ASSESSMENT OF GROUNDWATER QUALITY IN SIRTE CITY

Submitted By

Aisha Farag Rahel Amhamed

B.Sc. of Science (Biology), Faculty of Science, Sirte University, Libya, 2001

A thesis Submitted For Partial Fulfillment
Of
The Requirement for the the Master Degree
In
Environmental Science

Department of Environmental Basic Science
Institute of Environmental Studies& Research
Ain Shams University

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APPROVAL SHEET

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ABSTRACT

Sirte is a city that lies on the coast of the Mediterranean Sea being overwhelmed by the arid or the semi-arid climate. Across the extension of this city, there are several valleys descending from south to the north to be pouring into marshes across the long coast

The main aims of the present study are to conduct hydrochemical study of the Sirte area, assess the available water resources and to examine water quality and suitability for different uses.

Thirty groundwater samples were collected from Wadi Jarif. The collected samples are subjected to different analyses in order to conduct hydrochemical and bacteriological study of the study area, assess the available water resources and to examine water quality and suitability for different uses.

Chemical analyses have been conducted on those wells samples in terms of determining the concentration of main ions (Chloride Cl^-, potassium K^+, sodium Na^+, sulfate SO_4^{2-}, carbonate CO_3^{2-}, bicarbonate HCO_3^-, Silicon Si^{4+}, manganese Mn^{2+}, Barium Ba^{2+}, magnesium Mg^{2+}, calcium Ca^{2+}, nıtrate NO_3^-, NH_4^+, Alkalinity, electrical conductivity, acidity, pH and total dissolved solids TDS) and bacteriological analysis (The total count of coliforms bacteria, Faecal coliforms and Faecal Streptococcus)

Assessment of groundwater of Wadi Jarif for different uses indicates that the groundwater of Wadi Jarif area can be used in irrigation with availability of high permeable soil, good drainage conditions, in choosing a specific crops resist the saline water conditions, and applying modern irrigation techniques. This groundwater can't be used for domestic purposes for its high Total Dissolved Solids (TDS), Total Hardness (TH) and corrosivity ratio(CR).

For drinking, this groundwater are classified as very poor and unsuitable, also, all analyzed samples for bacteriological content classified as contaminated and classified as unsafe too. This groundwater can use for livestock drinking with limitation and can't used for any industrial purposes.

Key words: Libya, Sirte, Wadi Jarif, Hydrogeology, Groundwater quality, Groundwater assessment, chemical analysis, bacteriological analysis.

List of Contents

List of Contents

List of Contents

List of Tables

List of Tables (Cont…)

List of Tables (Cont…)

List of Figures

List of Figures (Cont…)

INTRODUCTION AND LITERATURE REVIEW

1.1 Preface

Water is an essential commodity to mankind, and the largest available source of fresh water lies underground. As the world's population increases, the demand for fresh water has stimulated for the development of underground water supplies. Inevitably, progresses in the form of modernization and urbanization have magnified the problem of the search for fresh water supplies. Efforts have increased to solve these problems; methods for investigating the occurrence, patterns, and movement of groundwater have been improved, better means for extracting groundwater have been developed, principles of conservation have been established, and research of several types has contributed to a better understanding of the subject (**Todd, 1963)**.

Groundwater is an essential part of life; it is a vital source of water for domestic, irrigation and industrial uses in both urban and rural areas. The physicochemical and chemical properties of the groundwater determine its quality and suitability for irrigation and human consumption. The potential of groundwater is largely influenced by the specific geologic settings of the area **(Elango and Kannan, 2007; Manimaran, 2012; Parihar et al., 2012; Tmava et al., 2013).**

Groundwater is generally polluted; the pollution of groundwater regime is not only due to sub-surface waste disposal, but is also attributable to the seepage of contaminants from impoundment of toxic waste on

unlined surfaces such as indiscriminate spraying of insecticides, pesticides and excessive use of chemical fertilizers etc. (**Edmunds, 2003; Thangarajan, 2007; Abdul Jameel et al., 2012; Mumtazuddin et al., 2013)**.

Arid regions have being featured with strong solar radiation, intensive evaporation, significant temperature variations and frequent sand storm, which result in vulnerable environment, particularly water environment due to the insufficiency and non-uniformity of precipitation. Therefore scientific and comprehensive insight into the water resources and environment in such a region is important for water sustainability (**Sen, 2008**).

The rate of population growth in Libya is considered a high rate and creates a demand for water at a great rate and one of the most important reasons that led to the emergence of the problem of water scarcity. This added to the great diversity in the water demand for the versatility that characterized recent decades, which covered all aspects of life (**Mohamed, 2014**).

Groundwater is an important water resource in both the urban and rural areas of Libya for domestic as well as for agriculture purposes (**Kumar et al., 2014**). Libya as many other regions under arid climates suffer from inadequate water resources to cover all the needs of this rapidly developing country (**Elgzeli, 2010**).

The Libyan coastal area, south of the Mediterranean Sea, is among one of the different types of water systems, which has a common and specific water characteristic (**El-Ghawi, 2005**). The intrusion of salt