of the organizational outlook of community in terms of having a clear overview of the community members, it may also imply conditions for belonging to the community and excluding those who do or cannot pay. As one participant in the parent group interview summarized it:

> *At the end of the day we will know those who do not pay from the community. So, those particular [people] who do not pay, we will sit with them and question why they do not pay. The whole community would call them, whenever they would refuse – why? They are not concerned about children in school or why?*

In summary, the Kakiasi community could score high on factors such as a high level of participation in everyday life in a community and democracy in terms of including large number of community members in the decision-making processes. These conditions seemed to influence the values endorsed in making a socio-technical network that Latour proposes since Kakiasi had a large number of community members included in determining the value of the object. This however, may be also one of the most important aspects of durability of the borehole-community network and WFA project in Kakiasi. Despite the borehole's failure, the re-establishment of the actor network in Kakiasi proposed that when objects lose their function from a technical point of view, they do not necessary lose their function from the

[54]A basin equals to 5 liters. 10 Gp equals approximately 0,3 DKK.

social view as long as human actors perceive the objects as adding value to their economic or social life.

5.2 BALE COMMUNITY

What makes Bale a unique case is its specific economic outreach. The majority of approximately 800 hundred people living there are subsistence farmers, but the Bale community[55] is further disadvantaged due to a lack of access to a larger and more established market because of its geographical location. Namely, Bale is a true community in a sense that it is one hour away from the main road. Due to the lack of transport means, buyers from the Ghanaian South typically travel to Bale to buy agriculture products when ready. These products are then, usually for multiple amounts, sold in the South where purchasing power is much higher. In view of these economic factors, a community like Bale is especially interesting to study in order to gain understanding of the power in *potentia* and *actu* since Bale may appear, on first glance, as severely lacking it.

5.2.1 DEFINING ACTANT AND ACTORS: BOREHOLE, COMMUNITY MEMBERS AND THEIR ROLES

The existing associations of PTA and CMS[56], in October 2012 after the beginning of the school year, called for a community *"wide meeting*" to discuss the terms of borehole use. At this event, the community members, including teachers, defined the primary objective of the borehole and set the norm that it should be used to generate an income for the Bale primary school to cover some of its basic needs such as *"textbooks and football."* After the meeting, the task of PTA and CMS members was to go around the community and inform everyone about the decisions.

Although to use the borehole for income generation seemed to be a general agreement, the idea of paying fees in exchange for water failed and the translation process stopped. As told by PTA and CMS members, people refused to pay the fees "*when we went around,"*

[55]Bale is unique case among all there, since Kakiasi and Tinga have better access to the markets due to their geographical location next to the main road connecting Ghanaian South and North.

[56]School Management Committee (SMC) is board of Governance of the schools just as a Board of Directors of a corporation. The SMC is a constitutionally mandated body having a legal backing, while PTA is a voluntary organization of parents and teachers. The SMC is mandated by law and the two work together for the welfare of the school. Consequently, the SMC is the highest decision making body for the school.

especially through the whole year, due to their varying patterns of production and consumption, hence mobilization and enrollment did not occur. Being highly dependent on agriculture reduced during rainy seasons and income correlating with it, the community felt paying on a regular basis in exchange for the water was not viable and instead proposed a distinct solution for PTA and CMS members, which led again to the problematization phase, or the beginning of the translation process.

The community members decided to provide the primary school with land to establish a school garden to compensate for borehole water. While community members were to help with the cultivation and harvest of vegetables, the school was entitled to the entire revenue of the harvest when it would be sold. Thus, PTA and CMS members organized another meeting to discuss the proposed solution with *"everyone."* One of the teachers richly explained these initial stages:

> *People complained that one Ghana was too much. So, because of that they had to call an emergency meeting. And then they took a different decision. And the decision was that instead of them paying the money, they would rather make a school farm because school has water now. So, in fact that was the final decision. So, whatever we produce from the farm, then we can sell it, and then that will replace the money instead of them contributing. They went and clear the land, raise the amounts to even pay for seeds for yams[57] for us. We, us the teacher also sent the children to the farm to also do practical work and learn.*

5.2.2 ECONOMIC IMPACTS OF THE BOREHOLE AND THE CHALLENGE OF LOSS OF INCOME

The economic impacts of the borehole in Bale can be divided into two main impacts: direct financial revenue and the indirect long-term possibility of improving the quality of primary education through integration of practical skills in school curriculum. Namely, the teachers and students in Bale put up a small garden located next to the borehole, which was reported to be used primarily for agricultural training. However, although the interviewees in Bale expressed a high level of coalition in defining the borehole and its spectrum, an incident occured, which had devastating consequences in relation to expected monetary revenues. Bale's first attempt to generate income failed. As the teacher sample explained, when the harvest was ready, *"somebody from the community went behind and stole it."* Consequently, the school lost approximately 2500 GHS from the sale of yams grown in the garden.

[57]A type of potato commonly used across Ghana, but grown only in the Northern regions.

The crisis followed and the teachers called for another community meeting where they announced that the model of how to pay for the borehole water had to be revised, which implied the third attempt of establishing a functioning borehole-community network in Bale, but also indicated the durability of a network. The teachers set two conditions. Either the community would identify those *"who did that"* in order for the teachers to consider the garden as sufficient repayment for the water, or the community members would begin to pay fees in exchange for the water. PTA and CMS members claimed to begin an extensive investigation (which was reported at the time of the research as still ongoing), but without success, therefore parents and teachers agreed with the teachers' proposal that they, from the beginning of the school year 2013/2014, would begin paying money in exchange for borehole water.

The parents designed a new strategy and decided that the teachers would become the collectors because they believed that the teachers had a good overview of how many parents actually live in the community based on children being enrolled at the primary school. Each teacher was to collect money from their students, but the only question that remained was *"how much"* should be paid for the water. The teachers proposed a standard rate of *"50Gp"* per child and per term[58], while parents suggested *"20Gp,"* which became the final rate. Upon my field study in October 2013, the teachers were reported to have collected 300 GHS. The authority to spend the money collected as well as run the accounts was given to them. However, while teachers were responsible for determining the school's needs, the SMC was given approval for school purchases. As the school presented their financial plan, they still highlighted *"a new football and new text books"* as their priorities for the 2013/2014 school year.

As described, the Bale actor network was severely impacted by the opportunistic behaviour of unknown individual(s) who took advantage of the network's output in order to further his or her own interests. However, analysis of created controversy mirrors that even though very serious challenges occur that could have devastating consequence for the existence of network, the network continues. As ANT proposes, struggles are inevitable to actor networks, and each additional attempt of the network in Bale seemed to correlate positively with optimizing its strengths in relation to its productivity. Hence, the agency of the borehole seemed to be associated with the extent to which Bale needed the object to emancipate itself, i.e. feature the access and quality of primary education.

[58]Each primary school year in Ghana has four terms.

Additionally, the self-promotion of existing and well-functioning PTA and SMC associations in Bale to the focal group of actors corresponded well with the ANT idea that socio-technical networks in their establishment rely, to a high degree, on their local knowledge. The PTA and SMC initiated a borehole-community network in Bale, hence a new actor network derived from already existing social organizations, which raises the question of whether the qualities of focal actors are decisive in relation to networks output. However, looking at problematization in terms of defining the objectives of the network in Bale, this may put the ability of addressing some of the existing societal issues in the community in the forefront.

5.2.3 SOCIAL IMPACTS OF THE BOREHOLE: GENDER AND SOCIAL INCLUSION

Exploration of the gender dimension in relation to the WFA project led to the modification of fetching roles originaly reserved for females. Nonetheless, gender discussion proved to be the most vivid (and the longest in comparison to the rest of interview questions) among all sample groups in Bale and subsequent introduction of the new technology seemed to imply a potential reconfiguration of gender roles in the community. The student participants in their group interview explained that it was the students' role to select the individuals to fetch water and bring containers in front of the classrooms so everyone could drink during school hours. As they described, the student leader would draw a fetching schedule each Wednesday and the students selected were to fetch water until the next Wednesday.

Although the school had a male and female representative (student leaders), only the female student leader had the right to choose. The female student leader, commented during the group interview with other students that "*it's good that only girls fetch the water because... it's very hard to fetch the water. If we chose guys, they say they will not do that. They will say: girls are there and you should choose them."* Yet, the male participants instantly contradicted her by claiming that they would do it if *"we would only be chosen."* Girl students responded with *"No, you will not fetch the water!"* and all the students participating in the interview began speaking in their local language, exchanging their arguments.

The gender dimension also promoted intense discussions during the teacher and parent group interviews. By asking the teachers who usually fetches water in school, their initial response was laughter followed by silence, until one male teacher finally answered (with

noted reservation) by saying *"ok. Students."* A short silence followed again, but ended with the same teacher admitting, this time more specifically, that *"actually, with this question, actually we must be frank; it is the girls who are fetching."* The teachers' hesitation can be well explained by Noel Neuman's thesis mentioned in the methodology section, that in group situations people can sometimes respond not by what they think, but by what they believe would be a 'socially desired' answer. However, another way of explaining this may be the current gender policy in primary schooling in Bole, which is reinforced by NGOs. As one teacher elaborated:

> *In terms of gender. I have been having a question in my class. Like, most questions would be coming from the boys. That we have been saying to them that it is good for all to have equal rights and this means that everybody should be treated equally. But why is it that some initiatives always focus on the girls? If we are talking about equality. If they ask me, I always find it difficult to answer. If you are talking about equal rights. We should focus equally on both. It would help to fasten the development. But this development cannot come at a blow. It needs to start gradually. You have to consider our cultural practices.*

The problematization of which gender fetches water in the selected communities continued to led to a vivid exchange of arguments between males and females also with parents. Active, defensive, and direct participation of women in dialogue with men during the interviews signalled that women have power in *potentia* and *actu*, just as men do. While men in the parent group interviews argued that "*These days, all the men are serious about their children and education,"* females contradicted with *"If you are paying that small small amount, 10ps, that does not make you taking care of the children."*

Although the borehole did not directly change gender roles in Bale, which was part of IBIS's hope since complying with their primary education policy also implied tackling gender dimensions, the evaluation of the water fetching debate with all the Bale sample groups suggested that the borehole-community network opened up the public domain for both genders to discuss this matter among themselves. As documented during the interviews, the borehole became a polygon for community members to challenge existing gender roles. While teachers focused more critically on classifying gender as a 'development' dimension, parents, especially the females, actively disputed with their present male colleagues on current gender arrangements in Bale during the group interview. Hence, this can be categorized as another indirect, social outcome of the WFA project.

Lastly, reflecting on the participation of various groups of community members in the WFA project, all the sample groups signalled a high level of participation in the borehole decision-making processes. The only group, which appeared limited in terms of inclusion in

the process, were the students. Nonetheless, students were attached to the network as its ultimate beneficiaries and were also regularly informed about decisions taken in relation to the borehole by teachers. As the teachers explained (and students also pointed out): *"Every time we took a decision or something happened, we went to the class and told them what we discussed here about the borehole"*.

5.3 TINGA COMMUNITY

Compared to other two case communities, Tinga is unique due to its significantly different economic outreach. Tinga has been growing rapidly during the last few years in terms of market size and the number of people living there because of an informal gold mining hub. Tinga's predominantly informal market provides people with various opportunities to earn a relatively steady and high income as opposed to Kakiasi or Bale. Since Tinga is located near an illegal gold mining community in Qui, which can only be reached by passing through it, this has increased both demand and supply in the market for almost everything including gold buyers and sellers and even mining technologies sold by the Chinese. This, economic foundation can be directly linked to some of the factors determining the WFA outcomes presented below, and has to be considered in relation to the overall financial revenue from the borehole.

5.3.1 DEFINING ACTANT AND ACTORS: BOREHOLE, COMMUNITY MEMBERS AND THEIR ROLES

At the beginning of the 2012/2013 school year, Tinga held a *"community level meeting,"* where the present members specified the borehole as a source of income for Tinga's primary school. Setting the terms of its use, the PTA and CMS negotiated, in coalition, the price that everyone should pay for fetching water, excluding teachers and children. As described by the parent sample group, some members suggested 30 Gp, while others suggested 10 Gp. To reach a consensus, they calculated the average of all suggested amounts, and ended up setting the price at 20 Gp per basin[59]. As the parents specified, the reasoning for rejecting 10 Gp as a possible price was their consideration on whether the revenue collected could cover the cost

[59] A basin equals 5 liters.

of repair if needed.[60] On the other hand, they felt 30 Gp would be too high of an amount and not affordable for everyone.

Following this event, Tinga elected a specific individual to be in charge of collecting water fees; a senior woman referred to as the *"sales woman,"* who was to be seated next to the borehole area during the open hours. To decrease pressure and prevent missuse of the borehole, Tinga decided to keep the borehole locked between 6pm and 7am. Another important focal actor became a treasury man of the PTA whose responsibility was to take a deposit, once account was higher than 500 GHS, to the bank in Bole where they opened a special *"Water account"*; a unique feature of Tinga.

Looking at the durability of this network, the research found that the actor network in Tinga, once put in place, remained stable from the beginning of the project, suggesting a high level of durability. Moreover, the actor network activities have been standardized and formalized to a significant level by choosing a particular focal actor to be responsible for collecting fees from borehole users and keeping the money at the bank. These traits suggest that the borehole-community network in Tinga, not only successfully established itself, but also became an institution. Namely, the network defined particular modes of action by formalizing the rules of fetching, providing the means of their enforcement, and opening an official bank account.

5.3.2 ECONOMIC IMPACTS OF THE BOREHOLE

Economic impacts of the borehole in Tinga can be differentiated between direct financial outcomes and indirect short- and long-term improvements in the quality of primary education in Tinga. By selling water and generally reported low payment rate for it, which confirmed successful passing of mobilization and enrolment phases, community in Tinga generated revenue worth 1700 GHS. Although one may assume that this suggest that a more stable actor network correlates with a higher output because Tinga generated the highest revenue from the borehole and maintained the original actor network composition throughout the whole year, Tinga's higher purchasing power must also be considered. However, the problematization of the borehole's capacities may play a decisive role because the borehole provided an impulse to resolve some of primary education challenges in Tinga.

[60] The borehole in Tinga has been functioning without any technical issues as in Bale.

Altering expenditure of generated income, parent and teacher sample groups in Tinga reportedly allocated the funds for the following purposes. First, to cover one students' trip, which is held in Bole for students of primary class six, to the external examination where they write their final exam as an entry for Junior High School. Second, to pay salaries for community support teachers. Because of the lack of teachers in Northern Ghana, communities appoint their own members, who finished at least a secondary level of education, to teach at the primary school. However, these teachers are not dependent on the government's payments, but on the community own contribution. Lastly, to purchase electricity for the primary school. After the school obtained electricity, the parent interviewees explained the ongoing discussion of buying the first computer for the primary school in Tinga. They illustrated by saying that *"Because we are in age of technology and we have electricity, what we are thinking now is a computer."*

These findings show that the borehole in Tinga directly corresponded to some of the challenges in primary schooling. As the school's resource poverty in terms of teaching materials and skills integrated in school curricula were during my previous engagements problematized as both the curse and solution for the quality of primary education, the actor network used the borehole in order to design an action plan of how to resolve some of them. Moreover, the analysis of the Tinga case showed how progress in the quality of primary education is a process. This process started with attributing the borehole economic value, progressed to the provision of electricity to the primary school through enrollment and mobilization of the community members paying the fees for the borehole water, and ended with the plan to purchase a computer.

If the computer is obtained, this could further enhance the quality of primary schooling by increasing practical computer skills and increasing the returns from primary education, assuming skilled labour is associated with higher wages and more likely to find a job. This could also stimulate parents in Tinga who do not send their children to school to do so because the access and quality of primary education are inherently connected. Namely, for families in Northern Ghana, the private costs of primary education play an especially important role due to scarce resources and decisions on whether the family will send their children to school can be determined based on the opportunity costs of education and the employment opportunities after it.

5.3.3 SOCIAL IMPACTS OF THE BOREHOLE: GENDER AND SOCIAL INCLUSION

Turning to gender dimension, the question of who fetches water also led to dynamic discussions among the attendants in Tinga. Male participants in the student group interview claimed to fetch the water at home, but pointed out that at school the girls were *"too afraid to choose the boys."* To this, the female students answered by arguing, *"because if we say to boys to fetch the water, you will insult us."* It became the teachers' role to select individual students to fetch water, but they always selected girls. Discussing this with the teachers, one of them noted, *"We select the girls. Because the boys, especially in terms of washing the containers... So, you will say the boys to do that, they will rather pollute the water. They cannot fetch well."* However, another teacher in Tinga pointed out that "*It is good that we would be talking to both to fetch, so the girls understand that a man doing work of a woman is not useless man."*

These findings require further attention since they bring us to the function of tradition and cultural norms, which as Latour says, influences the organization of actor networks. Although male student participants claimed to fetch water at home, they specified they do not do it at school, which raises the question of why this may be so? The group interview with parents led to the discovery that if men are seen in the public performing roles typically ascribed to women, they may risk losing respect, which could negatively affect their social status. As a male participant noted, *"Our own women, when they see you as a man performing some duties as a woman, they overlook you and if you are not careful, you will not even get a woman to marry. If we are talking about involving men doing some work of the women, it should be taken with time."*

However, Latour not only argues that the values endorsed in the local context influence the actor network, but also that the actor network affects the dominant cultural predispositions. If men are seen fetching in public, this could negatively affect their status. Hence, power struggles between both genders could occur. As a few male participants in the parent group interview asserted, *"The contract here is that women are supposed to be in house, and men are supposed to go to the farm and bring whatever is to woman. Women do the fetching and cocking because the men work. That is the culture."*

Despite this, the power struggles did occur during the group interview with the parents. The women, evidently dissatisfied with the above view of their male colleagues, became loud and one even stood up and said, *"We also go to the farm or have other jobs!"* The public display of women challenging existing gender roles continued by the same female parent

when she began inviting other women to raise their hands in support of her point of view and fifteen of them did.[61] Even more, the women participating in the parent group interview pointed out how men who come to Tinga for work, do fetch the water. *"They fetch and they are men!"* one female participant in the parent group interview exclaimed while the interview was taking place. Hence, the borehole imposed a direct threat to existing gender roles and could, in long run, lead to the neutralization of fetching being exclusively perceived as a female role.

Evaluating the inclusion of different groups of community members in borehole related processes, the parents took the most important part in it. On the other hand, teachers were relatively passive. Addressing the teachers' integration in the network, their role was marginal since the only teacher included in the actor network was the head teacher. As the teacher sample group explained, the head teacher was informed about accounts on a regular basis and was invited to give recommendations on the borehole's income expenditure. Students were also treated in a similar manner. Parents claimed to ask their children about their primary education needs before finalizing the purchases. However, despite students' passive role in the network decision-making processes, they were the ultimate beneficiaries of the socio-technical network in Tinga.

Picture 3: Random fetching in Tinga and the 'Sales woman'.

[61]The approximate number of women participating in the parent group interview in Tinga was 40 or half of the parent sample group.

5.4 IBIS AND GES[62] ON THE PROJECT WATER FOR ALL

On the whole, GES and IBIS[63] seemed satisfied with the project. However, based on their position in IBIS's hierarchy in Ghana, IBIS's interviewees had different comments in relation to the project. An IBIS's employee in Bole labelled it as an *"innovation"* arguing that:

> *Apart from addressing the problem of lack of water... Or lack of education... Project at the same time is empowering the schools with regular source of income. The innovative aspect of it all is that the borehole provides quality water to children and teachers and at the same time it helps in improve teaching and learning. That is the innovative aspect.*

On the other hand, IBIS's director of Education For Empowerment (EFE) programme, implemented in all WFA project schools, focused on the lack of training associated with maintaining the borehole for select community members as one of the project's downsides. As he put it, *"One that I see lacking is failure to train caretakers. I mean, those, area mechanics. Under the national strategy, if you are doing water project, you need to train caretakers. Not an individual. Two or three per community, who should know how to do basic maintenance."* In addition to his comments, IBIS's country director in Ghana added that all those 'caretakers' should be women in order to stimulate *"women's empowerment."*[64]

Furthermore, EFE programme director depicted that *"we also need to add some hygiene education so the children know how to handle this thing. I said hygienic education component is something we can look at so they would have some buckets in the toilets."* However, IBIS's EFE director seemed to be unfamiliar with the fact that Tinga was the only one of the project's primary school having toilet facilities. On the other hand, IBIS's facilitator in Bole felt that the borehole improved hygienic standards in the school and community by evaluating:

> *Before, communities were relying on unhygienic source of water for the children. That is why the intervention is able to provide quality water to the children. They are not experiencing stomach related diseases or whatever. And again, the fact that they have a borehole within the school environment, the children are fetching the water direct from the source, so contamination associated with transportation of water is also reduced.*

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[62]To recall. GES stands for Ghanaian Education Service, governmental body responsible for designing and implementing Ghanaian National Primary Education Policy.

[63]All IBIS's interviewees were only IBIS's Ghanaian employees.

[64]To understand how the borehole was put in place, a meeting with the constructor from WFA was organized, where the company's director described that the borehole in Kakiasi (as in Bale and Tinga) was built with the help of "some community members." The director also explained that after installation of the borehole, his company provided four community members with training and tools for the borehole's routine maintenance.

Views of IBIS personnel also differed in relation to whether they believed the WFA project should focus on the whole community or only on the primary school. EFE's programme director, however, commented that the projects' fundamental idea of high inclusion for all community stakeholders as *"yea, but our focus is on the children!"* His Bole's colleague expressed quite the opposite, as he argued, *"The specific scope of this project, where it is a community school based project and going to be handled by the community is an innovation."* He thus proposed the idea about an all-inclusive project may provide durability.

Discussing the WFA project in relation to the financial contribution in exchange for water, GES's and IBIS's staff both expressed that they were surprised that all the communities generated some income. The crucial factor that unfolded this *"mystery,"* as IBIS's EFE director referred to it, was a careful evaluation of the community's needs in order to supply in accordance to them. As EFE's director pointed out, "*Maybe, how you went about to identifying the project. Maybe, the secret is in the initial stages. That should be the secret, I think.*"

The above may imply one of the crucial pre-conditions for determining the success of external interventions in 'developing' countries, such as Ghana, and for determining the promotion of technology to an actor; a challenge discussed in the theoretical background. Namely, the question of whether objects have limits, not from a technical point of view, but from the social one. The preparation stages of carefully evaluating a community of interest to gain familiarity with the community, including the identification of its needs together with the community members living there, may be one of the crucial factors for objects to become actors and gain agency. As IBIS's facilitator in Bole evaluated:

> *[We] Need assessment in terms of demand and supply. For me the need assessment was properly done. To ensure that the program is solving a need, an existing problem. You know you could give a project, but a project may not be addressing the need, so at the end you do not see the use of the project because the project is not addressing the need.*

Nevertheless, GES and IBIS identified sustainability as an important challenge for any external interventions, which, to them, was understood in two ways. The first way to address sustainability is in relation to the project's ownership and the timeframe for when a community feels it belongs only to themselves. The second way to address sustainability deals with the threat of technological failure, which may lead to completely stopping the project because the community would be unable to either bare the cost of fixing the object or simply lack the initiative to make repairs.

To resolve these sustainability challenges, IBIS's Bole facilitator and GES perceived the WFA project as a *"learning experience"* and saw potential for its replication by the Ghanaian National School authority, GES, in other primary schools in the northern region provided with a borehole funded by the Ghanaian government. Another community in the Bole district named Bogda, was described by GES as *"very poor. Like Bale,"* and by providing it as an example, GES illustrated the difference between giving the objects and establishing the borehole – community relationship. As GES's director in Bole described, the government gave Bogda a borehole, but because "*community, parents and children are not serious in it, they decided to lock it. Because the parents are not taking care of it. Nobody is responsible."*

Altering the above perceptions, these findings indicate that community-based projects may be more likely to begin and continue their own life, as opposed to prioritizing only a segment of a community such as focus exclusively on the primary school, or in particular teachers skills as IBIS practices. By providing a borehole to schools, students' lives changed by the impacts induced by the community members themselves, while the sustainability of that project seemed to be dependent on the durability of actor network by assembling various community members within it. Hence, objects are indeed powerful actors since they can stimulate humans to incorporate them in their life and organize a set of actions to advance the socio-economic change they define as important.

Lastly, interviews with IBIS and GES also illustrated the fluid nature of the socio-technical networks. Although the objective of the WFA project was to provide a borehole to a community, which can be classified as a very small-scale intervention if we consider its very specific territorial locus, the communal actor networks influenced something bigger than themselves. The GES's idea to replicate the actor-network model in the three project communities shows there is no real bottom or top to focus on, but rather puts forward a network. The small-scale actor network can expand beyond the territorial limits of a single community and transform into a net of independent elements that suddenly become connected, constituting a larger network that can be, in traditional sense, called a state.

6. COMPARING CASES

All three case studies illustrate elements of ANT ideas and thoughts, especially Callon's process of translation or how actors formulate and distribute the roles among themselves, promote objects into becoming actors, and establish a community-borehole network. All three communities set and claimed a particular problematization and successfully established themselves as the obligatory point of passage (OPP) through which that problem could be addressed. The comparative analysis of the cases showed that the borehole, as non-human actor, played an essential role in both network formation and the promotion of power in *potentia* to power in *actu*, resulting in agency and change. However, the problematization agendas, challenges faced, indirect and direct economic, and social gains varied among the communities as did, consequently, the agency level of the borehole.

6.1 PROCESS OF TRANSLATION AND ESTABLISHMENT OF BOREHOLE – COMMUNITY NETWORK

When we structure cases according to the Callon's translation moments, we find that all cases succeeded in establishing a socio-technical network between the borehole and people. Analyses of the problematization and interessement phases exhibit promotion of the focal actors and conceptualization of a borehole. In the former, the research identified various constellations of the focal actors, which were negotiated in Kakiasi, while self-promoted in Bale and Tinga. In Kakiasi, Bale and Tinga, community members agreed upon the terms of use for the borehole and defined its scope of abilities. In all three cases, the borehole was originally defined as a supplier of clean water, but social actors in Bale and Tinga also conceptualized the borehole as a source of income that would be invested in their primary schools to cover some of their needs.

Altering focal actors, several interesting findings appear. First, none of the cases selected a single focal actor to direct the network's actions. Although focal actors in Bale and Tinga were self-promoted, they came about as a group. Second, the identification of focal actors in all cases corresponded with the ANT's idea that establishing socio-technical networks relies on local knowledge. Namely, the selected group of focal actors in Tinga and Bale included

members of already established and well-functioning associations of the PTA[65] and SMC[66], whereas Kakiasi appointed the Community Water Group of four community members, and yet they too were selected based on their previous engagements in the community. Third, in moments of crisis like those observed in Kakiasi when the borehole broke and stopped functioning, the focal actor arrangement shifted completely from a group to a single person.

As all communities claimed to have set the terms of use for borehole 'in coalition,' this approach also seemed to influence the promotion of the focal group of actors. However, the degree of coalition was significantly reduced in critical moments when the object lost its primary function of providing water. On his own initiative, the single focal actor, Kakiasi's chief, decided to organize the borehole's repair and cover the cost. This is an important trait regarding risk management and organizational theory because it suggests that in moments of crisis individuals may be more effective in solving a problem compared to a group. On the other hand, Bale also experienced a crisis, yet the original coalition of focal actors persevered and resolved it as a group. One possible explanation may be the nature of the problem. While, the challenge in Kakiasi was of a material origin, the issue in Bale was of a social one.

Another, and perhaps more valid account, were the enrollment and mobilization phases, which differed substantially in Kakiasi than in Bale. Although enrollment and mobilisation materialized to the extent that a functional borehole's water selling system was put in place in all communities, the level of its degree varied among the cases under observation. While Bale and Tinga displayed relatively high levels of commitment to the idea of selling the water based on the amounts generated, Kakiasi's payment rate for the water was the lowest. Although community members claim to define the borehole in coalition and successfully pass the problematization and interessement phase, this signals that there is no guarantee for the mobilization and enrollment phases to accelerate.

However, a decisive difference between Kakiasi, Tinga, and Bale may actually reside in the problematization phase itself as Figure 3 illustrates. Compared with Tinga and Bale, Kakiasi initially established a much narrower problematization scope for the borehole. While Tinga and Bale's network included short-term and long-term considerations when addressing the challenges of the borehole's breakdown and increasing their primary schools' performance, while Kakiasi's agenda reflected only the former. Subsequently, Bale and Tinga defined their object as having economic value while Kakiasi perceived it as an ultimate provider of safe drinking water.

[65]To recall. PTA stands for Parents Teachers Association.
[66]To recall. CMC stands for School Management Committee.

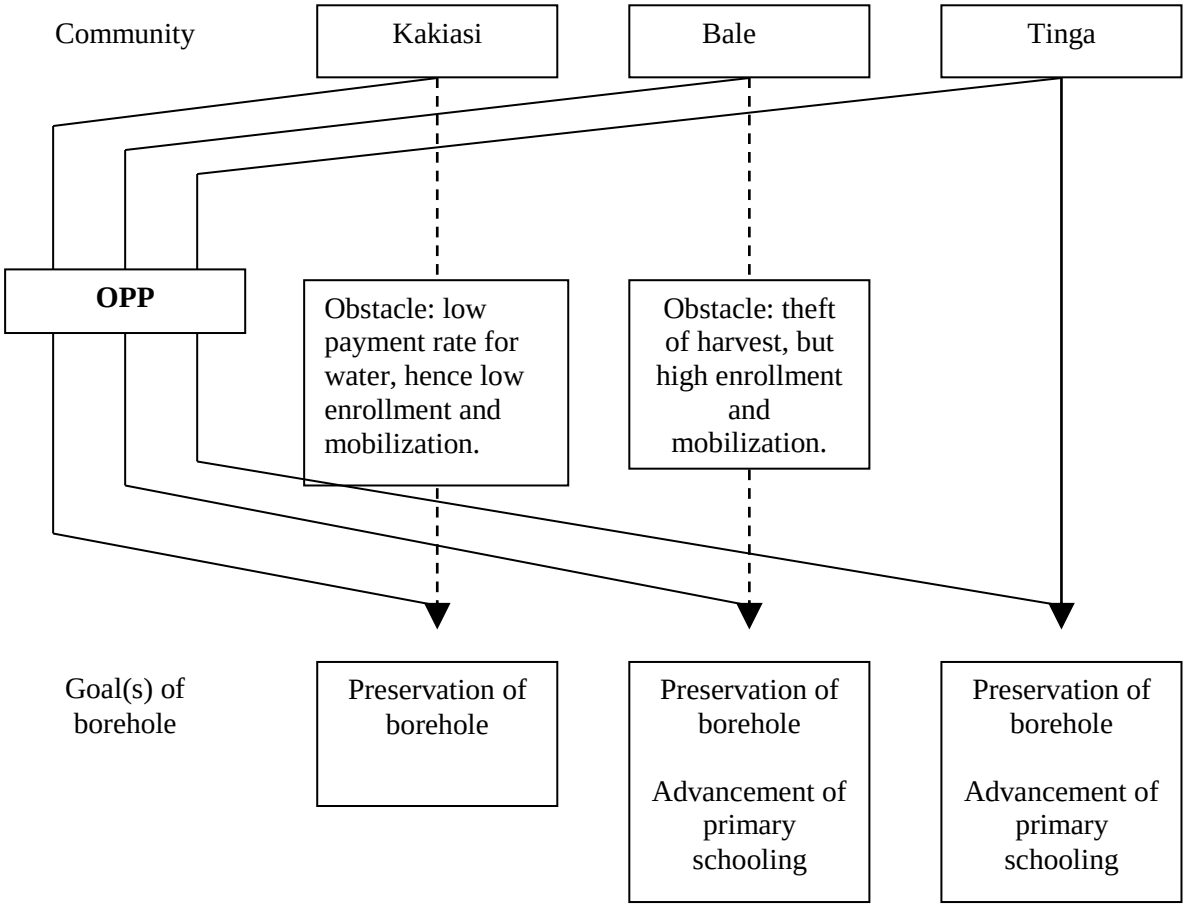

Figure 3: Differences between Kakiasi, Bale and Tinga according to Callon's phases of translation

Hence, the study identified that returns from the borehole might be highly dependent on the spectrum of the problematizaton zone. The previous differences suggest it is critical for community members to perceive technology, not only as immediate solution to their needs (water), but as a long-term commodity to solve broader societal considerations. If there were a higher network purpose as in Bale and Tinga, the actors were more likely to cooperate in paying fees in exchange for water so that it would generate investment funds for their primary school. On the other hand, if the main concern of the borehole-community network was the borehole itself, this seemed to result in a greater focus on short-term gains, a decline in the payment rate, and an increase in opportunistic behaviour.

Looking further at the translation process, this research demonstrated its features of being dynamic set of activities. In support of Latour, this research showed that once networks are established, they do not have a permanent nature, but are dynamic. Moreover, it manifested how falling apart and careful planning of the weak ties in socio-technical network can be

essential to improve and optimize the network's performance. When the networks in Kakiasi and Bale were challenged, Callon's moments of translation not only helped reconfigure the network, but also identified the network's failures, problematized them, and negotiated new solutions.

Moreover, this reflects a positive nature of socio-technical networks in terms of power in a sense that actor networks are not restrictive and provide actors the freedom to act or resist. However, as seen in all three cases, while this freedom seemed to be enlarged during the problematization and interesement stages, it decreased substantially in during the enrollment and mobilization phases. While the first two stages can be referred to as an establishment of social order, where actors define the rules of the game for themselves, they intend to put social pressure on those who refuse to cooperate in the final stages of translation. Hence, objects can assemble social actors and strengthen ties among them by providing a purpose for their cooperation. However, this can also imply social exclusion and put those who *cannot* cooperate at risk. Although none of the cases displayed direct consequences for individuals who did not act according to the rules, they all signalled a tendency to control deviations. Further observation would be needed to examine the nature and degree of exclusion for those who do not or cannot comply with the set standards.

Lastly, the comparative analysis of the cases clearly demonstrates how socio-technical networks are subject to a social theory because humans play a fundamental role in it. The real challenge in forming relations between the objects and humans does not derive from the objects themselves, but from the way people perceive and interpret them. However, as this study tracked, if a large number of members of particular society believed that objects added value to their socio-economic life, they were more willing to cooperate in all phases of translation. This leads us to a principle that seemed to be fundamental: if objects are to become actors and agents of change, they need to be supplied in accordance with the local demand.

6.2 SMALL-LARGE SCALE SOCIO-ECONOMIC ORDERING

By constructing a social meaning to the borehole, human actors in Bole enabled technology to become an actant, hence gain its agency, yet in reverse, the borehole gave back agency to the community members themselves. The real power or value of the network can be estimated based on how much borehole-community networks produced according to the Table 1:

Table 1: Outcomes of the actor networks

Case	**Outcome(s)**	**Economic Impact**	**Social Impact**
Kakiasi	*Direct*	65 GHS* Garden Food programme Improved access to primary education through direct provision of water	Improved health through safe drinking water and sanitation
	Indirect	Improved quality of primary education through productivity skills	Improved school security through distancing the dangerous road from the school
Bale	*Direct*	300 GHS Garden Improved access to primary education through direct provision of water	Opening of a public domain for discussing gender roles as a public affair
	Indirect	Improved quality of primary education through productivity skills	Moving toward neutralization of some of gender roles
Tinga	*Direct*	1700 GHS Improved access to primary education through direct provision of water	Opening of a public domain for discussing gender roles as a public affair
	Indirect	Improved access and quality of primary education through provision of salaries for community based teachers, purchase of electricity and paying for external examinations	Moving toward neutralization of some of gender roles

*One GHS equals three DKK.

As Table 1 shows, all three actor networks produced in accordance to their conceptualization of socio-economic problems that needed to be addressed, of which, access and quality of primary education was outstanding. The direct provision of safe drinking water to the primary schools seemed to positively correlate to the access and quality of the primary

schooling because all of the sample groups in the three communities reported lower student absenteeism from class. With the borehole being provided within 50 meters of each school's perimeter, the sample groups claimed that it enabled students to stay at school during breaks hours because they no longer had to travel long distance to find water, which had previously resulted in children returning to the classes with a delay or not returning at all. Moreover, the findings showed that a borehole as a source of safe drinking water may further reduced student absenteeism because of a decrease in the contamination rate from dump water that was typically used prior to the borehole.

Furthermore, the borehole water was used to generate income for the schools for investments in teaching and learning materials to reduce school resource poverty. However, the largest improvement among all cases seemed to be achieved in Tinga, which generated the highest revenue among all communities, even given that they were the least deprived community in economic terms among the cases under observation. Looking at Tinga's expenditures, the community seemed to be very strategic in investing the generated funds from the borehole because it modelled a step progress. This step progress started with the external provision of the borehole and then continued with Tinga's community members enrollment in a network and mobilization of the funds, purchase and installation of electricity and is to be followed with computer, as outlined in Tinga's future investment plan.

On the other hand, Kakiasi and Bale consolidated their attempt at improving the quality of primary education by establishing a school garden next to the borehole because of its irrigation possibilities thorough the entire school year. Teachers in both communities claimed that the largest impact of the garden was the integration of productivity skills in their school curriculum. This alters human capital theory, the idea that investments in primary education lead to economic returns once the school's curriculum reflects the rural labour market's demands and lifestyles, and thus incorporate suitable technical, vocational, manual, or agriculture skills.

Subsequently, we can validate the provision that the borehole can be an effective education intervention tool in improving the quality of human capital since the economic benefits listed above may positively affect the educational production function in the long-run or the ratio between educational inputs and outputs. Since low educational output in Bole highly corresponds to the primary schools' poverty, the borehole triggered an actor network to use its agency or capacity to become commodities to solve some of their socio-economic challenges through water sales. However, it is critical to stress that further observations in all

three communities are needed to estimate long-term effects of this project on the quality of their primary education and the overall economic outreach of the selected communities.

Referring to the social impacts of the borehole, the subsequent introduction of the new technology seemed to imply a potential reconfiguration of gender roles in the community. As the analogy between father and ruler in Africa has often been challenged, especially by foreign NGOs, who call for the destruction and reconstruction of a patriarchal gender, this research extended their perspectives on how these can be changed through the lens of ANT and the problematization translation moments.

Although the borehole did not directly change gender roles in Bole, evaluating the water fetching debate with the sample groups suggested that the borehole-community networks opened the public domain for both genders to discuss this matter among themselves. The problematization of which gender fetches the water in selected communities led to a vivid exchange of arguments between male and female participants in all sample groups. Additionally, in virtually all sample group interviews, the largest amount of interview time was consumed by discussion of this topic. Active, defensive, and direct participation of women in dialogue with men during the interviews signalled that women have power in *potentia* and *actu* just as men do. Hence, a provision of the borehole can utilise the power struggles among genders and facilitate revision of the gender roles in actor network. As a senior participant in Bale's parent group evaluated the scope of the borehole in terms of gender dimension:

> *We [the parent group] want to tell you something about the borehole you gave us. It is not only borehole. It has really opened our minds for so many things. That all these that we have just said here. That if you did not brought this water, the thing would be in us, in our minds, and we would be corralling among ourselves for them, and our wives. We would be corralling!*

Additionally, the interviewees modelled social change as a process that requires time and cannot *"come at a blow,"* as a teacher in the Bale interview stressed. However, the significance of this change from ANT point of view is that the borehole provided full freedom to the actor network to determine for themselves the kind and the extent of social change they may pursue. Hence, actor networks in these communities enabled the beginning of a process of socio-economic change within them. Yet, the question arises whether we can look at this small-scale analysis and draw general conclusions about the possibility of small-scale actor networks influencing something beyond them.

As found in the Kakiasi parent group interview, the two geographically independent actor networks in Kakiasi and Bale became connected through Kakiasi replicating the knowledge of

Bale's network. Furthermore, as found in the IBIS and GES interviews, with a particular aim to gain a specific understanding of the small scale actor network's potential to influence something bigger then itself, the experience gained from small scale actor networks was characterized as a *"lesson for the government."* Hence, small-scale actor networks embedded in the WFA project triggered GES's motivation to replicate their knowledge to other communities, which gives rise to Latour's view of how small scale socio-technical networks can become linked to the larger networks by a metrological principle.

As the study of the Bole WFA project visualizes how a borehole can build an actor network and assemble community members in a unit, it can also help bind other elements of a macro society together as confirmed in De Laet and Mol (2000). Hence, it can be argued that the borehole was indeed making a community, while at the same time also directing the conceptualization of socio-economic change of a small-scale and beyond. Nevertheless, to validate the networks' scale, further examinations are necessary and should also employ a dimension of belonging to examine how belonging to a particular actor network separates or excludes those who do and do not belong to other networks, and whether boundaries of belonging to a specific network can give rise to conflicts between different networks.

7. IMPLICATIONS: FROM DEVELOPMENT TO EMPOWERMENT *or* FROM AGENCY OF THE BOREHOLE TO EMPOWERING THE PEOPLE

In conclusion, the borehole led to an empowerment of people and a provision of water led to socio-economic change in communities within the Water For All project. All observed cases demonstrated the role of the borehole was fundamental because it was a stimulant for social interaction and conceptualization of social and economic change determined by the humans. The borehole thus provided individuals with freedom and a capacity to act, yet their capacity materialized by entering into a borehole actor network, hence becoming a collective agent. The first learning point of this study is that objects can indeed lead to a change in society under the condition that humans prescribe objects with a specific function, through which they can address their socio-economic considerations.

A second learning point was that an increase in the access and quality of primary education in communities such as Bole can be meaningfully addressed by the provision of a borehole because these findings suggest a positive link between the provision of water and the improvement in primary education function. As the actor networks in one project community mobilized, they built the school a garden to integrate productivity skills into their curriculum. Integration of practical skills in the school curriculum played an outstanding role for the teachers because they believed it could enhance the economic value of a primary education, hence increasing the rate of return from parents' investments in primary education, and consequently the economic empowerment of the individuals. Thus, tracing the link between the borehole and primary schooling, we find that the borehole became a strategic object through number of connections it enrolled as shown in the fallowing figure:

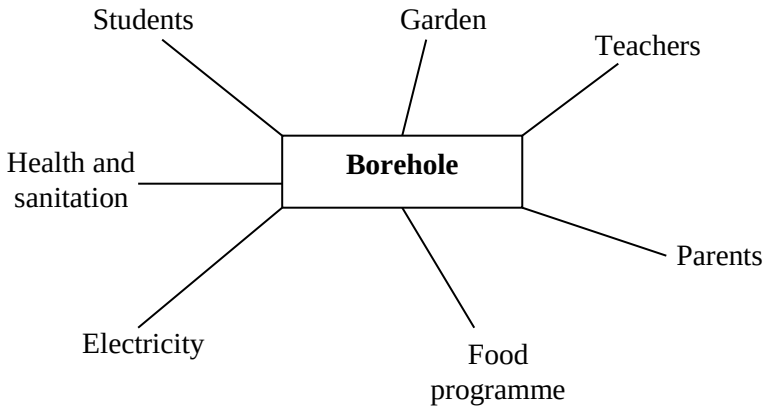

Figure 4: Borehole – Community network

The third learning point is the freedom from development. As many development approaches are designed externally, and with good intentions, to develop communities based on their own socio-cultural experiences, the concept of an actor network enables local communities to constitute a social or economic change for themselves and establish the socio-economic order that they perceive as valuable. The provision of a borehole did not impose any self-evident links between objects and humans to be formed. The cognitive links between both needed to derive from members of the project communities, who may or may not use the borehole to improve their overall quality of life and schooling. Hence, the actor network represents a new approach to traditional development, understood here as a top down externally designed intervention because it facilitates how relationships between parts give rise to collective behaviours of a network and how a network can influence its environment and forms a relationship with is as illustrated in the Figure below:

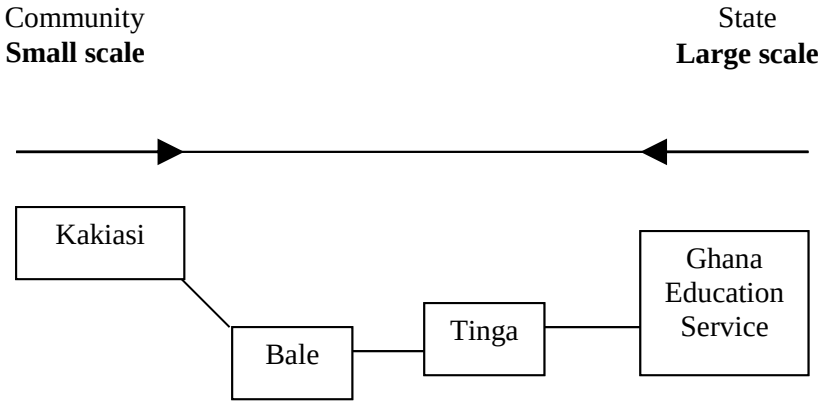

Figure 5

The fourth point is based on the findings, which can be argued that by providing an object, like a borehole, to a community, a successfully formed network between objects and humans can create a particular political public space between connections, where struggles for social equality of women's rights accelerate. The explicit focus on the women portrayed in many external development interventions is, in an ANT actor network perspective, substituted with the creation of public space where humans can renegotiate their roles, including gender. This study finds that culture, as ANT suggests, significantly impacts the organization of an actor network. Yet, using their agency, women can claim for a restructuring of existing gender order and, together with men, gradually achieve a new set of relations or social ordering.

The final, and one of the most important learning points, is that external, top-down intervention models to stimulate local or community empowerment may be inefficient unless they incorporate local people before and at the start of the projects. Because a single

community is as complex as the whole society, the community is an independent element with its own socio-economic features that needs to be accounted for when creating intervention models. Based on interviews with IBIS personnel, even IBIS's local Ghanaian employees showed a lack of understanding for the local realities because the more senior an employee in IBIS's hierarchy or the further from Bole they were located, the more disillusioned their views were from the realities of everyday life in the Bole project communities and in the status of their primary schools.

Hence, the findings of the WFA project suggest that it is necessary to evaluate the needs of a community before creating an external initiative and then supply the community in accordance with the local demand in order to increase sustainability of the projects by employing the actor network principle. Durability, which can be classified as a synonym to sustainability, of objects (or projects) largely depends on a number of connections they bring about among humans, and the degree to which they are able to address people's socio-economic challenges. In this perspective, objects (or interventions) are more likely to become agents if they are locally desired and demanded, thus resulting in empowerment.

In conclusion, the final point in support of the project comes from an old Chinese quote[67] frequently referred to in the development field: "Give a man a fish; you have fed him for today. Teach a man to fish; and you have fed him for a lifetime." This particular mantra largely influences current development agendas that focus on the provision of skills, yet overlooks whether there is even a sea, lake or river for humans to fish. Most importantly, do the people in that particular society even eat fish based on their cultural backgrounds or biology, or do they consume something else instead.

[67] http://escotet.org/in-focus/issues/premier-issue/fishing-for-a-new-paradigm-in-development-education-focus-on-real-needs/. (June 2014)

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