Projekt „Wasser für Kinder in Tigray“ Heimberg, 10.02.2023

Das Anliegen, für das wir Unterstützung benötigen, ist dringend: In der durch politische Konflikte und wiederkehrende Dürren geplagten Region Tigray in Äthiopien kam die Wasserversorgung schon immer an ihre Grenzen. Besonders betroffen ist die rasch wachsende Stadt Mekelle, in der sich das grösste Hilfszentrum von Operation Rescue für Kinder befindet. Seit dem Krieg in der Region, mit dem auch grössere Projekte zur Stabilisierung der Wasserversorgung gestoppt wurden, leidet die Stadt unter unerträglicher Wasserknappheit. Selbst, wenn sich die Situation in Zukunft einmal entschärfen würde, bliebe die Versorgung unseres Zentrums mit Wasser sehr kostspielig.

Wir wollen das Problem mit einer Grundwasserbohrung und einer professionellen Wasserfassung lösen. Eine Grabung in unserem Zentrum hat gezeigt, dass bereits in geringer Tiefe Grundwasser vorhanden ist. Für eine genügende Versorgung muss eine Bohrung von 80 Metern Tiefe in die zerklüfteten Kalksteinschichten vorgenommen werden, um auf grössere Vorkommen zu stossen. Das Ziel ist, täglich 53 Kubikmeter Wasser zu fördern, die wir brauchen, um die gut 350 Kinder, Mitarbeitenden und Besuchenden zu versorgen. Wichtig ist uns aber auch, die öffentliche Wasserverteilstation an der Strasse vor unserem Zentrum weiterzuführen, dank der Bewohner und Bewohnerinnen Wasser trinken, sich damit waschen oder Wasser nach Hause nehmen können.

Die Bohrung mit Wasserfassung, Pumpe und allen Installationen kostet total Fr. 27’485.-. Fr - können Sie sich vorstellen, den Rest der Kosten mitzutragen? Wir würden uns ausserordentlich darüber freuen, Sie zu den Trägern des Projekts „Wasser für Operation Rescue in Tigray“ zu zählen und danken Ihnen bereits im Voraus für Ihre Grosszügigkeit.

Auf den nächsten Seiten folgt der ausführliche Projektvorschlag mit Aufschlüsselung der Kosten.

Der Gerne können Sie uns kontaktieren –
wir freuen uns auf Ihre Antwort!

Marciano Teixeira
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Water for Operation Rescue Children's Home

Project Proposal to Drill a Borehole



Mekelle

January 2023

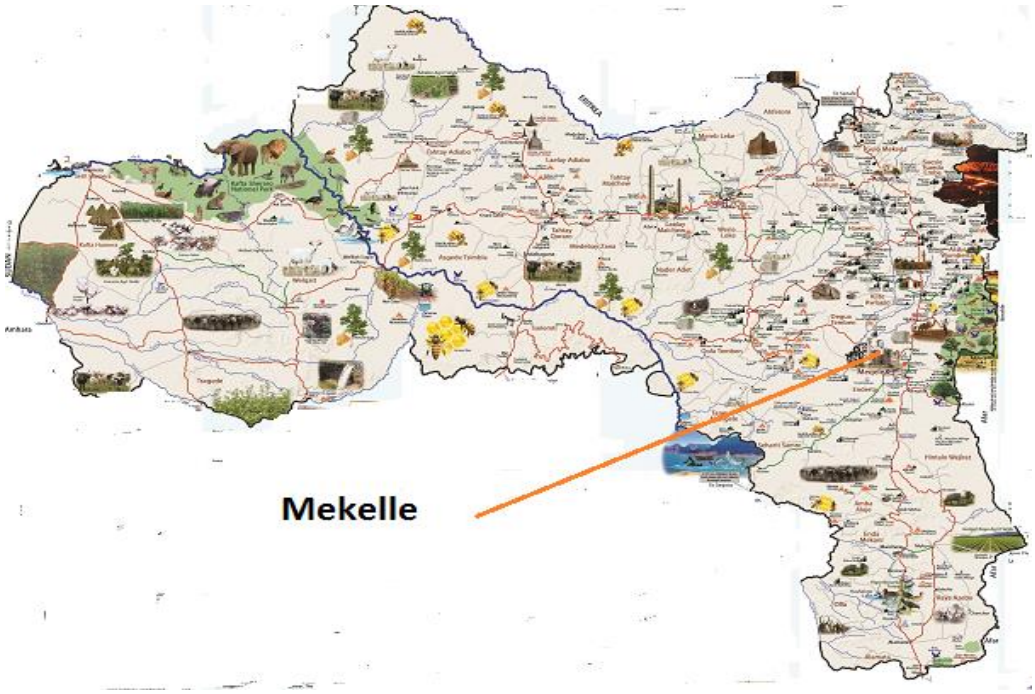
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Location and Accessibility

Tigray region situated in the horn of Africa is one of the eleven regional states of Ethiopia. The Sudan and Eritrea are the countries that border the region in the west and in the north & northeast respectively. And in the east & south the region borders with Afar & Amhara regions which are among the regional states of the country. Mekelle town currently with over 323'000 population is the regional town of Tigray regional state. Out of the said population tens to hundreds of thousands of them are people displaced from western and northwestern parts of the region. Location wise Mekelle is located in the northern part of Ethiopia at about 790 Km road distance from Addis Ababa. The town is easily accessible by both land and air transport. The town having an altitude of 2100 to 2300 m.a.s.l. falls under the Woinadega Ethiopian climatic classification zone.

Map of Tigray



Statement of the Problem

In early years, sources of water supply for Mekelle town were unprotected springs, seasonal streams and hand dug wells. These sources were inadequate in quantity and sanitary wise all were very poor. As years elapsed and the development of the town highly progressed, the growth of the population was fast and the town expanded rapid. Boreholes were drilled to cater for the water demand of the town. However, these boreholes were inadequate in quantity to solve the water demands of the inhabitants. Some years back water supply projects meant to alleviate the water supply problem of the town for minimum of twenty years was implemented. Still this was not successful for the growth of the town in population and aerial coverage was at an alarming rate. Recently, after the regime change in Ethiopia, construction of a dam by Chinese company was underway but because of the disastrous war, implementation of the project was disrupted. In fact the change of water source from borehole to dam was a very good strategy in giving lasting solution for the water problem of town. But as stated prior above, the project is currently at a standstill and the probability of getting back to work very soon is very low. As a consequence of the rolled water shortage problem and the fast ever increasing population growth accompanied by the high influx of displaced people, Mekelle town currently is under unbearable severe water supply shortage. The Operation Rescue project area being in the center of the town is among the victims facing severe water shortage problem. The consequence of this is that supplying food and other related lifesaving activities could be hindered thereby complicate and escalate the prevailing problem. In fact, even if the water supply is improved, the demand of the organization is far beyond individual domestic consumptions. Consequently, running cost for water supply will be high. Having its own source is not an option but mandatory.

For this reason, looking for a water source that give lasting solution for this serious problem is an issue that needs an immediate action and could never be compromised with other necessities.

Project Objective

As it is known in all wars around the world, women and children are the ones who suffer most from the adverse effects of any war. In Tigray since the magnitude of the ravaging war is far beyond human mind can imagine, the humanitarian crises is so deep, wide and diverse. That is to say, the hearts of all members of the society are broken thus the psychological distress is so deep, the economic status has fallen below poverty line and almost all types of infrastructures are destroyed. For this reason, be it for the regional government and/or the government of Ethiopia rehabilitating the infrastructures and bringing holistic healing for the victims of the war if not impossible is deemed so difficult. The objective of this report is therefore, by showing the real picture of the situation in Tigray to request all humanitarian organization to exert their utmost effort to reverse the situation and in our case to intervene in addressing the water shortage problem of the project under consideration, Operation Rescue.

Geomorphology of the Region

The occurrence of recurrent tectonic activities and other geological incidences in the geologic past, like the transgression & regression of the Indian Ocean, volcanic eruptions, etc., accompanied by high and long standing erosional activities have made the topographical settings of the region so rugged with steep slopes. Thus, the central part of the region is mountainous and with chains of hillside features. The flat plains found on top of these plateaus are highly dissected and so have numerous gullies,

ravines and gorges. Not only this, backward agricultural practices and high deforestation stemmed out from low awareness level have aggravated the disturbance of the morphology of the region. There are undulating and rolling with relatively large low lying flat plains in the western and southern part of the region. These plains are covered with relatively saying thick alluvium resulted from the deposition of the seasonal flooding and intermittent streams. Generally it can be said that the geomorphology of the region is so disturbed and most part of the region is denude of vegetation cover. The effort exerted by both the community and the regional government to improve the vegetation cover was so enormous and encouraging. Construction of thousands of kilometers soil & water conservation was undertaken and different reforestation measures were implemented. Since the increment in the vegetation cover was remarkable the region won global award. But again because of the devastating war the vegetation cover was massively demolished thus the region is left with a vegetation cover vastly of bushes and shrubs coverage. Concerning the altitude of the region, it has an altitude that range from 500 to over 3500 meters above sea level.

Brief Discussion on the Geology of the Region

The basement complexes, lower & upper complexes, upon which all younger geological formations are deposited are the oldest rocks in Tigray and Ethiopia at large. The lower complex is mostly built of gneiss and the upper complex being overlain by sedimentary rocks are strongly folded and low grade metaphoric rocks. The Tsaliet group, the Tembien group, the Didikama formation and Matheos formation are the major components of this complex In Tigray, unlike central part of Ethiopia which mostly are high plateaus covered with the Trap series volcanic rocks and fluvial & alluvial soils and eastern & southwestern lowlands of parts of the country which mainly are covered with

sediments of Cenozoic era, outcrops of all geological formation are found exposed. This is to say from oldest the rocks of Precambrian era up to sediments of recent Quaternary are found uncovered in parts of the region. In fact, exposures of the rocks varies with altitudinal changes of each locality. This means as elevation increases and when moving from west towards the central part of the region the basement rocks are found overlain by glacial deposit sedimentary rocks of the Paleozoic era. These rocks known as Enticho Sandstone and Edag Arbi glacial are well bedded, poorly consolidated, and at times found interfingered. Enticho sandstone is white medium grained, coarsely cross-bedded with silty and some feruginoues layers. Whereas Edga Arbi glacial having purplish to pink color is friable with grey calcareous tillites is poorly sorted with fragments of quartz pebbles. On top of these rests the Adigrat sandstone with undulating unconformity. Adigrat sandstone has yellowish to pink color and is fine to medium grained with non-calcareous quartz and forms a high cliff above the glacial. Antalo limestone which belongs to the Mesozoic era conformably lies on the Adigrat sandstone. This limestone having dense yellowish grey, black to bluish color at its top units appear to have more shaly and gypsiferous nature. This limestone associated with shale formations of different kind are results of the transgression & regression of the Indian Ocean of Mesozoic Era. Sequentially the volcanic rocks known as Trap series lie on the different sedimentary rocks of the said abov era. These rocks classified as Ashangi group and Megdela group consist Aiba basalt, Alaje basalt, Tarmraber basalt and Ryholites, Trachytes, Phonolites and other pyroclastic rocks. Finally Quaternary to Recent sediments overlay on these volcanic rocks and in the valleys and gorges that are result of tectonics and high erosion activities.

When dealing with geological structures, it can be said that Tigray region is the most geologically disturbed region of the country. This is because of the occurrence of dynamic, rigorous & recurrent tectonic activities and vigorous volcanic eruptions. Faults and folds resulted from tectonic activities and plugs, sills, dykes and the like resulted from the fissure volcanic actions are clearly observed everywhere. As a result of this, the topographical setting of the region is so rugged with rocky steep slopes and the sequences of the geological formations in most parts are discontinuous & overturned. Various types of erosional activities resulted from long aged settlements accompanied by backward agricultural practices have also exacerbated the topographical disturbance of the region

Last but not least, the region has well exposed geologic formations of all ages, crops from the oldest rocks of Precambrian era up to the sediments of recent age are clearly visible in different thickness, at different elevations and in different profiles superimposed in different ways. As a result of this, for scholars who are interested to study geology and geological processes Tigray region is an ideal place to learn about.

Geology of the Project Site

The geologic formations that are found in the town of Mekelle and its vicinity are known as the Mekelle outlier. This group of rocks consist shale with intercalations of marl, limestone, dolomite, gypsum. In almost all these formations intrusions of dolerite in the form sills and dykes are sporadically observed. In between these formations clay, silt & silty sand, sand sediments rarely associated with cobbles and boulder are found as intercalations. Overlying the outlier, sandstones that belong to the upper sandstone of the Amba Aradom formation are found on the hillsides that surround Mekelle town from

south. Finally in some parts of the town very thick but mostly thin accumulations of clay, silt & silty sand, sand cover the aforesaid formations.

Hydrogeology of the Project Site

Naturally groundwater occurs at different depths with different degree of potential. The occurrence of groundwater is greatly governed by the topographical setting of the area, amount & intensity of precipitation, type & thickness of subsurface formations of the area under consideration, vegetation cover. For the occurrence of groundwater unconsolidated formations and highly weathered and/or fractured consolidated formations play the major, in other words major storages of ground water.

In Mekelle and it vicinities, ground waters are mostly tapped from fractured & weathered limestone. In fact when moving to the northern part of the town shales alternated with clay silt and sand deposits are encountered. Quality wise, in the town the quality of the ground water deteriorates when moving towards north.

When coming to the occurrence of ground in the locality of our interest, the geologic formations that are most likely to be penetrated are clay, shale, limestone and intrusions of dolerite. In the selected drilling site the possibility of striking with alteration of the geologic formations is very high. In fact as underneath to the thick unconsolidated clay is expected to be highly weathered and/or fractured limestone formation the probability of striking ground water at a shallower depth is possible. But for tapping a sufficient amount of water that would fully cater to the demand of the project, penetrating further down is needed. For this reason conducting the drilling to a depth of 80 metres below ground is deemed imperative.

Water Demand

The beneficiaries of this project are the 300 children of the project, staffs of the project office, local visitors and foreign visitors that would stay in the guest house. The water would also be used for watering the football field grass and the flowers planted to beautify the compound. Based on this, the expected water consumption is as presented below.

Beneficiaries	**No of beneficiaries**	**Average Consumption in liters**		**Total Consumption**
Children	300	Per person/ day	150	45000
Staff	50	Per person/ day	100	5000
Local visitors	10	Per person/ week	100	1000
Foreign visitors	3	Per person/ day	200	600
Kitchen & related with activities	1	Per day	900	900
Gardening	1	Per day	500	500
Total Demand/Day				**53 m^3**

Estimated Cost Breakdown

	Description of Activities	Unit	Qtty	Unit Price in Birr	Total Price in Birr	Total Price in CHF
1	Mobilization of Rig, materials and man power	LS	1	20,000.00	20,000.00	344.00
2	Construction of camp facility	LS	1	10,000.00	10,000.00	172.00
3	Drilling in All formation, DTH 122" bit diameter	M	10	6,000.00	60,000.00	1’030.00
4	Drilling in All formation, DTH 10" bit diameter	M	90	6,500.00	585,000.00	10’080.00
5	Lithological borehole logging	L.S	1	0.00	0.00	0.00
6	Supply and Installation of 10" steel temporary surface casing	M	10	1,000.00	10,000.00	170.00
7	Supply and Installation of 10" steel permanent surface casing	M	10	7,500.00	75,000.00	1’290.00
8	Supply and Installation of 6" ID PVC blind casing	M	60	2,000.00	120,000.00	2’040.00
9	Supply and Installation of6 6" ID PVC screen casing	M	30	2,500.00	75,000.00	1’290.00
10	Supply and pack selected river gravel	M3	16	3,000.00	48,000.00	816.00
11	Grout with mass concrete to a depth not less than 6m and construct well head (0.8x0.5x0.4m) C-25 concrete	LS	1	5,000.00	5,000.00	86.00
12	Well cleaning and development using appropriate method	Hrs.	8	2,000.00	16,000.00	272.00
13	Supply and weld iron cover on top of borehole	L.S	1	3,500.00	3,500.00	60.00
14	Well disinfection with hypochloride (150mg/l)	L.S	1	850	850.00	14.00
15	Mobilization man power and equipment for pumping teste	L.S	1	15,000.00	15,000.00	258.00
16	Step test (Four steps of 1 1/2 hrs. duration)	Hrs.	6	1,000.00	6,000.00	102.00
17	Constant Test	Hrs.	36	1,000.00	36,000.00	612.00
18	Recovery Test	Hrs.	12	1,000.00	12,000.00	204.00
19	Physical and Chemical test	**L.S**	1	1,500.00	1,500.00	25.00
20	Supply and install Submersible pump with all accessories	**L.S**	1	500,000.00	500,000.00	8’620.00
21	Supply & fit compatible Generator set to submersible pump	**Ls**	1	0.00	0.00	0.00
22	Submit completion report (3 copies) with soft copy	**L.S**	1	0.00	0.00	0.00
Total cost					**1,598,850.00**	**27’485.00**

Project Schedule

Description of Activities	May 2023																	
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Mobilization, rigging up and camping																			
Conducting drilling																			
Casing installation and gravel packing																			
Well development and preliminary testing																			
Conducting pumping and recovery test																			
Water quality analysis																			
Pump installation and wellhead construction																			
Equipping generator and/or electrification																			
Elevated reservoir Construction																			
Connecting pipe with the water storage																			
Submission of well completion report																			