

# **ABSTRACT**

**Keywords: environment, waste water treatment plants, the phenomenon of environmental pollution**

This doctoral thesis studies the impact of wastewater treatment plants in Yemen have on the environment and society, high levels of pollution and lack of concern of the authorities in this regard.

The research comprises six chapters, distributed as follows:

## **Chapter 1 - Introduction**

Includes part of the study together with an overview of the importance of the subject to help solve problems related to the operation of some wastewater treatment plants, functioning in several cities in Yemen. The purpose and objectives of this study is to find answers to the problems caused by the malfunctioning of some stations, that have negative environmental impacts, and propose solutions to resolve them.

The results will help current and future smooth operation of existing plants and the design of others that do not generate the same kind of problems, as some large number of municipalities has a pressing need for modern wastewater treatment plants.

## **Chapter 2**

Overview of current knowledge on the use of sludge from wastewater treatment plants, worldwide, in Europe, in Romania, the countries in the neighboring region and in Yemen.

Comparisons have been made to the situation in this field studies in developed countries of the world. Yemen compared to other countries is at the beginning.

### **Chapter 3**

Presents complex study of a wastewater treatment plant in the capital Sana'a and other situations in the provinces of Aden treatment plants (WWTP Al - Sha'ab and Al-Areesh), Yare, Amran, Hajjah and Ibb . All these stations are designed and built by outside specialists and work within generally satisfactory parameters. The need of water in agriculture caused the wastewater to be used for this, which has had a negative effect on the environment and people's health.

### **Chapter 4**

Presents the operating characteristics of the natural wastewater treatment plant in the capital Sana'a and surrounding areas.

The climatic conditions of the region - warm and dry - make strictly necessary for wastewater treatment plants for cities and agriculture might use wastewater for irrigation and sludge as fertilizer. This location was chosen for study, as it is a densely populated area, around which agriculture is practiced and because it is also an area with significant historical sites of major tourist interest.

### **Chapter 5**

Presents a study of materials and methods used. For the study we worked in collaboration with a group of specialists, representatives of central and local authorities and citizens in the area. We set the perimeter where we took samples for analysis and investigating the environmental impact through questionnaires. I used tools and equipment in the laboratories of the station's treatment plant, Sana'a University - faculties of

Agriculture and the National Laboratory equipment for controlling water quality and the environment.

Chemical, physical and microbiology analysis were conducted in these labs after specific methodology and the results were analyzed and interpreted according to the study objectives.

## **Chapter 6**

Results will be presented obtained from the field analysis, where there were used, the local community questionnaires and results of chemical analysis and biological samples carried out on various different sources of wastewater. Analysis were performed in the laboratory station within the current standards and specifications. The study found negative results when high proportions in Sr, Ni, Pb, V, Zn occurred. These results largely explain the phenomenon of environmental pollution and presents conclusions and recommendations to improve considerably the existing reality.