A Watershed Assessment for Wajir – Community based natural resources management using a watershed approach

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A WATERSHED ASSESSMENT FOR WAJIR

Preface

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The preface was prepared by the Technical Advisor, Save the Children Regional Office.

Background

Northern Kenya displays many of the characteristics of remote rural areas caught in chronic poverty traps, which face multiple and interlocking forms of disadvantage. Isolation, insecurity, weak economic integration, limited political leverage, and a challenging natural environment combine to produce high levels of risk and vulnerability. In the context of ensuring food security and resilient livelihoods in the Counties of Wajir in North East Kenya, Save the Children is commissioning an integrated analysis of the current situation and of the future aspirations and scenarios for the diverse groups in the communities of the county. An understanding of the dynamics of pastoral poverty requires a focus both on

1. the descriptive and behavioral aspects of poverty (i.e., what the poor do to survive?) and

2. the structural causes of poverty (i.e., why are they poor and their options so limited?).

Many studies address the former and avoid answering the second, more difficult question of why certain communities and individuals are poor in the first place and what has kept them trapped in poverty. Policy makers often misunderstand local patterns and causes of poverty and wrongly assume that herders are so impoverished that they will be quick to abandon pastoralism if provided viable alternatives. Northern Kenya is not an exception of the consequences of such thinking. One way to overcome this challenge is through understanding the environmental context and how natural resources may be used as means to reduce vulnerability in the region and consequently, addressing the underlying causes of poverty.

Problem statement

Communities in North Eastern Kenya find themselves being constantly affected by recurring droughts. The frequency of droughts in the region has exacerbated existing socio-economic and environmental vulnerabilities. This is due to the fact that communities have not been able to recover from drought emergencies in time before the next drought strikes (Crosskey, 2011). Climate change projections indicate that drought in the Horn of Africa (HoA) is likely to become more severe over the next decades (IPCC, 2007). Some regions in the HoA will receive more rainfall than historically observed. However, precipitation patterns are harder to predict and as these vary over time and space they will likely have an effect on the length of dry spells. Hence, there is a need to shift the way in which development is being implemented in the region if communities are to be in a stronger position to develop sustainably. In order to build resilience and break away from the current humanitarian cycle it is essential to shift interventions from a reactive to a proactive approach. This will require a comprehensive understanding of current socio-economic and environmental vulnerabilities combined with future climate and socio-economic trends.

Approach

Save the Children aims to mainstream risk reduction and adaptation through a landscape assessment approach. The landscape assessment will rely on participatory spatial and temporal mapping tools (i.e. monitoring calendar) in addition to a thorough watershed assessment of Wajir County. These assessments will allow stakeholders (children, community, local authorities etc.) to make decisions regarding preparedness in a timely manner before a hazard strikes, hence reducing impacts on their livelihoods.

The watershed assessment will enhance Save the Children's understanding of how socio-ecological systems function. Moreover, it will help Save the Children plan future development interventions aiming to reduce risks within livelihoods, food security, and water availability goals.

Contents

Introduction

This document presents results of an ongoing rapid assessment of eight village lying in three districts of the Wajir county. A multiple stage survey was conducted in these villages. Participants during the survey included village elders, the government appointed chief. Other participants included members of village committees, women and youth. Information collected per village varied based on the persons participating in the exercises.

The purpose of these surveys was to develop an understanding of issues pertaining to natural resource availability, use and management and to determine whether and what interventions could be made to consolidate natural resources, particularly water and forage, to improve resilience of the communities against repeated emergencies triggered by drought.

Methods used

Participatory surveys were undertaken using tools such as group interviews, ranking and mapping. These were supplemented by site visits during which photographs and GPS locations were collected. This information was analysed in conjunction with secondary data and information derived from satellite imageries.

The selection of villages was done based on prior knowledge about the site, involvement of Save the Children in projects and proximity to the Wajir town from where the teams operated. The selection of villages tried to ensure that they covered all major types of livelihood strategies and resource dependencies and conditions, chiefly water (table 1).

Each survey ran between 3 to 5 hours and repeated visits were made to the villages for validation of existing data and collection of additional information.

The following details were collected during the survey:

History: A brief history of the village, when it was founded and the kinds of major disasters that were faced and coping strategy adopted by the community.

Infrastructure and ownership: Major infrastructure of the settlement and its ownership and access restrictions if any.

Statistics: Demography of the village in terms of households, proportion of different age and gender groups and a breakup of the livestock populations. A ranking of wealth was also attempted. Please note that the responses on proportion of population were significantly different from the census dataset. Respondents across villages estimated the proportion of women:men at 60:40, while the census indicated the opposite trend.

Stakeholder analysis: Ranking of different institutional stakeholders.

Table 1: *Broad categories into which selected villages fell.*

Name	Major Livelihood	Status of water
Leheley Eladow	Pastoral, labour	Sufficient for domestic and livestock use
Kulaley	Pastoral	Insufficient during dry months
Katotey	Pastoral	Sufficient for domestic and livestock use
Sitawario Qajaja I Qajaja II Argani	Pastoral	Insufficient during dry months. Water trucking required.

Figure 1: *Rapid participatory surveys underway at Leheley village.*

Livelihood analysis: Occupational group and income sources ranked by season and importance.

Seasonality: Major resources and events such as prevalence of disease were ranked and organised according to seasons.

This was followed by a participatory mapping of the village resources. The resource map was then transferred to paper, major locations mapped using a GPS and the map ported to the GIS. A number of additional *layers* of information (summarised below) were added to the resource map based on secondary data and from processing satellite imageries. This information is meant to support decisions such as selection of areas for pasture land development such as described in the figure.

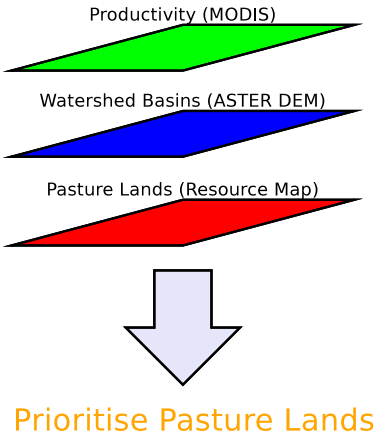

Figure 2: *Layers used for the analysis.*

The second stage of the survey involved validation of the results and collection of further details on water resources used by the community. In addition, structured interviews were held with village elders, chiefs and religious leaders to understand the systems in place to manage these resources.

Limitation of the methods

Data presented below (not including the maps) was collected over a period of one to three days per village. Therefore the amount of information collected per village was different. Initial village surveyed (e.g. Eladow) had less detailed information than subsequent ones. This was partly because the methods used to collect data were new to the team, but more so because the human resource available for the first field visit were fewer[1]. This changed with subsequent visits where the data entry was further streamlined. For instance, all schedules were transferred to flip charts and filled in by the respondents directly as far as possible. More importantly, the additional Somali speaking members of the SC team took on the facilitation of data collection directly allowing for the group to be broken up into two sets of respondents and hence a wider range of questions to be asked.

[1] Only one person spoke Somali and therefore each question needed to be asked first in English, then translated to Somali and back into English.

There are however some important qualifications to be made on the data collected.

1. No attempt was made to break up the respondents into specific groups. Hence there was no attempt to reduce dominance and bias of respondents due to clan, gender or age. Furthermore, while efforts were made to invite elders and chiefs to the meetings, this did not ensure representation of all the interest groups and their viewpoints.

2. Some of the questions, particularly those pertaining to quantification of demographic or livestock composition, were not easily answered by the respondents. This can be explained by the very nature of these settlements, significant components of which remain semi-nomadic.

Background of the study sites

Wajir County

Wajir is the third largest county of Kenya with an area of 56685.75 km^2 which is about 10% of the land mass and has a population of 661,941, about

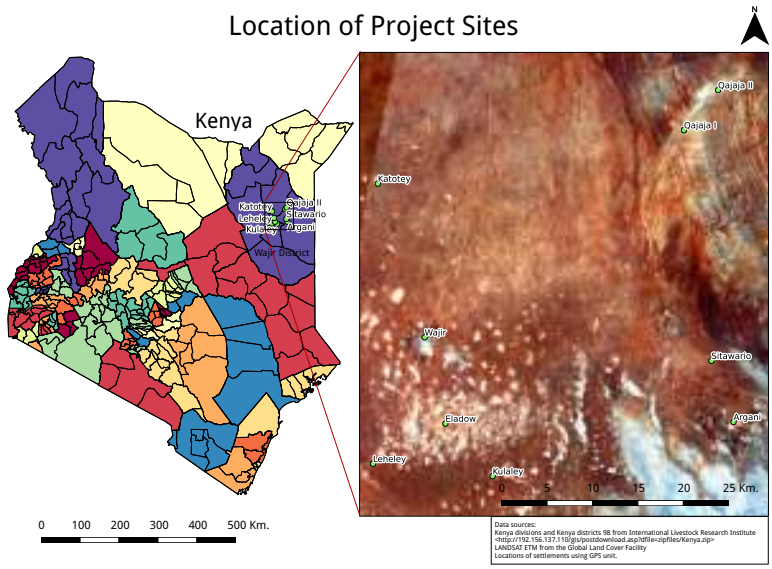

Figure 3: *A location map of the sites in Wajir district. Wajir, in yellow, is the third largest district in Kenya with a high population and shared borders with both Ethiopia and Somalia.*
The project sites are south of Wajir town and fall under the Central division of the district.
A printable version of this map can be downloaded from this link: `https://docs.google.com/open?id=0BxykXtTROSU2RVlqTTNxLUlRczQ`.

2% of the country.[2]

It has long been considered a frontier district and shares borders with Somalia and Ethiopia. Wajir is divided into four constituencies named after the directions and fourteen administrative divisions. It is largely a semi-arid region with pastoralism being the traditional and primary occupation. There are three main clans, namely the Ajuraan, Degodia, and Ogaden (Menkhaus, 2008), all belonging to the Somali ethnic group. Control of resources, particularly pasturelands and water, between these clans is the main cause of inter-clan conflict[3]. This has usually be fuelled through cross border movement and supply of fighters and arms and often attributed to arrival of "newcomer or galti clansmen" from cross border areas who have no local stakes (Menkhaus, 2005).

Degradation of the natural resource base has exacerbated levels of conflict in the region (Meier et al., 2007). Climate change is expected to accelerate this process as there are expectations of prolonged periods of drought interspersed with extreme weather events - both rainfall and temperature spikes (Hesse and Cotula, 2006). The scientific community continues to argue over the causal relationship between pastoralism and resource over-exploitation (Ellis and Swift, 1986; Illius and O'connor, 1999; Scoones and Graham, 1994). There are varying degrees of disagreement with the initial views inspired by Hardin's tragedy of the commons, which portrayed pastoralism as environmentally destructive and a purely exploitative system. A number of studies have demonstrated that pastoral communities have evolved ways to manage rangelands and partition resources.

The Problem

Some basic lessons have emerged from this debate which define the problem at Wajir.

- Sedenterisation of nomadic pastoralists probably plays a major role in local resource overexploitation. This in turn is closely related to the policy followed by the government and numerous aid agencies of sinking bore-

[2] You can download the population census data from the following link `https://docs.google.com/file/d/0BxykXtTROSU2SXBzTjRXUy1wdUk/edit?usp=sharing`.
It was compiled from `http://www.knbs.or.ke`, `http://www.cck.go.ke/html/final_annex1_cover_status.pdf` and the Kenya National Bureau of Statistics `http://www.knbs.or.ke/counties.php`.

[3] Most recently between Ajuraan and Degodia during 1990-1997, between the Garre and Ajuraan in 2000 and between the Garre and Marehan clans in 2004.

holes and the proliferation of shallow wells in the region by local communities.

- The number of boreholes in Wajir has increased from four major permanent water points in 1940 to over a hundred, many of which are non-operational or unusable due to high salinity. Nonetheless, many agencies, including the government are encouraging the exploitation of the aquifer for livelihood diversification into agriculture. Little is known about the ground water potential of specific areas in and around the Wajir county. Available information is based on studies conducted two decades ago and provides an extremely coarse and sketchy picture of the location and size of aquifers. Furthermore, little attention appears to be given to aspects of sustainability of these aquifers. Where and to what extent are they recharged, can this recharge be augmented and how can local communities play a role in their management are questions that remain to be addressed.
- Local communities are likewise extending the number of shallow wells in the region. While some attempts are being made at harvesting rainfall, these are aimed at providing additional surface water sources rather than to recharge the shallow aquifers. Most local efforts are based more on enhancing existing depressions as opposed to identification of optimal sites based on drainage patterns and local geology and soil properties.
- Most settlements around Wajir utilise shallow wells to meet their water requirements. Water quality and quantity varies between the wells, and, in many settlements they dry up during the summer leaving the settlement dependent on water trucking.

Wajir sits on the Merti Aquifer, "one of the best known productive aquifer in eastern Kenya" (Krhoda, 1989). The aquifer is unconfined in some areas and semi-confined in others. There are, however no detailed investigations into the size and yield of the aquifer (see (Mwango et al., 2004) for a summary). Tentative figures arrived at indicate that it is 20 – 90 km wide, 200 km long and 90 – 140 metres deep. The primary source of recharge is the Ewaso Ngiro river which originates at Mt. Kenya and the Aberdare Range (Krhoda, 1989). Areas closer to the Lorean Swamps and Lak Dera drainage way between Habswein and Dadaab, appear to receive intermittent recharge from the Ewaso Ng'iro river (Swarzenski and Mundorff, 1977).

However, this is only known to reach the more northern and eastern regions and border areas during "exceptional floods" (Krhoda, 1989). This is consistent with the observations made by local elders who refer to the drying up of the aquifer during periods of drought and needing to migrate closer to Wajir town.

Possible Interventions

Highly fractured aquifers or those with numerous sink-holes are prime candidates for local recharge. The Merti aquifer fits this description (Liu, 2001) and local recharge can play a major role to augment the far less frequent natural flooding described earlier (Huggins, 2000). Discussions with communities and local government officials suggest that stream flow can be substantial during the rainy seasons. This was verified during field visits where

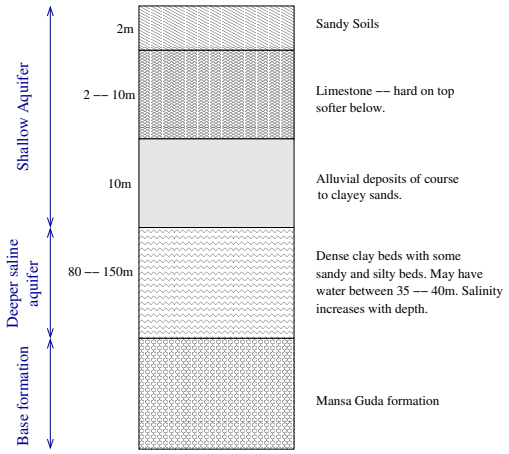

Figure 4: *A diagrammatic view of the Merti aquifer based on (Krhoda, 1989). The shallow aquifer with its fractures and sink-holes provides an opportunity to recharge it locally.*

communities themselves have tried to enhance natural depressions for surface water storage. Viability of artificial recharge at these sites needs to be explored by hydro-geological surveys.

Natural depressions, such as the Magarale Wells at Leheley, provide an example of such a process which occurs naturally. Magarale is a cluster of wells built in and around a natural depression into which a local stream flows. The wells retain water throughout the year, and unlike the Leheley wells, barely a few kilometres to the South, the Magarale wells rarely go dry. Water flowing into the depressions during the rainy season submerges many of the wells, recharging the local aquifer.

Figure 5: *The Maqarale Wells of Leheley are ranked as the most important wells by the village elders. They provide for pastoralists from distant locations such as <Hibo, Razzak to provide names>.*

There appears to be a strong case for a gamut of soil and water conservation measures based on the shape and size of local watersheds. A brief summary of the measure that may be considered is provided below.

Sub-surface dams These dams, usually built downstream of wells, are designed to block the underground flow of water and to create a below ground reservoir thereby making it available in the nearby wells(Nilsson, 1988). There are a number of low cost techniques for building such dams, which offer a number of advantages over surface storage such as lower evaporation, reduced numbers of disease vectors as there is no water for them to breed and the fact that they tap into sub-surface flows which are more common in arid areas.

Artificial recharge structures There are a number of techniques available for enhancing the natural recharge of aquifers from surface flows (Bouwer, 2002). Criticisms aside (Kumar et al., 2008), there are a number of advantages of using artificial recharge, particularly in regions such as Wajir, where precipitation is the major form of ground water recharge and where impervious upper layers often prevent natural recharge of lower water absorbing layers.

Contour bunds Soil mounds running along contour lines provide a cheap and effective way to capture soil and water runoff in low gradient regions. Different designs of these structures are available to meet local requirements such as spreading of water for pastures or other ways to increase biomass productivity(Critchley and Siegert, 1991).

Consolidating shallow wells The number of shallow wells can be increased and existing ones can be enhanced and protected using a range of cheap and locally adaptable technologies. This includes hand operated augers which allow a small team of three to four persons to rapidly drill shallow bore-holes. Various hand or foot operated pump can be assembled locally to partially alleviate the drudgery of fetching water using ropes and pots. Furthermore, existing shallow wells can be deepened and/or fitted with these pumps and platforms which greatly reduce or prevent their contamination and reduce the breeding of vectors in the open wells.

The push for agriculture as a means of livelihood diversification has found many takers. All villages with sufficient seasonal water had entrepreneurial farmers who grew a mix of vegetable, cereal and tree crops. However, water availability remained a constant issue and major cause for failed crops. There are a number of water conservation measures such as drip-irrigation, micro-sprinklers and appropriate planting strategies which can be used to minimise water consumption, particularly in small farms.

Technological “fixes” exist for some of the water quality issues, particularly salinity. Installation of solar powered, reverse osmosis based de-salinisation plants could resolve water quality issues in village without other sources of water. De-salinisation, however, comes with its own package of challenges among which are removal of brine which contains concentrated levels of salts and other toxins that may be present in the water. The need for frequent replacement of membranes is another challenge both in terms of expense and logistics. Solar power units themselves need to be maintained and replaced at regular intervals which adds to the complexity of this approach.

How to use this document

The document comprises of four chapters the first being the present introduction. Chapter two provides the background of each of the villages based on the analysis of the non-spatial data collected during the surveys. The third chapter deals with the spatially explicit datasets collated and generated through analysis of secondary datasets and imageries as discussed earlier. The fourth and final chapter deals with how this work can be built upon by the SC teams for their own projects with a focus on what additional information is required.

This is a work in progress and provides links to a number of sources of data and maps which will be updated regularly. These links are provided on the right column and are meant to take you to a Google Drive address on the internet from which you can download databases, printable maps and GIS data bases[4]. Materials provided include the following:

1. Printable maps in PDF format.

   These may be used for updating features along with participants and to facilitate discussions on possible interventions in natural resources management.

2. Spreadsheet data in Microsoft Excel format along with charts of the data collected.

   This can be used as background information about these villages and built upon through additional surveys into a more complete baseline.

3. GIS data as:

   (a) GRASS database (attributes stored in sqlite file).

   (b) ESRI shape format for vectors.

   (c) TIFF files for rasters.

   (d) Q-GIS cloud server links.

   GIS data is provided to serve as a baseline as well as to facilitate creation of different maps as required for discussions. For example, a map may be created to focus on a specific region of the village. This can easily be achieved using the Q-GIS package. Note that the GRASS dataset can be used from within Q-GIS as well. Therefore the user need not be familiar with the analysis itself in order to use the results.

   The Q-GIS cloud server allows you to use the appropriate Q-GIS plugin to view and explore maps layouts.

[4] All original data provided here is shared under Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License

Derived and secondary data is subject to license restrictions of the source datasets and users are requested to contact the concerned author/institute directly for the same.

Village Reports

Introduction

Short reports for seven villages surveyed during the study are presented below. These reports are a result of a rapid surveys of the villages undertaken using methods described in section . Datasheets used for the surveys are provided in the appendix . The village reports are meant to provide a broad introduction to the villages and have a focus on natural resources, particularly water. However this information can be used in other sectors as well. For instance:

Data for all villages in Excel format can be downloaded using this link:https://docs.google.com/folder/d/0BxykXtTROSU2aW9FcG81U3VqSjA/edit?usp=sharing. Printable maps in PDF format can be downloaded from here: https://docs.google.com/folder/d/0BxykXtTROSU2VzJUTWNxVmJlczA/edit?usp=sharing

- Contour bunding which has been suggested for some villages has direct relevance to pastureland development, fodder production and reforestation.
- Many communities are keen on diversifying into agricultural production. Consolidation and extending available water resources and encouraging conjunctive use of water resources may be the key to successful and sustainable agricultural production in the region.
- Arresting land degradation by soil and water harvesting is relevant to food security and agricultural livelihoods.
- Consolidation of structures around water resources can help in reducing contamination of water resources through faecal contamination due to livestock. Furthermore, open water bodies and wells provide breeding grounds for disease vectors such as mosquitoes.

It additionally needs to be noted that the study did not attempt to identify technological options such as high yielding and better breeds of backyard poultry and livestock, drought resistant and quick maturing varieties of crops and suitable varieties of trees which could be grown in backyards of houses and enclosures.

The time taken to run the surveys for the villages was reduced from 2 half day sessions to a single half day where the survey team split into three parts and ran surveys in parallel. The various team members at Wajir who assisted in running the surveys are well versed with the methods and should be able to extend these to other areas. Links to datasheets and questionnaires used for the surveys are provided in the section on field protocols.

All the potential activities listed in the village reports would require that a strong community mobilisation effort is in place to ensure equity, transparency and accountability in the use of resources created. While the report

Figure 6: *A manually operated auger well being used to drill shallow wells for a ecological restoration project in South India. Photo credits: FERAL.*

Figure 7: *The team conducting group discussions at at Qajaja I. Hibo and Abdi Kader facing the camera as Anthony looks on.*

does not cover strategies for community mobilisation, it is understood that this is often more challenging than physical interventions themselves.

Eladow Village

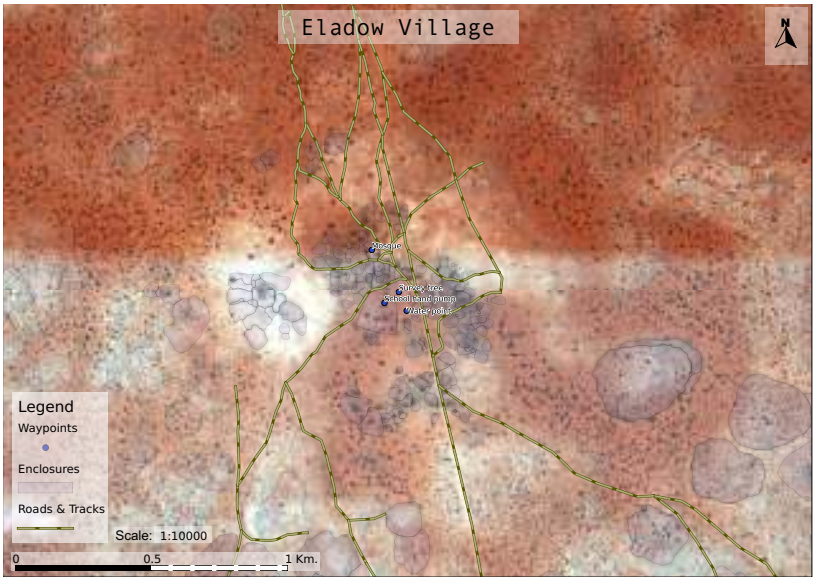

Figure 8: *A mosaic of Google Map based satellite imagery over the Eladow village with some landmarks, enclosures and roads digitised. The former were collected with a handheld GPS unit. The source data is scaled to 1:5000 which conforms to a cadastral scale and allows users to mark and identify features easily visible on the satellite image.*

History

Eladow is a settlement inhabited by a mix of pastoral drop-outs and active pastoralists. It lies 10km south of Wajir town, along the Wajir Nairobi road. The settlement was founded 26 years ago, in 1986, by, Adolah who dug the first shallow well which yielded water. The community was purely nomadic before this and economically better off.

The presence of a high water table together with the proximity to Wajir and the road were the main reasons why this site was attractive. This allowed the pastoralists to diversify into sale of wood and as labourers in the town. The village was settled by about 30 households initially, all of which were pastoralist drop outs due to drought. Subsequently additional pastoral drop outs as well as active pastoralists have settled down in the vicinity of the village. There are four sub-clans in the region of Wajir South. All four are represented in the village and in addition members from two other clans have joined the village.

Resources and Livelihoods

Occupations in the village have diversified from a period of well off pastoralists to less remunerative livelihoods over the years. A series of droughts successively added pastoral drop outs to the settlement. These were *Af Majir* in 1995, *Dablak* in 2000 which added 200 households to the village, a third in 2006 and finally the one last year (2011) led to the death of children and old persons as well as decimated the livestock population. In addition to this there was the El Niño flood in 1997 which caused diseases in both children as well as livestock.

At present the village has about 430 households, with a bias towards women in the population[5]. In terms of occupations, men are largely involved in generating income. Work includes quarrying, collection and sales of firewood and trading in the Monday animal market. Women are engaged in trade and sale of milk, small businesses and shops selling household consumables and collection of domestic fuel-wood and water. Children also help in the collection of water and fuel-wood for the house.

Other occupations pursued include farming, there are a few traditional "Koranic" teachers and a tailor. None of the villagers are engaged in skilled labour, however unskilled labour is a livelihood strategy pursued by the very

[5] A detailed breakup was not available during the meeting and demographic data needs to be collected from the Chief.

Table 2: *Breakup of livestock. Goats and sheep are taken out for grazing during the rainy season as they tend to get diseased if they are wet. Camels are few in number and tend to range freely.*

Livestock	%	Grazing in months	
		Local	Migratory
Goats	70%	11/12	1/12
Sheep	15%	11/12	1/12
Cattle	10%	8/12	4/12
Camel	< 5%	All year	

poor. The participants were unable to rank the different occupations in terms of income or number of persons engaged.

Analysis of the relationships of importance and access to relevant institutions revealed that government institutions rank high in both importance and often in accessibility. Save the children was considered the second most important and accessible amongst the four NGOs listed, the agency highest on the list is an implementing partner of Save the Children. Both the health department and the local government department were listed but given a "zero" ranking by the community.

Access to all these resources remain open to the community. Nomadic pastoralists from other communities also often use the water and grazing facilities. This is not encouraged, however, the community is unable to enforce any ownership. About 40% of the village is considered to be very poor and 15% well off. The former have few assets and rely on manual labour for earnings. The latter own at least 5 cows and 30 goats.

Livestock owned by the village is largely goats followed by sheep and cattle. There are very few camels in the village[6]. Facilities in the village include a school which goes up to class 8, numerous shallow wells and troughs spread in and around the settlement, a mosque and a screening shed. Save the Children supported both the school reconstruction and constructed the screening shed to check for malnourishment and diseases among children. The government maintained road is the only state "owned" property. All the other infrastructure is considered as being owned by the community, with the exception of a few private wells. Among the major natural resources are the quarry, forest, pasture lands and water related resources. The quality of pasture is considered to be very good by the community. There is also substantial wildlife in the area, however it is not used for any economic purpose.

Seasonality of resources and economic events showed that the *Xaaga* summer after the rains is particularly bad for diseases but is the most remunerative for agriculture, fuel-wood scales and quarrying. Both Xaaga and Jiilal are good seasons for animal traders while the latter sees the highest sales of Mira and migration for pastoralism. The Gu' summer rains are the most productive for pasturelands, forests and water quality in the shallow wells improves.

Management structures in the community are based on a traditional committee. Persons from all the six clans, including women, are present on this committee which makes decision on resource use and management. This committee, however, is distinct from the local government structure. The latter comprises an appointed chief for three nearby settlements. There is no formal ownership over resources. As a result, certain activities such as quarrying are carried out by not only the villagers but by other entrepreneurs from Wajir.

Table 3: *Importance and access of the community to institutional stakeholders.*

Institution	Importance	Accessibility
Government agencies & ministries		
Education	6	9.5
Health	0	0
Livestock	2	2
Provisional Admin.	4	5
Local Govt. (DM)	0	0
Nongovernmental agencies		
WASDA	4	9
Save the Children	3	8
ALDEF	1	1
Islamic Relief	1	1

[6] These figures need to be cross checked with graziers as they may be biased.

Table 4: *Seasonality of resources and occupation.*

Item	Jiilaal (Jan-March)	Gu (April-June)	Xaaga (July-Sept)	Deyr (Oct-Dec)
Resource quality				
Pastureland quality	20%	40%	10%	30%
Shallow well quality	10%	40%	30%	20%
Forest (wood)	20%	30%	30%	20%
Disasters				
Animal disease	30%	10%	40%	20%
Child sickness	30%	10%	40%	20%
Occupation				
Pastoralism	40%	20%	20%	20%
Quarrying	20%	30%	40%	10%
Mira Sale	40%	20%	30%	10%
Firewood sales	20%	20%	40%	20%
Agriculture	20%	30%	40%	10%
Animal trading	30%	20%	30%	20%

This also applies to grazing lands. While there is a tacit understanding that watering points and pastures near the village are largely reserved, neighbouring villages also graze their animals and use them. As was pointed out, the neighbouring villages are largely the same clan and families are often spread across adjacent villages. Other than the traditional committee, NGOs working in the area have formed various committees corresponding to their activities. Thus there is a water users committee, a school committee and a relief committee as well.

Conflict Resolution

Access to water is regarded as the most common cause of conflict followed by access to pastures and mines. However there is no conflict over rights to construct or consolidate these resources. Conflicts arise most often within the settlement, these are dealt by the elders in the village. In case the conflict spills over to other villages, a third party involved. There are inter-clan arbitration structures in place in addition to local structures. These include inter-village committees. The government is asked to arbitrate in case these committees are unable to reach a consensus. In case of conflict within the committee, the village chief is asked to arbitrate, such conflicts are always settled within the village.

Common resources, shared between different villages such as water points are open to all groups, including other clan members. These are usually maintained by the local settlement through a committee set up for managing such assets. During times of scarcity, domestic use of water is prioritised over livestock or agriculture. Other restrictions that come into effect include limiting access for livestock and crops only to local residents and, in case the scarcity becomes acute, only domestic use of water is permitted.

The elders felt that a committee could be set up for managing any restoration initiative that might be started in the village. They already have a resource management committee which was capable of taking on the responsibility. The elders further stated that they would be able to raise funds if such a project were to be started. Both the Government and other NGOs would be approached for supporting infrastructure and maintenance of assets created by such projects.

Potential for interventions

Respondents suggest that other than repair and cleaning of wells, water resources for the village are stable and sufficient for domestic and livestock consumption. Specific areas of work include:

1. Cleaning up of the Afyur wells - removal of the carcass that has fallen in and flushing out the polluted water so the well can be utilised again.

2. Capping and construction of retaining walls and fences around productive shallow wells to prevent contamination.

3. Exploring possibilities of artificial recharge of Eladow wells which have saline water.

4. Introduction of suitable agricultural and irrigation techniques for the farm areas.

Further investigations into water harvesting structures need to be taken up at Eladow. The village has numerous depressions which have been further deepened and dammed by the community. Many of these could be extended even further or consolidated through strengthening and heightening of dams, clearing of inlet channels and creation of proper spillways.

Figure 9: *The water resources at Eladow appear to be sufficient to initiate pilot projects on appropriate agriculture. Natural depressions such as this could be strengthened further and extended to capture more rainfall and retain it for longer periods.*

Kulaaley Village

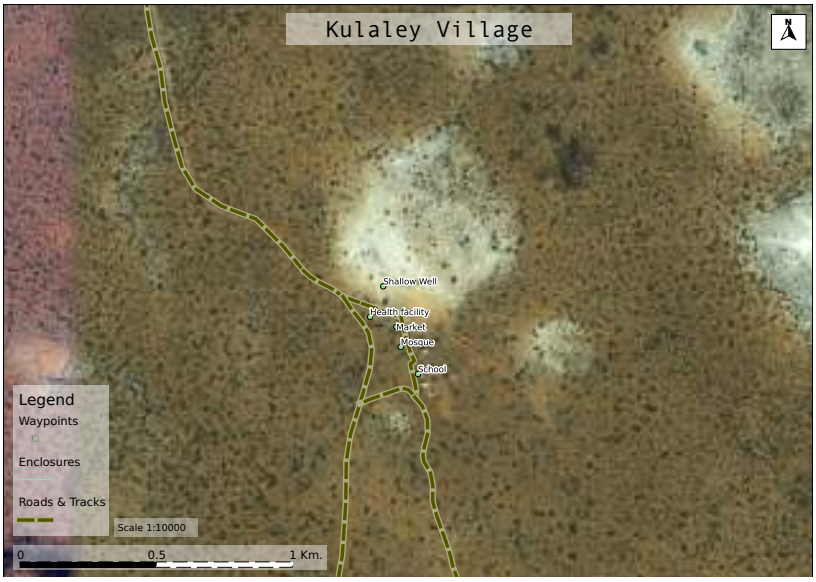

Figure 10: *A mosaic of Google Map based satellite imagery of Kulaaley village with some landmarks, enclosures and roads digitised. The former were collected with a handheld GPS unit. The source data is scaled to 1:5000 which conforms to a cadastral scale and allows users to mark and identify features easily visible on the satellite image.*

History

Founded in 1967, Kulaaley started similarly to Elado - by the discovery of water by two persons who dug a shallow well. The settlement was started with 16 households and was the only source of water in the region, other than the town of Wajir. This was a major attraction to the pastoralists operating nearby. Unlike Eladow, however, there are no pastoral drop-outs in Kulaaley. The village is largely comprised of the dominant clan of the region. Over the years, members of neighbouring clans have also joined the settlement.

Since its foundation, the residents of the region have faced a series of major disasters. These include droughts, floods, conflicts and disease. The major droughts were *Daun* in 1972 which claimed both human and livestock lives. *Maqarjit* in 1980 caused extensive loss of livestock. In 1984 *Afarmajir* drought resulted in drying up of all the shallow wells at Kulaaley and settlement had to be abandoned and moved to Leheley. This drought wiped out livestock and was followed by the El Niño floods in 1997-98 which caused widespread diseases in children and livestock. Many lives were lost. Among livestock, camels in particular were affected. However the floods also recharged the wells and the villagers returned to Kulaaley. Other disasters included a drought in 2005 and the most recent one from 2009 to 2011 named *Simana* which again caused water sources to dry out and widespread loss of livestock.. The 2011 rains broke the drought and recharged the aquifer. During the preceding drought water was fetched from nearby villages.

One of the important coping strategies followed by pastoralists during these periods of stress was to migrate to other regions, as far as the coastal town of Kismayo in Somalia, about 360km away as the crow flies. These long distance migrations allowed them to maintain a viable livestock number which would then grow back during periods of normalcy. The proportion of livestock and the number of months when the animals were grazed locally

Table 5: *Approximate demographic composition of Kulaaley. The total number of houses in the village at the time of the survey was estimated at 430.*

Breakup	Households
Men	16%
Women	24%
Children (5-15)	29%
Infants (<5)	18%
Elderly (>60)	12%

Table 6: *Proportion of livestock at Kulaaley and months spent in grazing at local and non-local pastures.*

Livestock	%	Grazing months	
		Local	Non-local
Sheep	20%	9	3
Goats	30%	9	3
Camels	5%	0	12
Cattle	15%	9	3
Donkeys	20%	12	0
Chicken	10%	12	0

as opposed to pasture lands further from the village showed that other than camels, most livestock was kept close to the village for the bulk of the year. It remains to be found out whether this practice in an indication of sendentarisation of the community and what has triggered this change in lifestyle.

Resources and Livelihoods

The village is predominantly pastoralist and the community takes pride in their traditional occupation.

Most other occupations at the village are also directly dependent on natural resource extraction and exploitation. The quality and abundance of these resources varies with seasons. Pastoralism remains the mainstay of the economy and the major occupation across income groups. Other activities such as fuel-wood sales are largely coping strategies to help rebuild livestock numbers while quarrying and sand collection are usually not a commercial activity but to meet domestic requirements. Among the business not based on natural resources are sales of Quatt or Mira and small shops and restaurants which were established with help from other international funding agencies.

The wealth ranking exercise placed 80% of the village in the very poor and the remaining 20% in the reasonably well off category, respondents insisted that there were no rich persons in the village. The bulk of the infrastructure in the villages is community or government owned. This includes schools, health facilities, ponds and dams and markets. Wells, however, are entirely privately owned although access to them remains open to the community as a whole.

Institutional analysis showed that government agencies were considered relatively more important than nongovernmental agencies, however the highest rank awarded was four out of five. Among the NGOs WASDA, a local agency supported by Save the Children ranked the highest with Save the Children itself sharing the same position as Mercy Corps (table 10).

Seasonality plays an important role in the availability of resources and incidence of disease and stress in the households. However, in terms of occupations, the respondents felt that only pastoralism and agriculture were important from a seasonal perspective. Jiilaal appeared to be the most stressful period of the year both in terms of resource availability, quality and frequency of disasters. The results are summarised in the table below.

Management structures in Kulaley remain strongly traditional. The most common causes of conflict in the community was in relation to access to water, access to pasture, access to mines and deforestation, in that order of priority. The elders were keen on supporting any development projects which further consolidated available resources. They did not see any conflict arising from activities which enhanced the village's natural resource base.

Table 7: *Percentage of incomes and persons engaged (employment) from major occupations at Kulaaley.*

Occupation	Income	Employment
Pastoralism	60%	70%
Quarrying	20%	10%
Mira Sales	30%	10%
Agriculture	20%	20%
Firewood Sales	40%	50%
Livestock Brokering	10%	10%
Shop keeping and hotels	20%	30%

Table 8: *Resources of Kulaaley village ranked by importance and number of users.*

Resource	Importance	Users
Pasturelands	15%	30%
Shallow wells	30%	35%
Quarry	0%	0%
Trees/forest	15%	5%
Farming	15%	10%
Dams	25%	15%
Wild animals	0%	0%
Sand	0%	5%

Table 9: *Ownership and maintenance of infrastructure.*

Infrastructure	Private	Community	Govt
School	0%	60%	40%
Open wells	100%	0%	0%
Ponds and Dams (Arahabis)	0%	100%	0%
Health facilities	0%	70%	30%
Mosque	0%	100%	0%
Market	0%	80%	20%
Road	0%	10%	90%

Table 10: *Institutional analysis ranking importance and accessibility of institutions with the highest grade being 5 and the lowest 1.*

Type	Institution	Importance	Access
Govt	Min of Education	3	4
	Provincial Admin	2	3
	Health	2	3
NGOs	WASDA	2	2
	Save the Children	1	1
	Mercy Corps	1	1

Conflict Resolution

Most conflicts over natural resources in Kulaley are between residents of the village. Village elders mediate such conflicts. In the event that the conflict involves non-local stakeholders, formal conflict resolution structures such as the village committee or the inter clan committee are called upon. In addition to this, inter-village committees exist and government representatives are engaged in mediation as well if required. The chief is also involved in arbitration in case of disagreement among committee members.

Item	Jiilaal (Jan-March)	Gu (April-June)	Xaaga (July-Sept)	Deyr (Oct-Dec)
		Resource quality		
Pasturelands	10%	50%	20%	40%
Water resources	10%	40%	20%	30%
Forest resources	50%	20%	10%	20%
		Livelihood		
Migratory grazing	10%	40%	10%	40%
Child diseases	10%	50%	10%	30%
Animal diseases	10%	20%	50%	20%
Malnutrition	20%	30%	40%	10%
Aid/Relief	40%	20%	10%	30%
		Disaster		
Fire	60%	0%	40%	0%
Drought	70%	0%	30%	0%
		Occupation		
Pastoralism	60%	10%	20%	10%
Agriculture	0%	50%	20%	30%

Table 11: *Seasonality of resources in and occupations in Kulaley village.*

There was consensus that resources such as water or pasturelands were communal and everyone, including pastoralists from other villages and clans had rights to access them. Managing such resources within the village, however, would be taken up by an existing committee or one created for the purpose. In the even that a resource such as large tracts of pasturelands, were to be restored, an inter-village committee would be set up. If any major asset or infrastructural investment or maintenance would be required, the elders would approach both the government and local NGOs.

Resources such as water are managed during times of scarcity by prioritising domestic use over others. Emergencies, such as bush fires (as in 2011) are handled by the village without external support.

Figure 11: *Livestock around the Kulaley wells. The site is spread across about a hectare of land.*

Potential for interventions

Respondents stated that the village faced acute water shortages during dry periods, in fact, wells had started drying up during the survey (mid February) due the failure of the Jiilal rains. Three of the five most important water sources dry up during the Jiilaal season and one of the two perennial wells is saline. Specific areas of work include:

1. Deepening and repair of existing shallow wells and structures.
2. Exploring potential for recharge of the major well clusters.
3. Identification of existing depressions around the village for surface water harvesting using check dams and sub-surface (sand) dams and possibly artificial ground water recharge.

One of the sites which were visited had a “failed dam” as the structure, built with government support, did not hold water for long. This may be rectified by restoration of drainage channels leading to the site. Other water harvesting structures along the major drainage ways could also be considered.

Figure 12: *The “failed dam” at Kulaley.*

Lehele Village

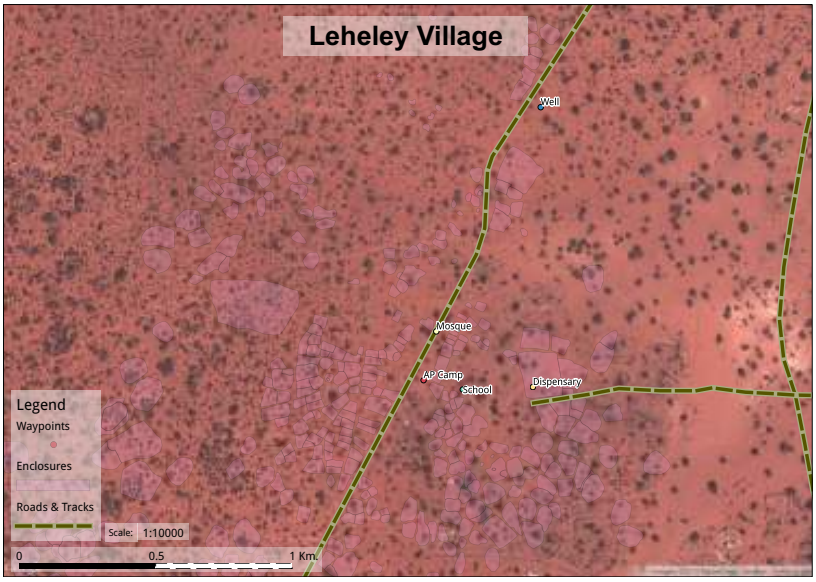

Figure 13: *A mosaic of Google Map based satellite imagery over the Leheley village with some landmarks, enclosures and roads digitised. The former were collected with a handheld GPS unit. The source data is scaled to 1:5000 which conforms to a cadastral scale and allows users to mark and identify features easily visible on the satellite image.*

History

Lehele, also spelled Lafaley, is the head quarters of the district, Wajir South. It was founded in 1970 as a result of the *Dahun* drought which had disastrous effects on human and livestock. As in the other settlements, it was the supply of water from shallow wells which brought the initial 40 households to the village. These households quickly extended the number of wells and the village grew to its present size of over 1900 families.

All the initial settlers were pastoralists and even though they came to the village empty handed, they made a livelihood through selling fire wood to Wajir and used the incomes to rebuild their animal stocks. Coping strategies have been essentially the same through the years. Each time there is a loss of livestock, it is rebuilt by other sources of income such as fuel-wood sales to Wajir.

Table 12: *Occupations and employment they offer in Leheley village.*

Occupation	Income & Employment
Pastoralism	30%
Agriculture	20%
Milk/meat trading	20%
Miraa selling	10%
Firewood	20%
Animal brokering	10%
Shop keeping	10%

There is some diversification in the occupations pursued in the village, as shown in table 12. The group however felt that over the years, the village had learnt to cope better with droughts as child mortality had reduced. The major shocks that the village has endured over the years include droughts which have repeated every five years or more frequently. Some of the major ones were *Rahole* in 1980. This resulted in the drying up of the shallow wells and the entire village had to relocate 5km towards Wajir to find water. In 1984 a major disease outbreak called “Furaq” rapidly spread through the cattle population causing extensive losses. The *Kamadi* drought of 1992 was the worst in terms of child mortality and was followed by *Afarmajir* in 1996, a milder drought *Wardig* in 2001, named after a dam that was built near the Somali border towards which all the families migrated. In 2005 the *Aftag* drought led to the cattle migrating to Somalia and finally the 2009-2010 *Simana* drought was the latest where losses were limited to livestock. Other disasters faced since the village was settled include the 1992-1993 inter clan conflict which engulfed the entire region and the El Niño floods of 1997-1998 which wiped out shoats and caused major disease outbreaks in children as well. Other major disease outbreaks amongst livestock include the *Furuk* in 1984, *Gesdor* a persistent disease of cattle which has been brought under control by drugs and the 2007 *Fighiq* and 2012 *Dukan*

camel disease, the latter presently in the area, which has drastically brought down the camel population.

Resources and Livelihoods

Leheley has a comparatively larger infrastructure base than the other two villages surveyed. The bulk of these assets are government or community owned with the exception of water points which are largely private (table 13).

In terms of natural resources, water related resources are ranked the highest. Agriculture, is ranked behind water and pasturelands as an important resource. Access to all resources, other than agriculture, is open to the community. Details of relative importance of resources or resource related occupations and the proportion of users is shown in table 14.

The demography of Lehele is bias towards women which comprise 60% of the population. Each house has approximately 2-3 children (between 5 and 15) and a similar number of infants (<5 years). The percentage of adult women and men was put at 30% and 20%, and elderly (both men and women above 60 yrs) at 30%. Most of the village was categorised as poor (70%) or of medium wealth (25%) with the remaining 5% categorised as rich. The table below provides the yardstick (livestock ownership) used to define these wealth categories.

	V Poor	Medium	V Rich
% Households	0.7	0.25	0.05
Assets	<20 shoats	30-40 shoats 5-60 cows	>100 shoats, >60 cows
Occupation	Labour based: Quarry, digging wells, firewood collection	Pastoralism	Pastoralism

The mainstay of Leheley's economy is livestock of which the bulk is sheep and goats. Migratory grazing is practised for most of the year, except for donkeys and chicken which are kept in the settlement. Leheley has a large camel population, all of which are kept in pasture lands throughout the year. A summary of the livestock and grazing patterns is provided in table 16.

A number of ranking exercises were conducted to determine the importance of local and external institutions to the village. All the ranking was done on a range of 1 to 5 with 5 indicating the highest rank and 1 the lowest. On occasion, the respondents assigned a 0 rank to indicate that a particular entity was totally absent.

Importance and access to community based organisations (CBO) was subdivided into the type of organisation which facilitated the formation of the CBO, i.e. government, NGO or the community themselves (local). In Leheley the only NGO formed committee was the rights committee which was considered defunct and wasn't given a rank. Details of the other CBOs are provided in table 17.

Similarly a ranking of governmental and nongovernmental institutions was done with respect to importance to the community and how easily these institutions could be accessed. Government institutions and NGOs tended

Table 13: *Infrastructure and facilities at Leheley and their ownership.*

Facilities	Private	Community	Govt
School	0	7	3
Hospital	0	2	8
Water Points	8	2	0
Roads	0	2	8
Market	0	9	1

Table 14: *Relative importance of major resources and the number of users in Leheley.*

Resource/Occupation	Importance	Users
Pasture lands	25%	30%
Shallow wells	30%	25%
Forests/trees	15%	20%
Farming	20%	5%
Quarrying	5%	20%
Wildlife	5%	0%

Table 15: *Wealth categories and their measurement and respective primary occupations.*

Table 16: *Livestock proportions and grazing patterns in Leheley village.*

Livestock	%	Grazing	
		Local	Migratory
Sheep	30%	4	8
Goats	25%	4	8
Cattle	20%	2	10
Camels	15%	0	12
Donkeys	5%	12	0
Chicken	5%	12	0

Table 17: *Ranking of community based organisations at Leheley by importance and accessibility.*

CBO Name	Importance	Access
CBO - Govt formed		
School mgmt committee	5	3
Health mgmt committee	2	2
Village health committee	3	5
Locally formed		
Local peace committee	5	4
Relief committee	3	2
Women groups	1	3
Youth groups	1	1

to be ranked similarly in Leheley village with five institutions, three and two respectively, being ranked 3 out of five. In terms of accessibility, government institutions tended to be ranked higher as shown in table 18.

Finally, an analysis of seasonality of resources, natural hazards and occupations was done. Much of the natural resource activity was centred around the long summer rainy season and its subsequent months. The winter dry season had the lowest importance with respect to natural resources, other than forest resources and fire wood sales. It also had the highest incidence of fire. Malnutrition and diseases in children also tended to be highest during the winter dry season and summer rains. Details are provided in the table below.

Table 18: *Importance and accessibility of institutions to the community at Leheley.*

Govt Institutions	Importance	Access
Min of Education	3	4
Min of Health	3	3
Min of agriculture	1	0
min of internal security	3	3
NGOs		
CESVI	1	1
Mercy Corps	1	1
Save the Children	3	2
WASDA	3	4
ALDEF	2	2

Table 19: *Seasonality in natural resource availability, occupation and hazards at Leheley village.*

	Jiilaal	Gu'	Xaaga	Deyr
Resources				
Pasturelands	10%	40%	10%	40%
Water	10%	20%	50%	20%
Wood/Forest	40%	10%	40%	10%
Hazards				
Disease in Children	40%	40%	10%	10%
Disease in Livestock	20%	10%	60%	10%
Malnutrition	40%	30%	20%	10%
Fire	60%	0%	40%	0%
Drought	30%	20%	40%	10%
Occupation				
Pastoralism	30%	10%	40%	20%
Agriculture	10%	30%	20%	40%
Firewood sales	40%	10%	40%	10%
Quarrying	30%	30%	30%	30%
Milk Sales	40%	40%	10%	40%

Conflict Resolution

The most frequent cause of conflicts over resources is access to pasturelands, water and then forests. The elders often ascribe this to poor management of these resources. There are no restrictions or cases of conflict about new resources being created or consolidated. Most conflicts were between residents of Leheley and non-residents from the same region and clan. It should be noted that the Maqarale wells attract a large number of pastoralists from a radius of over 50km.

The village committee tries to mediate whenever conflicts erupt. Whenever a conflict extends to other villages or clans, committees are formed by the elders of the concerned communities. The government is usually involved when such conflict resolution is being done to ensure the presence of a third party arbitrator. Conflicts within the village committees are also handled by third party arbitrators.

These committees have handled situations such as arsonists setting fire to pasturelands by first containing the fires using whatever means at hand and then apprehending the culprits and handing them over to the police for formal action.

Resource management, such as the use of a newly created resources is usually in the hands of a specific committee. New committees are set up whenever the need arises. Existing committees and elders would play a major role in this process. Raising funds for new infrastructure or restoration of existing infrastructure would be from government and NGOs.

Access to such resources, particularly in time of stress may be regulated with priority being given to local residents and then to pastoralists from other areas and clans. In cases of extreme stress, only local residents are allowed to use water resources for domestic consumption as a first priority. The second priority is given to use for livestock and agriculture, but again restricted to local residents.

Figure 14: *The Leheley wells have barely a foot and a half of water in the summer. The water level had receded alarmingly during this site visit in mid February, a good three to four months before the summer rains are expected.*

Figure 15: *The abandoned limestone mine at Leheley could be turned into a recharge structure if nearby streams could be channelled towards it.*

Potential for interventions

Our data suggests that Leheley does not have a serious water problem at the present levels of water extraction. However, levels of shallow wells decrease substantially during the dry seasons with most of the top five wells having between 1.5 and 6 feet of water during Jiilaal. There are a number of interventions that can be taken up in the settlement. There are two major reasons why interventions need to be actively considered for the village. The village has a very large number of households, a figure that is likely to increase as it has been designated the capital of the district, Wajir South. Secondly, there is an increasing interest amongst the community to diversify into agriculture. Both are likely to increase the demand on water resources substantially in the near future. Among the activities that can be taken up include:

1. Deepening and repair of existing shallow wells and structures.
2. Recharge structures around the Leheley wells including sub-surface (sand) dams and check dams.
3. Afforestation around the Maqaraley depression and channels leading to the depression.
4. Consolidation of channels and construction of silt/sediment traps and sand dams in the channels around the settlement.

Katotey

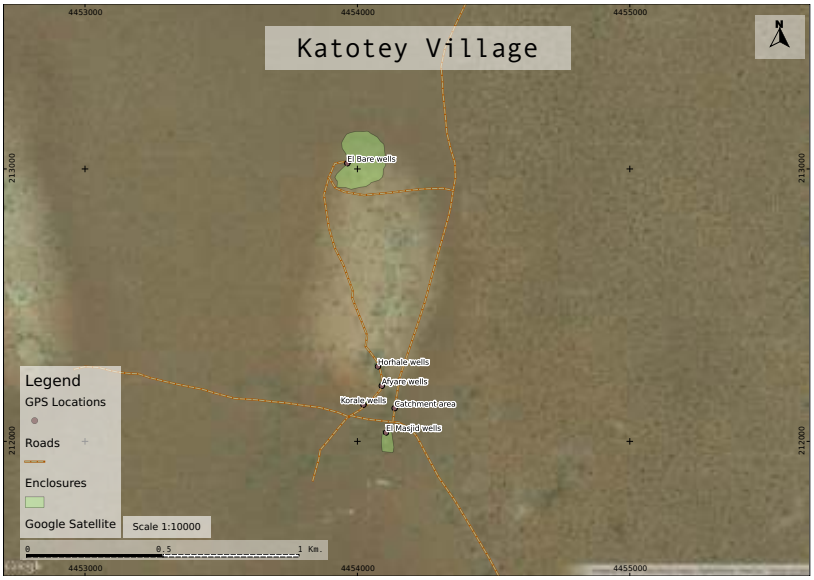

Figure 16: *A mosaic of Google Map based satellite imagery over the Katotey village with some landmarks, enclosures and roads digitised. The former were collected with a handheld GPS unit. The source data is scaled to 1:5000 which conforms to a cadastral scale and allows users to mark and identify features easily visible on the satellite image.*

History

Katotey, a settlement of 360 households was founded in 2003. This was a consequence of the El-Nino floods of 1997 which destroyed their livestock. The initial settlers were inhabitants of the El Nur village, about 7km away, in Eldas District, formerly part of the the larger Wajir West district. Another reason for the migration to Katotey was that water at El Nur had become increasingly saline and reduced in quantity as well. The well dug at Katote, however, yielded fresh water.

From an initial size of two, the village has grown to a size of 360 households. Livelihoods have also diversified from pastoralism to firewood sales, quarrying, livestock trading, shop keeping, restaurants and casual labour

. The number of people engaged in pastoralism is similar to those employed in shops and eateries. The village is comprised of members of the Degodia clan and its assets have grown from the initial livestock and pastures to a school, water points and a quarry.

The settlement has faced three major disasters since 2003. In 2006, the Looba'ay drought caused diseases and malnutrition in children and loss of livestock due to lack of water, pasture and disease. The community relied on water trucking using handcarts and supply of food and water trucking by other agencies. In 2009, the Weladhi drought had a similar effect on children and also resulted in loss of livestock due to lack of water, pasture and disease. Finally, in 2011, the Simina drought had similar consequences for children and livestock. The villagers had to migrate with livestock to search out new pastures, fed animals with tree bark and relied heavily on water trucking and the blanket supplementary feeding programmes run by aid agencies.

Table 20: *Demography of Katotey.*

Breakup	Percentages
Men	15%
Women	30%
Children (5-15)	35%
Infants (<5)	15%
Elderly (>60)	5%

Table 21: *Livelihood diversification at Katotey.*

Occupation	Income	People engaged
Pastoralism	30%	30%
Quarrying	10%	10%
Mira Sales	10%	10%
Agriculture	10%	0%
Firewood Sales	20%	20%
Shop keeping and eateries	20%	30%

Resources and Livelihoods

Sheep and goats form a little more than half of the total livestock at Katotey followed by Camels. A fairly large proportion of grazing by camels and shoats is done non-locally. Important infrastructural assets in Katotey include a school, hospital, roads or tracks, water points and the market. The ownership of these assets is largely with the community and government. The major exception to this are water points, half of which are privately owned.

A wealth ranking exercise revealed that the half of the households are considered very poor with few assets such as a few shoats and chicken. The bulk of this group, 55%, is engaged in casual labour. In addition their incomes come from quarrying and sales of fuelwood. Another 40% of the households were ranked as poor. Their assets included about 10 shoats, a couple of cattle and a few chicken. Poor households typically engaged in the same livelihood options as the very poor. Only 10% of the village was considered as having average wealth. This translated into about 40 shoats and 7 cows. Better off households were usually employed in animal trading and shop keeping. All three income groups were engaged in pastoralism.

In terms of resources, shallow wells, forests and pasturelands are considered the most important. The proportion of users for each resource however varied. For instance, more persons were engaged in quarrying than in fuel-wood collection even though the former resource was ranked higher in importance.

The importance of resources and occupations varied with season. Jiilaal is the harshest of the seasons, except in terms of milk trade which flourishes. During this period, between January and March, Resource availability is reduced, natural disasters are more common and pronounced and livelihood alternatives are more limited as shown in the table below.

Table 22: *Proportion of livestock at Katotey.*

Livestock	Percent
Sheep	30%
Goats	25%
Camels	20%
Cattle	5%
Donkeys	10%
Chicken	10%

Table 23: *Levels of migratory grazing between livestock at Katotey.*

Livestock	Months local	Months non-local
Sheep	58%	42%
Goats	58%	42%
Camels	33%	67%
Cattle	83%	17%
Donkeys	100%	0%
Chicken	100%	0%

Table 24: *Asset ownership in Katotey.*

Infrastructure	Private	Community	Govt
School	0%	40%	60%
Hospital	0%	90%	10%
Water Points	50%	30%	20%
Roads	0%	40%	60%
Market	30%	60%	10%

Table 25: *Importance and number of users for major resources at Katotey.*

Resource	Importance	Users
Pasture Lands	15.00%	20.00%
Shallow Wells	40.00%	50.00%
Forests/Trees	20.00%	10.00%
Farming	10.00%	5.00%
Quarrying	10.00%	15.00%
Wildlife	5.00%	0.00%

Table 26: *Seasonality of resources, employment and hazards at Katotey.*

	Jiilal (Jan-March)	Gu' (Arp-June)	Xaaga (Jul-Oct)	Deyr (Nov-Dec)
Resource Availability				
Pasturelands	10%	40%	20%	30%
Water Sources	10%	40%	20%	30%
Wood/Forests	10%	40%	10%	40%
Quarry	10%	30%	30%	30%
Hazards				
Drought	60%	0%	40%	0%
Flood	0%	70%	0%	30%
Fire	40%	0%	60%	0%
Disease in Children	30%	20%	10%	40%
Disease in Livestock	30%	10%	50%	10%
Occupations				
Pastoralism	10%	40%	20%	30%
Agriculture	0%	50%	10%	40%
Firewood Sales	20%	10%	50%	20%
Quarrying	10%	30%	20%	40%
Livestock Business	20%	10%	60%	10%
Milk Sales	50%	10%	30%	10%

An institutional analysis across community based organisations and external institutions demonstrated the importance of local committees in an array of functions. These were both more numerous and considered more important and accessible than most external agencies in the region. The school management committee was considered the most important followed by the pastoral committee. The two NGOs operating in the region were also ranked high both in importance and accessibility (table 27).

Table 27: *Analysis of institutions, their importance and accessibility by the community at Katotey.*

Organisation	Importance	Access
Founded by govt. and NGOs		
School mgmt. committee	5	5
Locally founded Agencies		
Local Peace Committee	1	1
Relief Committee	1	1
Women Groups	2	2
Youth groups	1	1
NGO Founded		
Pastoral association committee	3	3
Relief committee	2	2
Govt Agencies		
Ministry of Education	2	1
Ministry of Health	1	2
Ministry of Internal Security	2	2
NGO Agencies		
Save the Children	5	5
ALDEF	5	5

Conflict Resolution

Conflicts over resources in Katotey differed from other villages. Access to forests was the highest ranked cause of conflict followed by water, pasture and mines. However, as in other villages, the community did not restrict users from construction or consolidation of new resources such as digging new wells or fencing off areas for homesteads and agriculture.

Most frequent conflicts were between residents and non-residents from the same region and clan followed by conflicts between residents of Katotey itself. Resolution of conflicts between local and non-local stakeholders were resolved through mediations by committees of the two villages. Inter village committees have been formed in the past, with members from Katotey, to mediate between local and non-local stakeholders over access to pasture. The government or a third party arbitrator is called upon to mediate in cases where the inter-clan or inter-village committee is unable to mediate successfully. Cases of conflict within committees are referred to the peace committee of the village for resolution.

Elders did not consider it important to restrict access to resources based on origin of the stakeholder, regardless of region or clan. However they considered the management of public assets in the village to be the responsibility of the local committee. They added that they would levy a small fer for the use of such assets in order to generate funds for their maintenance. There were no restrictions on access to resources to other stakeholders at time of scarcity.

Elders were supportive of any additional project that may come about for management of natural resources. They felt they would be able to form a new committee to meet the requirements of any such project. The existing village resource management committee would be in a position to advise and guide on the formation of such a new committee if required. The community would approach both the government and NGOS for funds to set up new assets or manage any assets created by such projects.

Potential for interventions

Katotey has a reliable water resource, to the extent that some of the shallow wells aren't used until the peak of summer. The one exception to this is the Korhale well which is in disuse owing to highly turbid water, only suitable for livestock.

The village has a number of farmers, each with their own wells, who cultivate, paw-paw, maize and tomatoes during the rainy season. Farming is an activity that many[7] individuals are interested in and are awaiting support from government or other programmes in the form of subsidy.

Additional activities that could be considered are harvesting of surface flows from streams[8] by enhancing local depressions and creating check dams or through installation of recharge wells. These interventions may be important to ensure conjunctive water use and recharge of aquifers, especially in light of the community members intending to take up agriculture on a larger

Figure 17: *The solar powered Masjid Well is one of many reliable water sources at Katotey.*

[7] About 20 persons were interested in farming as per our respondents.

[8] The road to Tarbaj turns into a stream during rains.

scale. Sites, such as those in figure 18 could be ideal for this.

Contour bunds to check erosion and increase soil moisture could also be considered in large parts of the catchment.

Figure 18: *Limestone from the shallow aquifer reaches the surface near a natural stream.*

Sitawario (250 households)

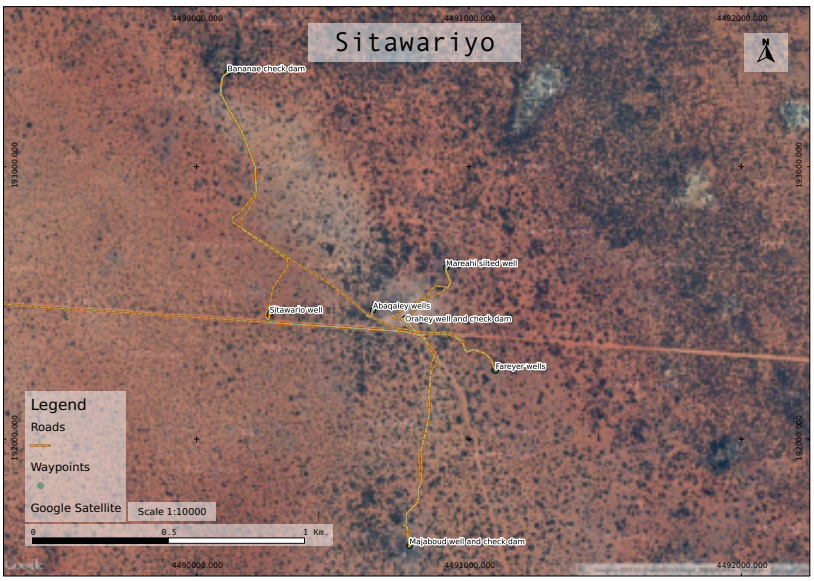

Figure 19: *A mosaic of Google Map based satellite imagery over the Sitawario village with some waypoints and roads displayed. The source data is scaled to 1:5000 which conforms to a cadastral scale and allows users to mark and identify features easily visible on the satellite image.*

History

Sitawario is a settlement of 250 households. It was founded by Abdullahi Abidi in 2005, when he shifted from Lakoley due to death of livestock. All members of Sitawario were pastoralists when it was settled, however livelihoods have diversified to include firewood sales, quarrying, trading livestock, shop keeping and running restaurants.

The settlement has always comprised of one clan - Degodia. Its assets have grown from only livestock and pasturelands to include a school, water points and reservoirs.

The settlement has faced three major disasters since its foundation. In 2006, the Boyad drought caused disease, malnutrition and starvation amongst children. The village also lost livestock due to lack of water and disease. To cope, the community organised water trucking through contributions. This was supplemented by aid agencies. The second drought, ”Othikaweyn”, hit the area in 2009 and led to out-migration to Diff, near the Somali border. There was disease and malnutrition among children accompanied by the lack of water. Livestock died of thirst and disease and had to be buried. Agencies such as Save the Children provided water trucking and health facilities to cope with the disaster. Finally, in 2011, the “Kalacarar” drought brought with it disease and malnourshment for children. Livestock was lost again due to disease. Coping strategies adopted included seeking out veterinary health interventions and de-stocking of livestock by NGOs. External agencies such as Save the Children stepped in again to provide water trucking and health care for children.

Resources and Livelihoods

Sixty percent of the livestock at Sitawario comprise of shoats, which camels adding another fifth to the livestock population. Camels are also the only

Table 28: *Livelihood diversification at Sitawario.*

Occupation	Income	People engaged
Pastoralism	10%	10%
Quarrying	10%	20%
Mira Sales	10%	10%
Agriculture	0%	0%
Firewood Sales	20%	50%
Livestock Brokering	0%	0%
Shop keeping and eateries	50%	10%

Table 29: *Demography of Sitawario.*

Breakup	Percentages
Men	5%
Women	15%
Children (5-15)	30%
Infants (<5)	35%
Elderly (>60)	15%

Table 30: *Proportion of livestock at Sitawario.*

Livestock	Percent
Sheep	15%
Goats	45%
Camels	20%
Cattle	5%
Donkeys	10%
Chicken	5%

animal which is grazes mostly on non-local pasturelands, the rest confining themselves to the vicinity of the village for the bulk of the year.

This indicates a significant grazing pressure exists in the pastures in and adjacent to the village. Livestock comprise the bulk of the asset ownership in the village. Infrastructural assets in the village are limited to the school and roads which are owned by the community or government and the water points, about half of which are privately owned.

Wealth ranking in the village placed 60% of the households in the very poor bracket followed by poor at 30% and the rest falling into the category of average wealth. Most very poor households had assets limited to 2-5 shoats, a shelter and utensils. Other than pastoralism, they pursued fuel sales as their principal occupation. Households in the "poor" classification owned about 10 shoats, and a cow in addition to a shelter. They too pursued pastoralism and supplemented their incomes through fuel sales and charcoal production. Households of average wealth owned about 20 shoats, a couple of cows and donkey carts which was rented out for income in addition to earnings from pastoralism. They also owned shops and ran small businesses.

A ranking of resources gave a higher importance to water and forests than pastures. However in terms of users, pastoralism ranked second and more people appeared to be engaged in farming than firewood collection and sales. Seasonality of resource quality and availability, natural hazards and occupations was documented on a chart replicated below. Other than fuelwood collection and quarrying, Jiilaal was the most stressful season in terms of resources and frequency of hazards. However in terms of occupations Jiilaal brought with it higher sales of fuelwood, milk, livestock and qarrying - making it a good season for traders and labourers. The rainy seasons of Gu' and Deyr were the most productive for pasturelands and water resources, however they brought with them floods and associated diseases of children and livestock.

Table 31: *Levels of migratory grazing between livestock at Sitawario.*

Livestock	Months local	Months non-local
Sheep	83%	17%
Goats	83%	17%
Camels	25%	75%
Cattle	100%	0%
Donkeys	100%	0%
Chicken	100%	0%

Table 32: *Asset ownership in Sitawario.*

Infrastructure	Private	Community	Govt
School	0%	40%	60%
Water Points	40%	30%	30%
Roads	0%	40%	60%

Table 33: *Importance and number of users for major resources at Sitawario.*

Resource	Importance	Users
Pasture Lands	20.00%	30.00%
Shallow Wells	35.00%	35.00%
Forests/Trees	30.00%	15.00%
Farming	15.00%	20.00%

Table 34: *Seasonality of resources, employment and hazards at Sitawario.*

	Jiilal (Jan-March)	Gu' (Arp-June)	Xaaga (Jul-Oct)	Deyr (Nov-Dec)
Resource Availability				
Pasturelands	10%	40%	0%	50%
Water Sources	10%	40%	0%	50%
Wood/Forests	40%	10%	40%	10%
Quarry	40%	10%	50%	0%
Hazards				
Drought	40%	10%	50%	0%
Flood	0%	40%	0%	60%
Disease in Children	40%	10%	10%	40%
Disease in Livestock	40%	10%	10%	40%
Occupations				
Pastoralism	10%	40%	0%	50%
Agriculture	0%	40%	0%	60%
Firewood Sales	40%	10%	40%	10%
Quarrying	40%	10%	50%	0%
Livestock Business	40%	10%	40%	10%
Milk Sales	30%	10%	40%	20%

An analysis of local institutions showed that two kids of community based organisations existed in Sitawario - those facilitated by the government and by NGOs and those which were locally instituted. The school, health and peace committees were considered the most important. However in terms of access, the health management committee scored very low.

Analysis of external institutions, i.e. government agencies and NGOs brought out the dissatisfaction with the government health system and pointed to the need but lack of agricultural support. Education and security however ranked above the others. Two NGOs, Save the Children and ALDEF were operational in the region (table 36).

Discussions with elders about resource management and conflict resolution were conducted.

Table 35: *Analysis of institutions, their importance and accessibility by the community at Sitwario.*

Organisation	Importance	Access
Founded by govt. and NGOs		
School mgmt. committee	3	3
Health mgmt. committee	6	0
Village health committee	2	2
Locally founded Agencies		
Local Peace Committee	3	3
Relief Committee	2	2
Women Groups	1	1
Water Users Committee	0	0

Table 36: *Analysis of institutions, their importance and accessibility by the community at Sitawario.*

Organisation	Importance	Access
Government Agencies		
Ministry of Education	3	3
Ministry of Health	0	0
Ministry of Agriculture	1	1
Ministry of Internal Security	2	2
Non-government Agencies		
Save the Children	3	3
ALDEF	2	2

Conflict Resolution

Elders ranked access to water as the most common cause of conflict followed by access to pasture, forests and mines. Construction or consolidation of resources such as new shallow wells, homesteads or farms were not seen as causes for conflict. Most conflicts occurred within the settlement or with non-residents from the same region and clan. Conflicts between the latter were dealt with by inter-clan and inter-village committees. The elders were part of the inter-clan and inter-village committees that were consulted for mediation and conflict resolution. The government plays the role an arbitrator when conflicts between local and non-local stakeholders are not resolved by the inter-village committees. The government appointed chief also plays arbitrator in case of conflicts within village committees in case they are not resolved internally.

The elders felt that any additional water resources constructed for the community should only be used for domestic purposes in times of scarcity. Such assets would be managed and maintained by the local water user committee. When asked about the ability of the community to manage large tracts of pasturelands, the elders felt that if such projects were initiated, an appropriate committee would be constituted. Existing village committees for managing natural resources would be consulted in such an event. The elders were confident about setting up appropriate management frameworks for watershed scale initiatives and mobilise participation for any such effort. They however indicated that government or NGOs would be sought out for funds to initiate any large infrastructural investment or repair of existing infrastructure.

Figure 20: *The Orahey dam. Note the darkened clays in the depression to the left of the photograph. The dam may be an ideal site for an artificial recharge structure.*

Potential for Interventions

The five most important water resources of Sitawario comprise of four wells and one natural depression. The former dry up during both the dry seasons, while the latter is only function during the long Deyr rains. The depth of water in the wells rarely exceeds 3 feet and one of them, Majabow, has saline water. Most of the wells are used primarily for domestic supply while the depression is largely for livestock use.

Sitawario, unlike the other settlements surveyed, has a lateritic soil which forms a layer, many metres thick in places, over the limestone aquifer on

which the community depends. Initial surveys suggest[9] that this layer probably reduces the local recharge of the aquifer. The potential for interventions in water harvesting and soil and water conservation include:

1. The Orahey dam lies just below the Orahey wells which were ranked as the second most important water source for the village. The site may provide an opportunity for artificial recharge of the local aquifer.

2. The Bananey dam is another location where water harvesting could be done for a pan dam, or, depending on the geology, a recharge structure. However, the dam is a little distant from the village which makes it a better location for providing water to livestock.[10]

3. Contour bunds could be constructed in many areas around the village. The soil appears to have sufficient quantity of clay and nutrients to build long lasting structures which will rapidly result in regeneration of grasses and saplings. Saplings of appropriate species could be planted in conjunction with such soil and water conservation structures.

4. Given the low levels at which water is available, deepening of some of the shallow wells could be considered as an immediate intervention. However this needs to be preceded by a hydrogeological assessment to gauge the depth and extent of the aquifers themselves.

[9] As in other sites, these are preliminary observations which need to be corroborated by a more thorough hydro-geological survey of the sites. Soil and water tests would provide important information about the potential productivities of these soils.

[10] It should be noted that having open water bodies (and wells) near settlements provides breeding grounds for disease vectors.

Figure 21: *Bananey dam, another potential site for ground water recharge. The number, foilage and size of trees indicates moisture not too far below the ground.*

Qajaja I

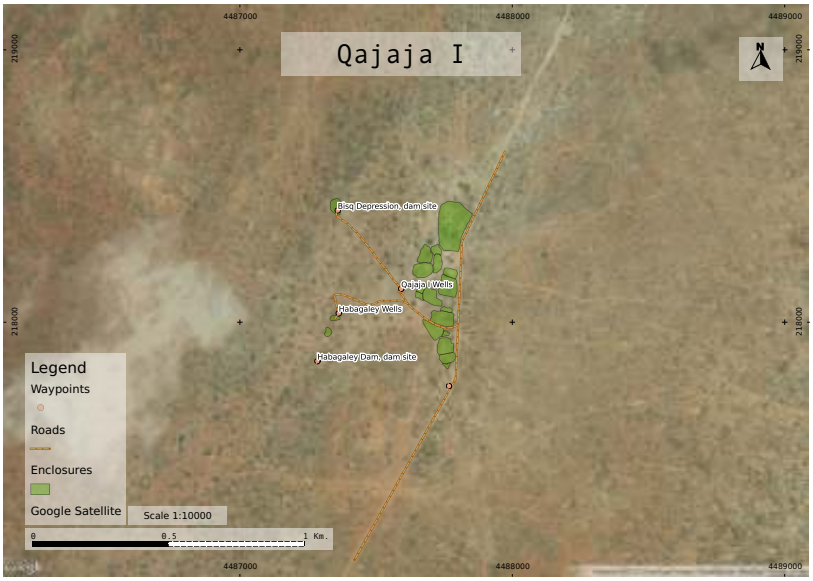

Figure 22: *A mosaic of Google Map based satellite imagery over the Qajaja I village with some waypoints, enclosures and roads digitised. The former were collected with a handheld GPS unit. The source data is scaled to 1:5000 which conforms to a cadastral scale and allows users to mark and identify features easily visible on the satellite image.*

History

Qajaja I is a settlement of 500 households which was first settled in 1988 . The site was selected by an initial three families which moved here after the El Nino rains, as it had water. These three families were headed by Maalim Khalil, Hassan Adan and Hssein Shale. The settlement has grown to about 500 families over the past fifteen years.

The inhabitants have faced four major disasters in the decade and a half since the village was formed. The drought "Tabarta Ugasar" in 2006 led to disease and malnutrition in children and to the loss of livestock due to disease. The community coped through migrations to Somalia and the provision of food aid and water trucking by aid agencies.

The second drought in 2009-2010 called "Kalaluut" caused similar distress among children and loss of livestock. Coping strategies too remained similar with migrations and dependence on external agencies for food and water. Just an year later the community was hit first by the "Looba'ay" drought and shortly afterwards by the "Mashquul" floods. The drought caused malnutrition and disease in children and resulted in loss of livestock due to the familiar cycle of lack of water and disease. Coping strategies for the drought also remained more or less the same, however this time the village was covered under the Blanket Supplementary Feeding Program (BSFP). Food and water aid from external agencies continued. The floods that followed resulted in widespread diseases in both children and livestock. Many households had to be shifted to higher ground as a result.

Resources and Livelihoods

The village is comprised entirely of the Degodia clan which is the dominant group in the region. Dependence on natural resources remains high in the community around which the bulk of occupations are centred.

Table 37: *Demography of Qajaja I.*

Breakup	Percentages
Men	5%
Women	11%
Children (5-15)	26%
Infants (<5)	53%
Elderly (>60)	5%

Table 38: *Livelihood diversification at Qajaja I.*

Occupation	Income	People engaged
Pastoralism	37%	30%
Mira Sales	5%	4%
Firewood Sales	16%	26%
Livestock Brokering	16%	13%
Shop keeping and eateries	26%	100%

Livelihoods have also diversified over this period, from the traditional occupation of pastoralism to various trade related occupations including collection and sale of firewood, gum and resin from trees, livestock trading, sale of miraa, shop keeping and canteens. Agriculture is also being practices during the rainy seasons.

Assets in the settlement have also grown from livestock and pastureland to include a school, a few water points and reservoirs. The bulk of these are owned and managed by the community or the government, including the water sources which is a departure from most other settlements surveyed during this study. The settlement is located on the Wajir road which probably plays an important part in the growth of trade related occupations.

Eighty percent of the livestock at Qajaja I are comprised of shoats and camels all three of which are grazed in pasturelands outside the village. Cows, which mostly range in the vicinity of the village constitute 10% of the livestock followed by donkeys and backyard chickens, which are used locally as draught animals and food.

In terms of relative wealth, the community considered 70% of its inhabitants to be very poor with assets limited to up to 3 chickens, 1-4 shoats and a household size of 8 to 10. Households in this group typically depend on causal labour and fuelwood sales. The second category, poor households, comprise 20% of the population. Their assets are limited to 3-5 chickens, 4-7 shoats, a couple of cows, a camel and a donkey. Household size in this wealth category is 10 to 12 members and they depend on pastoralism, transport of materials, labour and fuelwood sales for livelihood. The households considered to be of average wealth comprise the rest of the village population. Their assets are shoats exceeding 7, donkey carts, 2-4 cows and upto 5 camels. Their primary source of income is pastoralism and transportation.

Analysis of seasonality of resources, natural hazards and employment in various occupations showed that Jiilaal, the dry winter, was the most stressful in terms of hazards and availability of resources. However, it was also the season when trade in livestock and milk was the highest along with relatively high levels of migratory grazing. The two rainy seasons were the most productive in natural resources as is to be expected. However the abundance of water contributed to higher incidence of diseases in both children and livestock. These details have been summarised in the table below.

Table 39: *Asset ownership in Qajaja I.*

Infrastructure	Private	Community	Govt
School	0%	30%	70%
Water Points	10%	60%	30%
Roads	0%	20%	80%
Market	0%	80%	20%

Table 40: *Proportion of livestock at Qajaja I.*

Livestock	Percent
Sheep	30%
Goats	25%
Camels	25%
Cattle	10%
Donkeys	5%
Chicken	5%

Table 41: *Levels of migratory grazing between livestock at Qajaja I.*

Livestock	Months local	Months non-local
Sheep	33%	67%
Goats	33%	67%
Camels	25%	75%
Cattle	75%	25%
Donkeys	100%	0%
Chicken	100%	0%

Table 42: *Importance and number of users for major resources at Qajaja I.*

Resource	Importance	Users
Pasture Lands	25%	25%
Shallow Wells	35%	35%
Forests/Trees	25%	25%
Farming	15%	15%

	Jiilal (Jan-March)	Gu' (Arp-June)	Xaaga (Jul-Oct)	Deyr (Nov-Dec)
Resource Availability				
Pasturelands	10%	40%	0%	50%
Water Sources	10%	40%	0%	50%
Wood/Forests	40%	10%	40%	10%
Hazards				
Drought	40%	0%	60%	0%
Flood	10%	40%	0%	60%
Fire	40%	0%	60%	0%
Disease in Children	10%	30%	10%	50%
Disease in Livestock	10%	30%	10%	50%
Occupation				
Pastoralism	30%	20%	40%	10%
Agriculture	0%	40%	0%	60%
Firewood Sales	40%	10%	40%	10%
Livestock Business	40%	10%	50%	0%
Milk Sales	20%	30%	10%	40%

Table 43: *Seasonality of resources, employment and hazards at Qajaja I.*

Institutional analysis carried out in the village showed there were five community based organisations in the village, two of which were formed by the government and NGOs. The village peace and health committee was considered the most important of these.

All six external institutions, four of which were government agencies, were ranked equally high in importance. Access to these institutions however varied from being very high in the case of the Ministry of Education and Save the Children to limited, as in the case of the Ministry of Agriculture.

Table 44: *Analysis of institutions, their importance and accessibility by the community at Qajaja I.*

Organisation	Importance	Access
Founded by govt. and NGOs		
School mgmt. committee	2	4
Village health committee	3	2
Locally founded Agencies		
Local Peace Committee	4	3
Relief Committee	2	2
Women Groups	1	4

Table 45: *Analysis of institutions, their importance and accessibility by the community at Qajaja I.*

Organisation	Importance	Access
Government Agencies		
Ministry of Education	5	4
Ministry of Health	5	3
Ministry of Agriculture	5	2
Ministry of Internal Security	5	1
Non-government Agencies		
Save the Children	5	5
ALDEF	5	3

Conflict Resolution

Access to water, pasturelands, forests and mines, in that order, were listed as the most frequent causes of conflict over natural resources. Elders, who were spoken to for this part of the survey also clarified that construction of new water sources or consolidation of homesteads and farmlands were permitted and not a cause of conflict. Most conflicts arose between members of the same settlement and were resolved within the village by a peace committee. In instances when these conflicts involved other settlements, inter-village or inter-clan committees were called upon. Elders from Qajaja I were a part of mediation efforts of this nature and participated in inter-village and inter-clan committees. In the event that these committees are unable to resolve disputes or arrive at a consensus, the government is called in as a third party for arbitration. Conflicts within the village committees themselves are arbitrated by the peace committee.

There was unanimity that resources such as water sources and pastures in the vicinity of Qajaja I were open to members of other villages and clans. In the event that new resources were to be created, a committee from Qajaja I would be set up to manage them. Access to water during times of scarcity is regulated so that domestic use gets a higher priority than livestock or agriculture. Non-residents are however allowed to use these resources.

In the event of a new project, the clan and village committee would provide

the basic framework for constituting a new committee. The elders extended their support to any such development in Qajaja I. However, their sources of funds to meet costs of infrastructure creation or maintenance remain the government or NGOs in the region.

Potential for Interventions

Particiapants listed four major sources of water during the survey of which two were wells and two were natural depressions. While the wells are a perennial source of water, the water levels range between one and six feet.

The natural depressions in Qajaja I offer opportunities to explore recharge of local shallow wells as well as creation of pan dams for livestock.

1. The Bisq depression, for instance, retains water for some months after the monsoon, even though it is a small depression. The depression falls along the main drainage way and appears to be an outcrop of the primarily limestone aquifer of the region. The site might provide an opportunity to create a sub-surface dam which would extend the period for which it retains water.[11]
2. The Habaqaley wells and adjacent dam is another potential site for augmenting recharge of the local aquifer through harvesting rainfall. It could also be used as a pan dam by extending the size if the depression, clearing the inlet channels and providing suitable inlet and overflow weirs to arrest siltation and provide a route for excess water.

Other activities possible in the village include soil and water conservation activities in the catchment of the major stream. This would improve the quality of pasture in the vicinity of the village and assist in the regeneration of saplings and trees.

Figure 23: *The Bisq depression, a small but reliable source of water for humans and livestock.*

[11] Based on a hydrogeological survey.

Figure 24: *The Habaqaley well and just beyond it, the potential dam site, being inspected by Anthony.*

Qajaja II

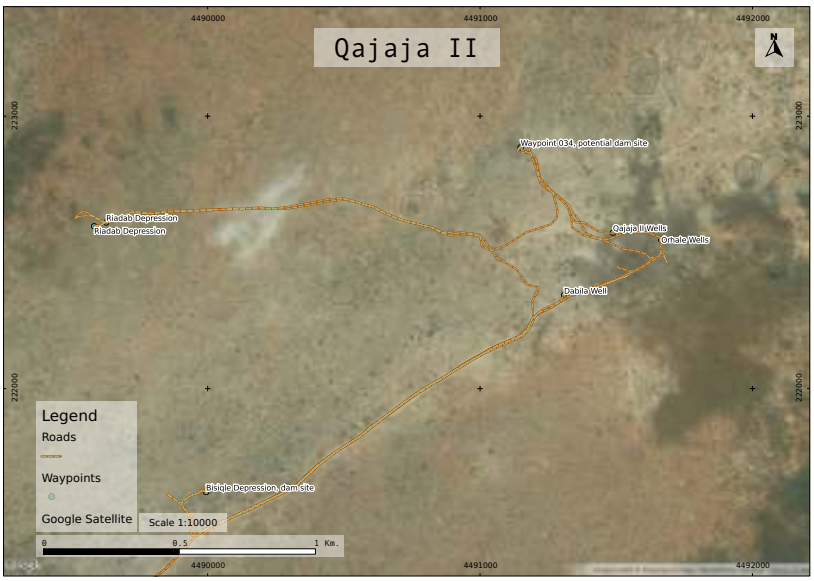

Figure 25: *A mosaic of Google Map based satellite imagery over the Qajaja II village with some waypoints, enclosures and roads digitised. The former were collected with a handheld GPS unit. The source data is scaled to 1:5000 which conforms to a cadastral scale and allows users to mark and identify features easily visible on the satellite image.*

History

Qajaja II, about 6 km further down the road from Qajaja I, is another settlement of 500 households

. Qajaja II was founded in 1997. The site was selected by Mohamed Yunis who hailed from Khorofharar village. He found it a suitable location for a shop to sell materials to pastoralists who'd use the local grazing grounds. The occupations in the settlement have diversified to firewood sales, livestock trading, shop keeping, canteens, sales of miira, tree gum and resin. Agriculture is also practised in Qajaja II during the rainy season.

The social composition of the settlement is limited to a single clan - Degodia. The assets and infrastructure in the village have grown to include a school, a (non-functional) hospital, water points and a mosque. All the major assets in Qajaja II are owned by the community or the government.

There have been two major disasters that the village has faced since its formation. During the period 2007-2009 a major drought "Othikaweyn" struck the area causing malnutrition, disease[12] and death in children and disease the loss of livestock. Many households migrated to Diff and Gerille to escape the drought and the government and aid agencies stepped in with water trucking and food distribution. This was followed by floods in October 2011 called "Aran" which swept away livestock, houses and roads and made the village inaccessible. Disease broke out in the aftermath of the flood and most of the village moved to the school for shelter.

Livelihoods and Resources

Pastoralism remains the most important source of livelihoods in the settlement, employing nearly 40% of the population. This is followed by livestock trading and agriculture, the latter being a seasonal activity pursued by about 15% of the population.

Table 46: *Demography of Qajaja II.*

Breakup	Percentages
Men	5%
Women	15%
Children (5-15)	25%
Infants (<5)	50%
Elderly (>60)	5%

Table 47: *Asset ownership in Qajaja I.*

Infrastructure	Private	Community	Govt
School	0%	40%	60%
Hospital	0%	30%	70%
Water Points	0%	80%	20%
Roads	0%	30%	70%
Market	0%	70%	30%

[12] Described as "Deyr gunduf"

Table 48: *Livelihood diversification at Qajaja II.*

Occupation	Income	People engaged
Pastoralism	29%	38%
Mira Sales	11%	8%
Agriculture	3%	15%
Firewood Sales	17%	8%
Livestock Brokering	23%	27%
Shop keeping and eateries	17%	4%

Table 49: *Proportion of livestock at Qajaja II.*

Livestock	Percent
Sheep	25%
Goats	31%
Camels	19%
Cattle	13%
Donkeys	6%
Chicken	6%

Three quarters of all livestock in the village is comprised of shoats and camels. The latter, in what is a deviation from other settlements, are grazed close to the settlement. Shoats however, are grazed in pastures outside the settlement for the bulk of the year.

Other natural resources considered important by the village include shallow wells, forests and agricultural lands. Shallow wells are considered most important of these, followed by pasturelands and forests.

Comparative analysis of wealth in the village revealed a trend similar to other villages. Half the households were considered to be very poor with assets being limited to not more than five chickens and main occupations being casual labour and fuelwood sales. Poor houses comprises another 40% of the village. Their assets included about four shoats and their occupations were pastoralism and gum collection and sales. 10% of the village was considered to have average wealth which comprised of about ten shoats, a couple of camels and shops and canteens. Their occupations included trading and running shops apart from pastoralism and collection and sale of gum.

Analysis of seasonality in Qajaja II showed that both the dry seasons were a time of stress with fewer resources and higher incidents of disease, drought and fires. In terms of trade, however, these were the most lucrative seasons as well. Agriculture was limited to the long rains which was also the period when pasturelands were the most productive.

Table 50: *Levels of migratory grazing between livestock at Qajaja I.*

Livestock	Months local	Months non-local
Sheep	42%	58%
Goats	42%	58%
Camels	75%	25%
Cattle	75%	25%
Donkeys	100%	0%
Chicken	100%	0%

Table 51: *Importance and number of users for major resources at Qajaja II.*

Resource	Importance	Users
Pasture Lands	30%	30%
Shallow Wells	35%	40%
Forests/Trees	20%	20%
Farming	15%	10%

Table 52: *Seasonality of resources, employment and hazards at Qajaja II.*

	Jiilal (Jan-March)	Gu' (Arp-June)	Xaaga (Jul-Oct)	Deyr (Nov-Dec)
Resource Availability				
Pasturelands	20%	40%	0%	40%
Water Sources	10%	40%	0%	50%
Wood/Forests	40%	10%	40%	10%
Hazards				
Drought	40%	0%	60%	0%
Flood	0%	40%	0%	60%
Fire	40%	0%	60%	0%
Disease in Children	20%	20%	40%	20%
Disease in Livestock	20%	20%	40%	20%
Occupation				
Pastoralism	30%	20%	30%	20%
Agriculture	0%	40%	0%	60%
Firewood Sales	30%	10%	40%	20%
Livestock Business	30%	10%	50%	10%
Milk Sales	30%	10%	50%	10%

Table 53: *Analysis of institutions, their importance and accessibility by the community at Qajaja II.*

Organisation	Importance	Access
Founded by govt. and NGOs		
School mgmt. committee	5	5
Village health committee	3	3
Locally founded Agencies		
Local Peace Committee	5	4
Relief Committee	3	1
Women Groups	2	2
Water Users Committee	4	3

An analysis of different institutions active in Qajaja II showed that the community had a number of local institutions and also maintained contacts with the government and non-governmental agencies. Among the community based institutions, the school management committee and the peace committee were the most important followed by the water users committee.

Among the non local agencies, the Ministry of Education and Ministry of Health were considered the most important followed by ALDEF, the Ministry of Internal Security and Save the Children (table 54). Access to all these agencies was average, with there being higher expectations from the Ministry of Health.

Conflict Resolution

The major cause of conflict over resources in Qajaja II is access to pasture followed by access to water, forests and access to mines being the lowest rank. As in other villages, no restrictions are imposed on constructing or consolidated new resources such as wells, homesteads or farms. Most conflicts occur within members of the community and are resolved by the local committee. In case they spill over and involve other villages or clans, inter-village or inter-clan committees taken on the role of resolving the issues. The government plays the role of arbitrator in case either the intra village or inter-village / inter-clan committees are unable to resolve the matter within them. The village chief also plays the role of arbitrator in case there is a conflict within the intra village committees.

The elder were keen to show support for any development initiatives that might be taken up in Qajaja II. They felt confident that existing village and clan committees would be able to form a new management framework for NRM related projects and interventions. On being asked about their ability to raise funds for new infrastructure or to maintain and restore infrastructure created by such projects, they said they were dependent on external funds from the government and non-government agencies.

The effectiveness of the internal village organisation has been tested not only during conflict resolution, but also in the extinguishing of bush fires for which the villagers were able to organise sand and put out the fire.

Table 54: *Analysis of institutions, their importance and accessibility by the community at Qajaja I.*

Organisation	Importance	Access
Government Agencies		
Ministry of Education	5	4
Ministry of Health	4	2
Ministry of Internal Security	3	3
Non-government Agencies		
Save the Children	3	5
ALDEF	4	4

Potential for Interventions

Qajaja II has a number of areas where interventions can be made for ground water recharge, surface storage and soil and water harvesting using contour bunds[13]. Among its prominent water resources are the Qajaja, Orhale and Dabila wells, all of which dry up during Jiilaal and Xaaga - the dry seasons. The water levels in these wells don't go above three to four feet of storage. Consequently the village depends on water trucking during the dry season.

The government has constructed a large checkdam by enhancing the Riadab depression , about two kilometres from the main settlement. The dam, however, doesn't hold water for more than a few months, possibly because it doesn't have any clay on its surface. Apparently, the recharge that might take place by the dam doesn't impact the shallow wells.

The community is very keen that the Orhale wells are treated as a priority for restoration. However, this site does not provide any natural depression or potential for harvesting or recharging rain water. Further the site has little top-soil and the exposed lime stone is not going to support much by way of vegetation.

On the other hand there are two depressions - one marked by waypoint 034 (see map), merely 400m from the Qajaja II wells, and the Bisiqle depression, provide a good opportunity for constructing checkdams. The Bisiqle depression, in particular, has naturally occurring clay which would retain the water in the dam for much longer. Hydrogeological surveys would help to determine whether the dam site at waypoint 034 can be used for creating an artificial recharge structure to help recharge the Qajaja II wells.

[13] Sites for contour bunding will need to be selected carefully as most of the soil is loose sand and shallow.

Figure 26: *Govt. constructed check dam that enhances the Riadab depression at Qajaja II.*

Figure 27: *The Bisiqle depression has naturally occurring clay at its base and provides an ideal site for surface water harvesting.*

Spatial Data

Introduction

This section presents the maps and spatially explicit data that was collected from field or derived from other sources. Links to the data are provided in the margins along with the "type" of dataset and its formal citation if it is from other sources[14]. Examples of how these datasets may be used have also been provided along with the source. For users who are not interested in the data, but in the maps, the entire dataset is being hosted on a QGIS Cloud Server as well. Links to the maps are being provided below each dataset which can be accessed using the Q-GIS cloud client plug-in within the Quantum GIS package.

[14] Please note that the approximate size of the file is noted in brackets. In some cases, we are not permitted to share the dataset directly and you're pointed to the source of the data. Please cite all the data as indicated in the citation note.

Primary Datasets

Village Maps

The following vector layers were digitised

- Enclosures. These in turn comprised of
  - Shallow wells
  - Farms
  - Homesteads and other structures

  These were digitised based on resource mapping exercises and using the Google Maps based base layer. Data was added to the maps[15] during the second phase of the field trips . The backdrop layer with major land marks was printed out and community members drew on it directly. GPS locations of major water resources were also collected and mapped on the base layers.

[15] Eladow, Kulaley and Leheley. Other villages may be added subsequently by the SC team.

- Roads and tracks
  These were based on GPS tracks created during the field surveys and by digitising visible tracks from the base Google Map layer.

Five major water resources of the village were identified during the second mapping exercise. All of these comprised of clusters of hand dug shallow wells. These wells are largely utilised for non-agricultural use, with the exception of some of the farms. A mosaic of Google Layers tiles was used as a high resolution backdrop to the vectors.

Derived Datasets

Base Layer

A series of high resolution images were downloaded from Google Maps[16] and mosaicked to provide a background on which village resources could be identified. This layer served as the background for the cadastral mapping of the village.

[16] http://maps.google.com

Watersheds

Elevation maps from ASTER[17] were used to derive basin boundaries and streams using a thresholds (from 20 to 100 ha). This provided information on the extents and shape of watersheds that comprised catchments or drained into important resources such as shallow well and grazing areas.

[17] http://asterweb.jpl.nasa.gov/gdem.asp

Primary Productivity

Net Primary Productivity (NPP) from MODIS[18] which provides an annual total of 8 day net primary productivity measures.

[18] http://modis.gsfc.nasa.gov/data/dataprod/dataproducts.php?MOD_NUMBER=17

Hydraulic Layers

Modelling routines were used to identify areas likely to receive flooding, flow lines and accumulation of run-off along these flowlines.

Other Sources of Data

A selection of sources of data which would be useful for implementation, planning and monitoring teams active in Wajir have been provided below. This list is, by no means, complete and will be updated from time to time.

European digital archive of soil maps[19]

This archive preserves and makes available soil datasets across the world. Maps are mostly available as scans of originals as JPG images.

[19] http://eusoils.jrc.ec.europa.eu/esdb_archive/eudasm/africa/lists/cke.htm

World Resources Institute

Potential Natural Vegetation Map of Eastern Africa[20]

This site makes available maps for the region as google layers and also provides links to vegetation maps from other sources [21]

[20] http://www.vegetationmap4africa.org/

[21] http://vegetationmap4africa.org/vegetation-map/other-resources.aspx

Africa Ecosystem Mapping - USGS[22]

The USGS RMGSC has modeled the distribution of terrestrial ecosystems for Africa which delineates ecosystems by their major structural elements. Maps are available as JPG images or via their viewer[23].

[22] http://rmgsc.cr.usgs.gov/ecosystems/africa.shtml

[23] http://rmgsc.cr.usgs.gov/ecosystems/dataviewer.shtml

ISRIC - World Soil Information Database[24]

[24] http://library.wur.nl/isric/

This is a large digital database of maps, reports and books compiled from a range of sources which deal mainly with soil but also , geomorphology, geology, vegetation, landuse and land suitability. Among the maps in its archives are those of Wajir from the Range Management Handbook of Kenya (Schwartz et al., 1991).

Africover[25]

[25] http://www.africover.org/

This is a well documented catalogue of maps dealing with a range of environmental resources for ten countries including Kenya. Africover requires you to create an account and make individual request for the maps. These are not available for commercial purposes. The site provides ample metadata and supporting information about the maps, including methods and procedures followed for their creation.

WorldClim - Global Climate Data[26]

[26] http://www.worldclim.org/

This is one of the global standards of free climate data for ecological modeling and GIS for non-commercial use. Detailed methods used to generate the datasets are available in the accompanying publication(Hijmans et al., 2005).

SWALIM[27]

[27] http://www.faoswalim.org/

Somalia Water and Land Information Management provides an GeoNetworks based interface to download a range of maps, both raster and vectors, for the Somalian region. The maps come with exhaustive metadata and are free for non-commercial use.

USGS/FEWS Net[28]

[28] http://earlywarning.usgs.gov/fews/

Source of satellite data connected with the Famine Early Warning System Network. The portal gives access to a mix of derived datasets, satellite data and other geo-spatial datasets. A number of simulation models have also be linked to the portal.

The International Livestock Research Institute[29]

[29] Main site: http://www.ilri.org/gis, GIS portal:http://192.156.137.110/gis/

A collation of datasets collected and created by scientists working at the institute for the past 20 years. The data is available as zipped ESRI shape files or KML files from an easy to use browser and includes layers from other institutes and agencies.

The World Resource Institute[30]

[30] http://www.wri.org/publication/content/9291

The WRI hosts a range of data on Kenya. This is shared along with metadata as zipped ESRI shape files or raster layers in ADF (Arcinfo Binary Grid) format. The data includes a mix of primary as well as derived datasets.

The Global Land Cover Facility[31]

[31] http://glcf.umd.edu/

One of the largest and most used facility for accessing NASA land cover data for the globe, the GLCF provides an easy to use interface for imageries and imagery derived layers. Data hosted on their servers includes:

- ASTER: land surface temperature, reflectance, and elevation.
- SRTM: Elevation maps at various resolutions.
- LANDSAT: Multispectral images of the earth surface, dating back approximately three decades.
- MODIS: Seven band multispectral images from the Terra satellite which are converted into de rived atmospheric, oceanic, and terrestrial products and made available as 16 and 32 day cloud free composites.

Other than this, sample high resolution imagery from Orbview, Ikonos and Quickbird and a range of derived datasets are available.

Google Maps[32]

[32] http://maps.google.com

Base layers used for much of the maps were downloaded from the Google Maps facility.

Further Work

Introduction

This section tries to summarise the ways in which the work done in Wajir could be extended by the existing teams to assist in the implementation of ongoing programmes. It is based on discussions with colleagues at Wajir and in Nairobi. To do so the team needs to equip itself with additional skills and hardware such as GPS units and a data server. Skills required include further training on GIS, particularly the handling and analysis of database attributes and thematic mapping.

Figure 28: *The team is well versed in data collection through participatory exercises and group discussions (shown above) as well as site surveys.*

Updating Existing Layers

Data that is presently available for the layers is sketchy owing to the limited time available for the field trips. This can be updated and extended at regular intervals or as opportunities present themselves. For instance, if a proposal for nutrition gardens is proposed, areas where such gardens could be established can be mapped onto the base layer and relevant attributes such as owners, water availability, soil types etc. could be collected. Information thus collected can provide the basis for monitoring progress of projects and measuring impacts against baselines.

Additional Layers

Information such as salinity levels[33] across seasons at various water points could be collected to create a layer of iso-lines or contours. Methods to do this have been shared with the WASH team. Discussions were also held about the possibility of integrating depth measurements and extraction rates from wells onto a GIS. Inexpensive depth level loggers (capacitance probes), or more expensive pressure transducers can be used to track water levels across seasons and provide the basis for an early warning system.

[33] A number of physio-chemical properties of water can be measured using inexpensive electronic meters. This includes salinity, pH, total dissolved solids, electrical conductivity and temperature.

Extending the Baselines

Colleagues who accompanied the consultant during the field trips are now well versed in the methods used for group discussions and for mapping. They are in the position to extend these surveys to other villages. This might be considered as part of an effort to generate a baseline for the Wajir region.

Studies on Water Markets

Water markets, both formal and informal, appear to play a major role in local economies and determine access to water, particularly in private shallow wells. This has been alluded to in some of the responses during the baseline surveys, however could not be delved into further due to paucity of time. Linked to water markets, are the variants of water trucking which are common. This ranges from donkey carts and camels to large water tankers mounted on trucks.

The who, what, how, when and where of formal and informal water markets needs to be unravelled along with the differential impacts it has on local communities, pastoralists and recipients of water aid and long distance water trucking. Among the lines of enquiry which may be pursued include:

- Identification of the seller and buyer across different scales of operation and types of markets. For instance, local access for a fee as opposed to local transport for domestic use as opposed to long distance trucking to other villages.
- The what in terms of sources of water, its quality and quantity, the different kinds of sources, with a focus on private and public sources as well as bore-holes and the apparatus used to extract water.
- The location of the various water resources and the buyers and how this changes over season and periods of emergency.
- The mode of transportation used for shipping water.
- Water pricing: relation to distance, volume and role of aid/subsidy from the government and other sources.
- Local impacts: do water markets limit the access of local communities to water sources?
- Investments: what is the nature of investment made in terms of infrastructure and how is this financed? In particular, does aid and emergency funding play a role in subsidising and supporting water markets, either through inadvertent financing of bore-holes and pumping apparatus, or inflating the costs of water trucking.

Gender Roles in NRM

A major limitation of this study has been the inability to conduct detailed stakeholder analysis, particularly that of the role of gender and age in access, management and control of resources. To do so requires an alternate methodology which identifies different stakeholders and pursues their interactions further. Areas that need particular attention are:

- Dependence and access to resources and services.
- Institutional representation and importance of women based community organisations in the institutional arrangements both in the village and between women and other institutions.

Additional attention needs to be given to mechanisms through which the representation of children and women can be ensured in programmes implemented by non-government agencies.

Field protocol

Based on learning from the field visits, a simple protocol for field work has been devised which is presented below.

The reader should note that participatory methods require a fair amount of flexibility to adapt to local conditions and unforeseen circumstances. For instance, if there are a large number of literate and educated respondents, data can be recorded on the sheets using text and numbers. In the case of illiterate respondents, one needs to resort to taking notes and representing numbers with dots or sticks.

[34] This link provides pre-formatted data sheets in PDF format. https://docs.google.com/folder/d/0BxykXtTROSU2alJzYWI0cjJQVEE/edit?usp=sharing.

Note that these data-sheets are likely to change and more added in the course of time.

Apparatus

- Data entry sheets (flip charts) with tables drawn on them as provided in the earlier sections[34].
- Dot shaped stickers to attach to the charts, each dot representing a proportion or number.
- Marker pens.
- Blank flip chart sheets.
- Powders of various colours for drawing resource maps on the ground.
- Note books and pens for notes.
- Camera.
- GPS unit for recording way points of landmarks and tracks of major roads.

Human resources

- Surveyors - a mix of genders who know the local language.
- Mappers - should know participatory mapping techniques including GPS based mapping, digitising and attribute management.
- Reporters - should have basic analytical and writing skills to reach conclusions based on maps and data. Should be able to generate thematic maps.

Preparation

- Appointments with the community should be arranged prior to the field visit. In particularly it should be ensured that elders, the chief and other representatives of CBOs are present during the sessions. This visit also should ensure that the community is willing to participate in the survey and understand the purpose of the exercise.
- Timings of the field visit should ideally be such that it minimises the disturbance to the community. This is particularly important if the visit coincides with important social or economic events or involves participants

who have other duties, domestic, social or economic. This also implies that sessions should not last longer than three or four hours.

- All data-sheets should be prepared beforehand, batteries in equipment should be new and all apparatus in order.
- Data, notes, GPS coordinates and photographs collected during surveys should be collated the same day. If possible, these should be digitised and shared by email with concerned staff.

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