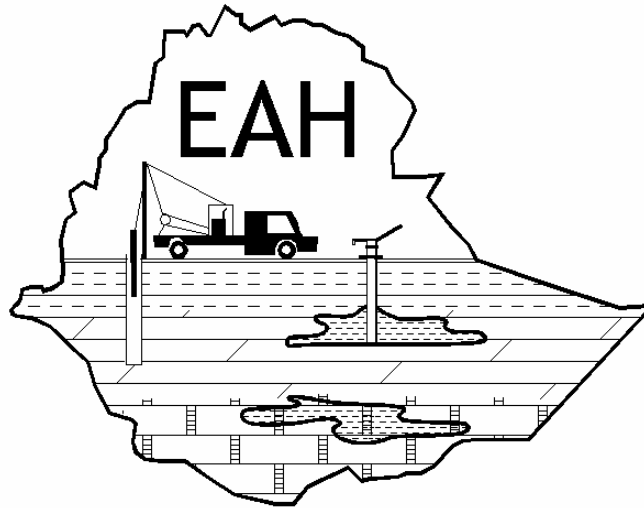


ETHIOPIAN ASSOCIATION OF HYDROGEOLOGISTS (EAH)



ABSTRACTS OF THE FIRST ANNUAL CONGRESS

**OCT. 06/2007
GHION HOTEL, ADDIS ABABA, ETHIOPIA**

Introduction

Ethiopia is embracing new millennium. The motto of this new millennium is to pull the country out of grinding poverty. Poverty in itself is both the cause and the effect of environmental degradation and poor resources management and use. Several indicators of poverty alleviations are related to the water sector. These include the number of citizens having access to safe and clean drinking water and sanitation facilities; increased productivity in agricultural sector; maintained biodiversity and sustainable environment. The vision of Ethiopia in the new Ethiopian millennium is to place the country parallel to medium income countries. The challenges for Ethiopia in the first decades of the new millennium is to meet the Millennium Development Goal (MDG). MDG encompasses among many enhancing the access to safe and clean drinking water for citizens. Water resources will have a central role in fulfilling the millennium vision of the country and attaining the MDG. Ethiopia is an example of country with ample 'physical water resources'. On the other hand, Ethiopia is also known for 'technical water scarcity'. Technical water scarcity is leveraged through knowledge, community participation, investment, and policy.

Currently groundwater accounts for more than 70% of domestic water use in rural Ethiopia. Major towns like Mekele, Harar, DireDawa, BahrDar, Gonder obtain virtually all their domestic water supply from groundwater. Addis Ababa obtains 40% of its industrial and domestic water supply from groundwater. Trends in groundwater exploitation will increase. Groundwater is also becoming important in the irrigation development sectors. Increased groundwater exploitation will need appropriate knowledge of the groundwater system, technology that suites the aquifer conditions and the water use options.

In partnership with the Nile Basin Initiative and its member states, International Institutions like the Global Environmental Facility (GEF) and the International Atomic Energy Agency (IAEA) are supporting the incorporation of the groundwater dimension as an integral part of the Nile Basin Initiative's thematic areas.

The Ethiopian Association of Hydrogeologists (EAH) was established in the year 2006 with the aim of creating a platform for groundwater professionals to play their role by knowledge creation, dissemination and collaboration. The association has currently more 80 members some of them are expatriates.

The agenda of the meeting very well recognises the role of research, information, knowledge and technology in reducing the technical water scarcity the country challenged with. It is expected that the participants of the meeting brainstorm on the two discussion points (Groundwater technology and research; groundwater information and knowledge management in the new Ethiopian millennium) and come up with recommendations that could benefit the citizens, practitioners, policy makers, professionals and researchers.

ABSTRACTS

Geological and Structural Investigation: A Case Study on the Groundwater Potential Assessment in the Hantebet Catchment, Southern Mekelle, Tigray

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The study area is located in the southern Tigray Regional State, about 46 km south of Mekelle having an area of 24.4 km². The major objectives of this research work were to identify and map the surface extent of the different lithological units, and to conduct a systematic structural map by analyzing the distribution and degree of interconnectivity of structures. The research is aimed at understanding groundwater resources and then for proper and full exploitation of these resources. Extensive work was carried out by collecting both primary data directly from the field and by compiling secondary data from different offices. Lithological boundaries, drainage patterns, morphological features and geological structures were traced from aerial photographs. The major lithological units in the basin are dolerite sills/dykes (45.2 %), shale (13.4 %), limestone (12 %), siltstone (0.5 %) and alluvial deposits (28.9 %). Stratigraphically, limestone is found at the base overlain by shale and followed by siltstone. The younger igneous intrusions of dolerite as a sill and dyke are exposed on the top part of the hills and plateaus. Alluvium with varying thickness is found overlying all these successions in the lowlands. The major structures observed in the area are extensional fractures such as joints, dykes, listric faults, karsts and primary beddings. These structures strongly control the groundwater movement of the area. Consequently, in the basin, except the alluvium the water bearing capacity of all the rocks depend (almost- this word is to elliptical please remove it if you think appropriate) entirely on the secondary porosity and permeability that develops as a

result of weathering and fracturing. Alluvial sediments, weathered and fractured shale, and weathered and fractured dolerite dykes that are found in the depression are important aquifers. Any future development of groundwater should be concentrated on these types of formations in the middle of the downstream part of the basin. Delineating the lateral extent and vertical thickness of the different aquifers; estimating the productivity of the respective aquifers; and assessing the presence of other multilayered aquifers are recommended to be investigated for a better understanding and development of groundwater resources of the area

Keywords: Aquifer, fault, fractures, groundwater, structure.

**Aquifer vulnerability assessment in Akaki River catchment, Addis
Ababa (Finfinne): implications for land use and water quality
management**

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Akaki River Catchment is located at the transition zone between the Western Ethiopian Plateau and the Main Ethiopian Rift (MER), and approximately bounded between 8° 46' 57" and 9° 13' 00" N latitudes and 38° 35' 00" and 39° 05' 00"E longitudes. It has an elevation range of less than 2040 to 3,200 meters above sea level.

The existing land use patterns in the catchment were broadly divided into four groups as: agriculture/open area (69%), forest land (15%), urban area and its associated uses (15%), and water body and wetland covers (0.98%) of the total land use/cover.

The studied area is made up of different volcanic rocks ranging in age from Quaternary to Miocene, and weathering products such as clay soils, lacustrine and recent deposits. At some localities these clay soil are either thin or totally absent. The assessment of *aquifer vulnerability to pollution* was undertaken using (Modified) **DRASTIC** system with **GIS** there by to prepare vulnerability index maps. An overlay analysis of the factors using Arc View GIS 3.2 spatial analyst results the maximum and minimum index values. The DRASTIC index maps (general and pesticide) show that the high values (249 and 260) in northern part of the study area, which is the recharge zone. Some localized zones also show high vulnerability indices.

The application of DRASTIC with GIS in this study showed a good result in that the areas which has got higher index values needs careful detail site investigation before sitting of polluting land use activities in these vulnerable zones as well as request the monitoring of those already established potential pollutants to protect the groundwater from pollution.

Key words: Akaki River catchment, aquifers, DRASTIC, groundwater, pesticide, vulnerability.

Workability of Chloride – Mass – Balance Method in Estimating Groundwater Recharge in a Semi-Humid Climatic Region: a Case Study of the Weybo River Catchment, Wolayita-Hadiya Zones, Southern Ethiopia

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Four different physical methods have been employed to reasonably estimate the groundwater recharge rate of the investigated area in a view to compare the results with the one obtained from the chloride-mass-balance (CMB) method. The four methods include the mean long-term minimum flow method, the seasonal recession method, the conventional water balance method and the groundwater budget method. The CMB yields in an over estimated result whereas the mean long-term minimum flow results in an underestimated recharge rate. The optimum groundwater recharge is obtained by comparing the values with the one obtained from the groundwater budget. This is because of under a steady state and no storage change conditions, the outflow components of the groundwater budget are readily estimated unlike to the components in the other methods. The most likely justifications are cited for the over estimated recharge rate obtained from CMB method, and suggestions are also forwarded in a view to bring the method in to effect in such a hydro(geo)logical environ.

Key words: *chloride-mass-balance, groundwater, groundwater budget, mean-long-term-minimum flow, recharge, seasonal recession, water balance*

**Influence of uncontrolled land use and urbanization on the
hydrochemistry and contamination of groundwater from Wolaita Soddo
town and its environs, south Ethiopia**

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SNNPRS water Bureau, Awassa

The study area is located in South Ethiopia's Western rift margin and NNW of Lake Abaya. The town is growing rapidly. It depends heavily on ground water as water resource for domestic water supply. Because of ubiquitous and increasing pollution treats, assessing the quality of ground water in the town water supply is important. The main objectives of the study are: understanding the hydrochemical characteristics and contamination of groundwater according to urbanization and land use pattern, distinguishing between the contribution of anthropogenic input and that of natural input, and analyzing the temporal variation of nitrate ion and conceptually modeling its effect based on urban land use change. Anthropogenic inputs to ground water contamination were identified from some point pollution sources in town and non-point pollution sources in rural area. To conduct the study, three important methodologies were used. They include; inventory of groundwater samples from 15 deep boreholes, 18 cold and hot springs, 9 hand dug wells and 1 rain sample; insitu measurement for some field parameters of water samples and chemical analysis for some cations and anions in laboratory for the water samples and finally ion concentration ratio method (Hem, 1980 and UNESCO, 2004) to understand the source of the ions in groundwater samples. Water samples show variation in chemical composition e.g. EC, from 43 to 6567 micro siemens per cm towards hot waters. Most groundwaters in and around the town are highly influenced by urbanization and uncontrolled land use or anthropogenic effects than by aquifer rock type. Around the new residential area, uncontaminated water sources show Ca- Mg- Na –HCO₃ type whereas waters from the town show Ca- Mg-

Na-NO₃-Cl type. This revealed groundwaters underneath the town (highly urbanized and business area) are contaminated by high nitrate, chloride, hardness and bacteria. The sources of nitrate, chloride, hardness and bacteria in ground water is likely to be municipal wastes of unlined land fills, leaky septic tanks, pit latrines, cemeteries and uncontrolled waste disposal to streams. Ratio analysis method implied that nitrate, chloride, and bacterial contamination were the main problems in unconfined and semi-confined aquifers in the town and its surroundings.

Keywords: Groundwater, Anthropogenic input, uncontrolled waste disposal, Soddo town, ratio analysis.

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Deliberation Points for panel discussion

1. Groundwater Research and Technology

- Setting contexts for hydrogeological research in Ethiopia,
- International cooperation in hydrogeological research
- Higher learning institutions and their curriculum
- Groundwater technology
 - State of drilling technology in Ethiopia
 - Existing capacity of drilling
 - Cost of groundwater over surface waters and determinants groundwater use
 - Investment needs in groundwater technology expansions

Chair: Ato Tariku Negera

2. Groundwater information and knowledge management

- Networking of water professionals and institutions
- Existing initiatives/facilities in groundwater info platforms
- Physical and institutional bottlenecks in groundwater knowledge sharing

Chair: Ato Zenaw Tessema

ETHIOPIAN ASSOCIATION OF HYDROGEOLOGISTS (EAH)

Date: 06 OCT. 2007 (Saturday)

VENUE: Ghion Hotel (Blue saloon)

TIME	TITLE	PRESENTER	CHAIRMAN	RAPPORTEUR
8:00-9:00	Registration			
9:00-9:10	Report from the General Manager		-	
9:10-9:30	Keynote address	Ato Getahun Demisse	-	
9:30-9:40	Opening Speech	H.E Ato Juneydi Saddo	-	
9:40-10:00	Election of conference leaders			
10:00-10:15	Tea Break			
10:20-10:30	Geological and Structural Investigation: A Case Study on the Groundwater Potential Assessment in the Hantebet Catchment, Southern Mekelle, Tigray	Nata Tadesse & Miruts Hagos	Elected Chair	Elected Secretary
10:45-12:30	Panel discussion on GROUNDWATER RESEARCH AND TECHNOLOGY	Participants	Ato Tariku Negera	Dr. Seifu Kebede
12:30-14:00	Lunch Break			
14:00-15:45	Panel discussion on GROUNDWATER INFORMATION AND KNOWLEDGE MANAGEMENT	Participants	Ato Zenaw Tessema	Dr. Seifu Kebede
15:45-16:00	Tea Break			
16:00-16:10	Aquifer vulnerability assessment in Akaki River catchment, Addis Ababa (Finfinne): implications for land use and water quality management	Dereje Nigussa	Elected Chair	Elected Secretary
16:15-16:25	Workability of Chloride – Mass – Balance Method in Estimating Groundwater Recharge in a Semi-Humid Climatic Region: a Case Study of the Weybo River Catchment, Wolayita-Hadiya Zones, Southern Ethiopia	Aychluhim Debebe	Elected Chair	Elected Secretary
16:30-16:40	Influence of uncontrolled land use and urbanization on the hydrochemistry and contamination of groundwater from Wolaita Soddo town and its environs, south Ethiopia	Abrham Asha	Elected Chair	Elected Secretary
16:40-17:15	Discussion	Participants	Elected Chair	Elected Secretary
17:15-17:30	Closing	Ato Tariku Negera Board Chairman		
17:30-19:30	Cocktail			

