



ELSEVIER

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Hydrochemical data on groundwater quality for drinking and irrigation use around Dangila town, Northwest Ethiopia



Mulugeta C. Fenta^{a,b,*}, Zelalem L. Anteneh^b, János Szanyi^a, David Walker^{c,d}

^a University of Szeged, Department of Mineralogy, Geochemistry and Petrology, Egyetem street 2, 6722, Szeged, Hungary.

^b Bahir Dar University, School of Earth Science, P.O. Box 79, Bahir Dar, Ethiopia.

^c Newcastle University, School of Engineering, Newcastle upon Tyne, UK.

^d Kyushu University, Faculty of Design, Fukuoka, Japan.

ARTICLE INFO

Article history:

Received 14 May 2020

Revised 9 June 2020

Accepted 10 June 2020

Available online 18 June 2020

Keywords:

Hydrochemical

Groundwater

Water quality

Drinking

Irrigation

Ethiopia

ABSTRACT

The groundwater of volcanic aquifers, dissected by various structures and affected by several volcanic eruption events, varies in quality. A large number of rural people depend on shallow aquifers tapped by shallow hand wells and springs. On the other hand, the urban population is dependant on deep aquifers using drilled boreholes. The location of springs, shallow hand-dug wells and boreholes inside or close to farmlands, and the advancement of irrigation water use from groundwater by the government entail the assessment of groundwater quality. Therefore, the focus of the present study is to determine the quality and suitability of groundwater around Dangila Town, Northwest Ethiopia, for drinking and irrigation uses. The water quality assessment was conducted by collecting groundwater samples from 14 shallow hand-dug wells, 4 springs, and 7 deep boreholes then analysing for different physical and chemical parameters. A total of 25 selected groundwater samples from shallow and deep aquifers were analysed in a laboratory for physical and chemical parameters. The physical parameters measured both in the field and the laboratory included pH, elec-

DOI of original article: [10.1016/j.gsd.2020.100408](https://doi.org/10.1016/j.gsd.2020.100408)

* Corresponding author.

E-mail address: mulugeta@geo.u-szeged.hu (M.C. Fenta).

<https://doi.org/10.1016/j.dib.2020.105877>

2352-3409/© 2020 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license. (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

trical conductivity (EC) and total dissolved solids (TDS). The chemical parameters analysed in the laboratory comprised cations of calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^+), potassium (K^+), Iron (Fe), manganese (Mn^{2+}) and anions of bicarbonate (HCO_3^-), sulfate (SO_4^{2-}), carbonate (CO_3^{2-}), chlorine (Cl^-), nitrate (NO_3^-), fluoride (F^-), and boron (B). Based on the laboratory results, the variation in groundwater facies, and major cation and anion sources were determined. Furthermore, the groundwater quality for human consumption was assessed and sodium adsorption ratio (SAR), Na%, and the residual sodium carbonate (RSC) values, which are crucial to determine the overall groundwater quality for irrigational uses, were calculated. Detailed interpretations of the data have been presented in the paper entitled "Hydrogeological framework of the volcanic aquifers and groundwater quality in Dangila Town and the surrounding area, Northwest Ethiopia" [1]. The presented dataset demonstrates the necessity of water quality assessments that would be helpful to water sectors, government, and policymakers for sustainable groundwater management.

© 2020 The Author(s). Published by Elsevier Inc.

This is an open access article under the CC BY-NC-ND license. (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Specifications Table

Subject	Earth and planetary sciences
Specific subject area	Hydrogeochemistry
Type of data	Tables, Figures
How data were acquired	The lightweight, portable, and multi-parameter measuring instrument (Hanna HI 991.301, USA) was used to measure pH, electrical conductivity (EC), and total dissolved solids (TDS) values. The atomic absorption spectrometry (novAA 400P, Germany) integrated with ASPECT LS software was used to measure the concentration of cations, and the colourimetry instrument (palintest photometer 7100, UK) was used to measure the concentration of anions.
Data format	Raw, Analysed
Parameters for data Collection	The new plastic bottles were rinsed with the sample water, and groundwater samples were collected, stored in a cool place, and transported to the laboratory within a day. The samples from shallow hand wells and springs were taken after pouring water for a few minutes, whereas samples from deep boreholes were taken in the middle of the continuous pumping test. Before laboratory analysis, water samples were filtered with a 45-micron filter to remove the suspended particles.
Description of data Collection	A total of 14 shallow hand-dug wells, two deep boreholes, and four spring water samples were collected during the dry season (February to April) 2015 and 2017 while the remaining five deep boreholes groundwater samples were collected during their pumping tests. The physical water parameters comprising pH, EC, TDS were measured in the field during sample collection. The chemical groundwater parameters comprising cations (Ca^{2+} , Mg^{2+} , Na^+ , K^+ , Mn^{2+} , Fe) and anions (Cl^- , SO_4^{2-} , HCO_3^- , CO_3^{2-} , NO_3^- , F^- , B) were measured in the laboratory.
Data source location	Data area boundaries from world geodetic systems 84 (WGS84) are; longitude: 36.70 to 37.00 °E and latitudes: 11.07 to 11.41 °N around Dangila Town, Northwest Ethiopia.
Data accessibility	Data are included in this article
Related research article	Mulugeta C. Fenta, Zelalem L. Anteneh, János Szanyi, David Walker; Hydrogeological framework of the volcanic aquifers and groundwater quality in Dangila Town and the surrounding area, Northwest Ethiopia. Groundwater for sustainable development [1].

Value of the Data

- Hydrochemical data presented in this article will enable the society to understand the groundwater quality of the area as it is the primary source for the provision of freshwater supply.
- The various groundwater datasets will be beneficial to develop effective strategies to strengthen the Dangila Town and surrounding rural area drinking and small-scale irrigation water supply.
- The water sector, government, policymakers, and scientific community can make use of these data to comprehend the hydrochemical characteristics of volcanic aquifers of the area and to plan sustainable groundwater management systems.
- The raw and analysed data will serve as a benchmark for further research and studies as the region lacks hydrochemistry data sources. Moreover, it can be useful for further insights on heterogeneous hydrochemical volcanic aquifers to create groundwater numerical models.

1. Data Description

This dataset of Dangila Town and its surrounding area of Northwest Ethiopia comprises of one Figure and 7 Tables. [Table 1](#), [Table 2](#), and [Table 3](#) consist of groundwater physical and chemical parameters used to assess groundwater quality for drinking and irrigation use from boreholes, shallow hand-dug wells, and springs, respectively. [Table 4](#) contains the quality of groundwater samples for drinking purposes based on the WHO 2011 drinking water quality index [2]. [Table 5](#) consists of the different water facies of the area, whereas [Table 6](#) comprises the formulas used to calculate the SAR, Na%, and RSC values of groundwater samples. [Table 7](#) consists of the calculated SAR, Na%, and RSC values of all groundwater samples. All datasets in the tables contain either water sample laboratory analysis data or the calculated results and statistical values of minimum, maximum, mean, and standard deviation for each groundwater scheme.

2. Experimental design, materials, and methods

2.1. Study area description

The collection of physicochemical data from groundwater samples was conducted at Dangila town and its surrounding area located in Dangila district, known in Ethiopia as a *woreda*, in northwest Ethiopia ([Fig. 1](#)). It is situated at the southwest of Lake Tana, which is the source of the Blue Nile river. It is mainly covered by Quaternary volcanic rocks with an annual rainfall of 1640 mm (measured since 1988 at the National Meteorological Agency (NMA) weather station at Dangila town), of which 91% falls from May to October. It has a moist subtropical climate with a median annual daily maximum temperature of 25 °C and a minimum of 9 °C [6]. The groundwater sampling was aimed to assess the quality of both shallow and deep aquifer systems of the area using existing springs, shallow hand-dug wells, and deep boreholes. The sampling sites were chosen to cover the area within the town and its surrounding rural villages.

A total of 25 groundwater samples were collected from deep boreholes (7 samples), shallow hand-dug wells (14 samples), and springs (4 samples) with plastic bottles rinsed by sample water ahead of sampling. The samples were poured into the plastic bottles after pumping out water for 10 min to remove the stagnant water from shallow hand-dug wells. The borehole samples were collected in the middle of constant rate pumping tests that lasted for 24, 36, 48, or 72 h depending on the plan of the test. The spring water samples were sampled at the point of spring discharge continuously from the ground.

Table 1

Hydrochemical and physical data of volcanic aquifers sampled from boreholes. The values of TDS, cations, and anions are given in (mg/L), whereas the EC is ($\mu\text{S}/\text{cm}$).

Borehole ID	pH	EC	TDS	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	Mn ²⁺	Fe	Cl ⁻	SO ₄ ²⁻	HCO ₃ ⁻	CO ₃ ²⁻	NO ₃ ⁻	F ⁻	B
BH1	6.83	245	159.25	35.34	6.03	15.54	15.1	0.022	0.08	1.9	1	175	0	1	0.63	0.057
BH2	7.84	262	150	23.8	4.9	39	1.7	0.022	BDL*	1.08	8	139	0	0.13	0.25	0
BH3	8.67	290	188.5	27.94	6.921	13.6	10.32	0.005	BDL	0.6	1.8	145	15	1.5	0.34	0.06
BH4	8.4	295	204	36	5.35	25	0.9	BDL	BDL	0	1.6	170.6	14.4	4.8	0	0
BH5	8.51	204	124	8	1.95	30	2.6	BDL	BDL	2	1.3	90	0	0	1.1	0
BH6	7.44	313	203	8.4	2.8	25.4	7.63	BDL	BDL	2.2	0.8	93	0	1.23	0	0
BH7	8.81	335	214	0.97	4.51	34.5	1.86	BDL	0.01	2.5	0.5	97.6	0	1.44	0.64	0
Min	6.83	204	124	0.97	1.95	13.60	0.90	0	0	0	0.5	90	0	0.13	0	0
Max	8.81	335	214	36.00	6.92	39.00	15.10	0.02	0.08	2.5	8	175	15	4.8	1.1	0.06
Mean	8.07	277.71	177.54	20.06	4.64	26.15	5.73	0.01	0.013	1.47	2.14	130.03	4.2	1.44	0.42	0.02
SD	0.73	44.21	33.56	14.20	1.75	9.32	5.43	0.01	0.023	0.93	2.62	36.51	7.18	1.60	0.40	0.03

* BDL represents below detectable limit for manganese and iron using flame AAS instrument with 0.0015 mg/L and 0.005 mg/L values respectively. These low detection limits of flame AAS instrument values are based on PerkinElmer's work that determined elemental standards in dilute aqueous solution with a 98% confidence level [3].

Table 2

Hydrochemical and physical data of volcanic aquifers sampled from shallow wells. The values of TDS, cations, and anions are given in (mg/L), whereas the EC is ($\mu\text{S}/\text{cm}$).

Shallow well ID	pH	EC	TDS	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	Mn ²⁺	Fe	Cl ⁻	SO ₄ ²⁻	HCO ₃ ⁻	CO ₃ ²⁻	NO ₃ ⁻	F ⁻	B
SW1	6.12	260	169	24.62	2.116	2.78	2.94	0.016	0.01	4.2	0.8	85	0	3	0.66	0.06
SW2	6.07	480	312	25.1	2.14	3.56	3.12	0.006	BDL	0.8	0.5	75	0	11	0.35	0.06
SW3	5.62	70	45.5	6.09	1.98	1.69	1.39	0.029	BDL	6.7	0.8	15	0	1	0.34	0.05
SW4	5.37	90	58.5	23.41	1.89	7.45	3.92	0.029	BDL	2.1	0.8	95	0	3	0.48	0.04
SW5	6.14	160	104	19.81	2.288	3.14	6.52	0.02	BDL	12.5	0.7	60	0	3	0.4	0.05
SW6	6.4	140	91	25.55	2.23	2.45	1.9	0.005	BDL	1.6	1.5	75	0	15	0.44	0.06
SW7	5.53	171.9	87	12.5	2.28	0.08	0.15	BDL	0.01	2.7	1.5	48.8	0	4.85	0.21	0
SW8	6.31	264.4	135	18.07	2.94	2.54	2.29	BDL	1.65	0.7	1.6	97.3	0	1.22	0.56	0
SW9	6.17	174	88	17.4	2.81	4.6	1.54	BDL	BDL	1.3	6.2	60.2	0	1.48	0.4	0
SW10	5.83	130.7	66	14.6	2.37	1.73	0.42	BDL	0.2	0.5	1.1	52	0	4.37	0.22	0
SW11	6.88	334.9	172	19.4	3.4	0.08	1.74	BDL	0.01	3.7	1.1	85.2	0	2.9	0.31	0
SW12	5.76	200.4	102	18.4	3.44	0.08	2.13	BDL	0.01	1.3	0.84	90.4	0	3.2	0.32	0
SW13	5.69	196.8	100	18.7	3.12	0.1	1.14	BDL	4.3	1.7	1.4	86.1	0	2.37	0.28	0
SW14	5.99	309.4	159	27.1	3.18	0.19	9.06	BDL	0.7	2.7	1.2	125.4	0	4.12	0.25	0
Min	5.37	70	45.50	6.09	1.89	0.08	0.15	0.00	0	0.5	0.5	15	0	1	0.21	0
Max	6.88	480	312.00	27.10	3.44	7.45	9.06	0.03	4.3	12.5	6.2	125.4	0	15	0.66	0.06
Mean	5.99	213.04	120.64	19.34	2.58	2.18	2.73	0.01	0.49	3.04	1.43	75.03	0	4.32	0.37	0.02
SD	0.40	108.99	67.88	5.74	0.54	2.13	2.42	0.01	1.19	3.19	1.41	26.69	0	3.92	0.13	0.03

BDL* represents below detectable limit for manganese and iron using flame AAS instrument with 0.0015 mg/L and 0.005 mg/L values respectively [3].

Table 3

Hydrochemical and physical data of volcanic aquifers sampled from Springs. The values of TDS, cations, and anions are given in (mg/L), whereas the EC is ($\mu\text{S}/\text{cm}$).

Springs ID	pH	EC	TDS	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	Mn ²⁺	Fe	Cl ⁻	SO ₄ ²⁻	HCO ₃ ⁻	CO ₃ ²⁻	NO ₃ ⁻	F ⁻	B
SP1	5.64	75	48.75	18.55	1.99	2.09	2.35	0.002	BDL	0.8	5	50	0	6.82	0.65	0.06
SP2	5.53	40	26	3.58	1.8	1.67	1.45	0.012	BDL	1.7	0.8	15.5	0	0.8	0.82	0.3
SP3	6	189.6	97	23.3	3.87	0.8	1.24	BDL	0.01	1.2	1.1	91.2	0	2.5	0.37	0
SP4	5.31	48.67	24	14.1	2.42	0.08	5.13	BDL	0.01	0.8	2.4	50.2	0	2.34	0.8	0
<i>Min</i>	5.31	40	24	3.58	1.80	0.08	1.24	0.00	0.00	0.80	0.80	15.50	0	0.80	0.37	0.00
<i>Max</i>	6.00	189.60	97	23.30	3.87	2.09	5.13	0.01	0.01	1.70	5.00	91.20	0	6.82	0.82	0.30
<i>Mean</i>	5.62	88.32	48.94	14.88	2.52	1.16	2.54	0.00	0.01	1.13	2.33	51.73	0	3.12	0.66	0.09
<i>SD</i>	0.29	69.14	33.95	8.42	0.94	0.90	1.79	0.01	0.00	0.43	1.91	30.96	0	2.59	0.21	0.14

BDL* represents below detectable limit for manganese and iron using flame AAS instrument with 0.0015 mg/L and 0.005 mg/L values respectively [3].

Table 4

Quality of groundwater samples from the study area for drinking purposes based on the WHO 2011 drinking water quality index [2]. The values of TDS, cations, and anions are given in (mg/L), whereas the EC is ($\mu\text{S}/\text{cm}$).

Water quality parameter	Measured ranges of samples			WHO (2011) maximum allowable limit	Samples above allowable limit
	Boreholes	Shallow wells	Springs		
pH	6.83–8.81	5.37–6.88	5.31–6.00	6.5–8.5	3 borehole samples
EC	204–335	70–480	40–189.60	1000 $\mu\text{S}/\text{cm}$	Nil
TDS	124–214	45.50–312	24–97	500 mg/L	Nil
Ca ⁺²	0.97–36	6.09–27.1	3.58–23.3	75 mg/L	Nil
Mg ⁺²	1.95–6.92	1.89–3.44	1.80–3.87	50 mg/L	Nil
Na ⁺	13.60–39	0.08–7.45	0.08–2.09	200 mg/L	Nil
Fe	BDL–0.08	BDL–4.3	BDL–0.01	0.4 mg/L	2 shallow well samples
HCO ₃ ⁻	90–175	15–125.4	15.50–91.20	120 mg/L	4 borehole and one shallow well samples
SO ₄ ⁻²	0.5–8	0.5–6.2	0.80–5	250 mg/L	Nil
Cl ⁻	0–2.5	0.5–12.5	0.80–1.70	250 mg/L	Nil
NO ₃ ⁻	0.13–4.8	1–15	0.80–6.82	50 mg/L	Nil
F ⁻	0–1.1	0.21–0.66	0.37–0.82	1.5 mg/L	Nil

BDL* represents below detectable limit for iron using flame AAS instrument with 0.005 mg/L value [3].

Table 5

The different groundwater facies of the area.

No.	Water scheme	Sample quantity	Water facies type
1.	SP	1	Ca-HCO ₃
	SW	7	
2.	SP	3	Ca-Mg-HCO ₃
	SW	5	
3.	BH	2	Ca-Na-HCO ₃
4.	BH	3	Na-Ca-HCO ₃
5.	BH	1	Ca-Na-Mg-HCO ₃
6.	BH	1	Na-HCO ₃
7.	SW	1	Ca-Mg-HCO ₃ -Cl
8.	SW	1	Ca-HCO ₃ -Cl

Table 6

The formulas used to calculate groundwater parameters for irrigation use.

Indices	Formula
Sodium adsorption ratio (SAR)	$SAR = \frac{Na^+}{\sqrt{\frac{Ca^{2+} + Mg^{2+}}{2}}}$ based on Suarez et al., [4].
Sodium percentage (Na%)	$Na\% = \left[\frac{Na^+}{(Ca^{2+} + Mg^{2+} + Na^+ + K^+)} \right] \times 100$ based on the United States Salinity Laboratory Staff [5].
Residual sodium carbonate (RSC)	$RSC = (HCO_3^- + CO_3^{2-}) - (Ca^{2+} + Mg^{2+})$
Where Na ⁺ , Ca ²⁺ , Mg ²⁺ , K ⁺ , HCO ₃ ⁻ and CO ₃ ²⁻ are in meq/L.	

The samples were separately labelled with sample identification (ID) and water schemes, such as BH1 to represent borehole groundwater sample no. 1, and stored at 10 °C temperature before analysis for different physicochemical parameters. The pH, electrical conductivity (EC), and total dissolved solids (TDS) were analysed in the field using a pH/EC/TDS multi-parameter measuring instrument (Hanna HI 991,301, USA). The device is characterised by having simultaneous pH, EC/TDS, and temperature measurements on a large three-line liquid crystal display (LCD). During the measurement of EC/TDS, the probe was placed in the sample water to be tested, and plastic beaker containers were used to minimise any electromagnetic interference. The value of EC, TDS, and temperature was taken after the temperature sensor reaches thermal equilibrium. The metre was regularly calibrated for pH by immersion of the probe in pure water with a neutral pH of 7.0 before pH measurements.

The atomic absorption spectroscopy (AAS) (novAA 400P, Germany) was used to analyse the cation concentration of the groundwater samples. The cation concentrations were determined using a flame technology system in the laboratory that has a typical characteristic feature of precision, fast speed analysis, automated dilution, and reliable quality monitoring, all with uncomplicated handling with the aid of Autosampler. The groundwater samples to be analysed for cations concentrations (Ca²⁺, Mg²⁺, Na⁺, K⁺, Mn²⁺, and Fe) using AAS in the laboratory were placed on Autosampler in their standard solutions forms. The atomisation process, the nebuliser delivers the liquid sample at a controlled rate, creates a fine aerosol that mixes with fuel and oxidant for a starter into the flame. The nebuliser uses the combustion flames to atomise and introduce the sample into the light path. The photomultiplier tube of AAS as the detector determines the intensity of photons of the analytical line exiting the monochromator. The decrease in intensity of the light is the process of atomic absorption, and AAS measures the change in intensity. A computer data system converts this change in intensity of light into an absorbance. The Software package (ASPECT LS) offers both routine operation and several developments and optimisation facilities. It allows comprehensive control, monitoring, and recording of all processes run in the spectrometer and its accessories.

The analysis of anions in the laboratory was conducted by Palintest instrument (Photometer 7100, UK), which uses the colourimetric method. The photometer is fully integrated with the whole range of Palintest water tests and uses light to measure colour changes in water samples

Table 7

The calculated values of SAR, Na%, and RSC of groundwater samples from boreholes, shallow hand-dug wells, and springs.

Boreholes ID	SAR	Na%	RSC	Shallow hand-dug wells ID	SAR	Na%	RSC	Springs ID	SAR	Na%	RSC
BH1	0.636	20.35	0.608	SW1	0.144	7.563	-0.010	SP1	0.123	7.329	-0.270
BH2	1.902	50.93	0.687	SW2	0.183	9.310	-0.199	SP2	0.180	16.642	-0.073
BH3	0.597	20.98	0.913	SW3	0.152	12.764	-0.221	SP3	0.040	2.248	0.014
BH4	1.028	32.49	1.039	SW4	0.398	18.538	0.233	SP4	0.005	0.335	-0.080
BH5	2.467	67.57	0.915	SW5	0.178	9.227	-0.193	<i>Min</i>	0.005	0.335	-0.27
BH6	1.939	56.67	0.875	SW6	0.125	6.604	-0.229	<i>Max</i>	0.180	16.642	0.014
BH7	3.277	76.26	1.180	SW7	0.005	0.425	-0.012	<i>Mean</i>	0.087	6.639	-0.102
<i>Min</i>	0.60	20.35	0.61	SW8	0.146	8.416	0.451	<i>SD</i>	0.079	7.29	0.120
<i>Max</i>	3.28	76.26	1.18	SW9	0.270	14.943	-0.113				
<i>Mean</i>	1.69	46.47	0.89	SW10	0.111	7.454	-0.071				
<i>SD</i>	1.00	22.30	0.20	SW11	0.004	0.269	0.148				
				SW12	0.004	0.276	0.280				
				SW13	0.006	0.356	0.221				
				SW14	0.009	0.446	0.441				
				<i>Min</i>	0.004	0.27	-0.229				
				<i>Max</i>	0.398	18.54	0.451				
				<i>Mean</i>	0.124	6.90	0.052				
				<i>SD</i>	0.116	5.97	0.242				

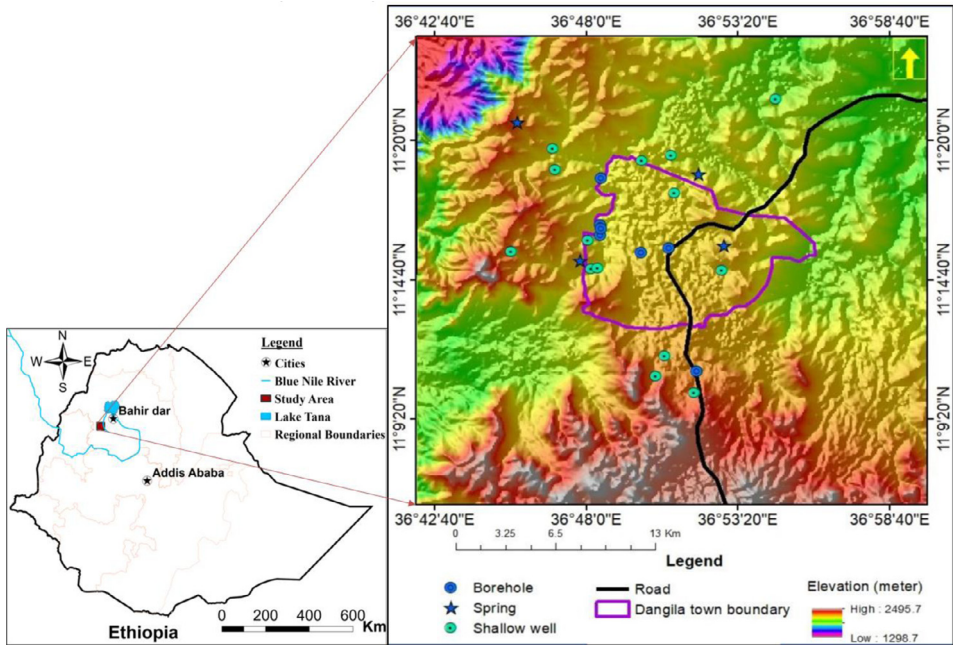


Fig. 1. Groundwater sampling points of Dangila Town and its surrounding area, Northwest Ethiopia.

treated with a reagent. The colourimeter is used to photoelectrically measure the amount of coloured light absorbed by a coloured sample in reference to a colourless sample (a standard deionised sample). The concentrations of Cl^- , SO_4^{2-} , HCO_3^- , CO_3^{2-} , NO_3^- , F^- and B were measured using the colourimetric method, and alternatively, the concentrations of HCO_3^- and CO_3^{2-} were determined by titration with HCl. The laboratory analyses to determine the concentration of cations and anions of groundwater samples were conducted based on APHA (2005) standard methods [7]. The values of cation and anion concentrations that can impact human health are below the maximum allowable limits of WHO 2011 drinking water quality standards [2].

The groundwater of the area has five main types of water facies (Table 5) as Ca-HCO_3 and Ca-Mg-HCO_3 in shallow aquifers, and Na-Ca-HCO_3 , Ca-Na-HCO_3 and Na-HCO_3 water facies in the deep aquifer system. The Piper diagram plot and the details of different water faces are described by Fenta et al.[1]. There are also $\text{Ca-HCO}_3\text{-Cl}$ and $\text{Ca-Mg-HCO}_3\text{-Cl}$ types of water facies in shallow hand-dug wells and Ca-Na-Mg-HCO_3 type water facies in boreholes. The presence of a significant amount of chloride in a few shallow hand-dug wells is related to anthropogenic pollution, whereas the increasing tendency in the concentration of Ca^{2+} , Mg^{2+} , and Na^+ with depth lead to Ca-Na-Mg-HCO_3 type of water facies. The existence of these types of water facies might be due to the intermixing of shallow and deep groundwater systems. The work by Fenta et al. [1] stated rock-water interactions involving silicate weathering, cation exchange, and carbonation are the main hydrochemical processes that control the primary composition of the groundwater chemistry.

The three commonly used factors in assessing the suitability of groundwater for irrigation use are SAR, Na%, and RSC. SAR is the measure of possible sodium hazard for irrigation water by United States Salinity Laboratory Staff (1954) [5], and Na% is a vital parameter that helps to categorise water suitability for irrigation purposes [8]. The excess amount of SAR, Na%, and RSC will affect water and air movement in soils and later affect plant growth. The three values of each water sample are calculated using the formulas listed in Table 6, and the calculated values are presented in Table 7.

Based on the calculated values, all water samples have low SAR values (< 10), which categorises all samples as excellent for irrigational use. The calculated Na% values of shallow hand-dug wells and spring samples are < 20 that classifies the shallow groundwater as excellent for irrigational purposes. The calculated Na% values of boreholes vary from 20 to 40 (3 boreholes), 40–60 (2 boreholes), and 60–80 (2 boreholes), which classifies the different deep aquifers as good, permissible and doubtful respectively for irrigational use. The RSC values of all water schemes are < 1.25 , which makes it suitable for agricultural use. The other related groundwater physical parameter, the electrical conductivity, has $< 750 \mu\text{s}/\text{cm}$ value, which is low to medium category based on US regional laboratory staff test [5].

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have, influenced the work reported in this article.

Acknowledgments

The authors are thankful to Amhara Design and Supervision Works Enterprise (ADSWE) hydrochemistry laboratory staff for their cooperation and offering laboratory facilities. The first author would like to thank the government of Hungary, and Bahid dar University of Ethiopia, for their educational and field logistics supports, respectively.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.dib.2020.105877](https://doi.org/10.1016/j.dib.2020.105877).

References

- [1] M.C. Fenta, Z.L. Anteneh, J. Szanyi, D. Walker, Hydrogeological framework of the volcanic aquifers and groundwater quality in Dangila Town and the surrounding area, Northwest Ethiopia, *Groundw. Sustain. Dev.* (2020) 1–21, doi:10.1016/j.gsd.2020.100408.
- [2] WHO Guidelines For Drinking-water Quality., 2011 Geneva, Switzerland.
- [3] PerkinElmer, Atomic Spectroscopy: A Guide to Selecting the Appropriate Technique and System, 2018, pp. 1–16. Waltham, USA.
- [4] D.L. Suarez, J.D. Wood, S.M. Lesch, Effect of SAR on water infiltration under a sequential rain – irrigation management system, *Agric. water Manag.* 86 (2006) 150–164, doi:10.1016/j.agwat.2006.07.010.
- [5] United States Salinity Laboratory Staff *Diagnosis and Improvement of Saline and Alkali Soils*, Agriculture, United States Department of Agriculture, Washington, D.C, 1954.
- [6] D. Walker, N. Forsythe, G. Parkin, J. Gowing, Filling the observational void : scientific value and quantitative validation of hydrometeorological data from a community-based monitoring programme, *J. Hydrol.* 538 (2016) 713–725, doi:10.1016/j.jhydrol.2016.04.062.
- [7] APHA, AWWA, and WEF Standard Methods for the Examination of Water and Wastewater, 21st ed., 2005 Washington, D.C. USA.
- [8] L.V. Wilcox, *The Quality of Water for Irrigation Use*, US Department of Agriculture, Technical Bulletin No. 962, Washington, D.C, 1948.