The spatial distribution of remote sensing stations to monitor water quality (Tigris River) within the administrative limits of the capital Baghdad, by using Geomatics technologies

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Abstract. The spatial distribution of remote sensing stations in the rivers is important technique in the detection of pollution in the river water and acceptance of Comparison Environmental determinants, as a result of toxic waste and waste from other service activities. Therefore, the study of the importance of those stations of the spatial distribution using spatial data and availability, which represent how to hold water in complete tests within the ranges of these stations in order to get to the planning ways to address and reduce pollution within the concept of sustainable development. This will address the project to outline the importance of using technology direct remote sensing in the presentation of spatial data of the stations as well as the use of geographic information systems software for the preparation of spatial databases in the presentation of contaminants databases and relying on the global system signature.

1 Introduction

The spatial distribution of remote sensing stations in the rivers is one of the important technical issues in the detection of water pollution in the rivers through the dumping of toxic waste through activities (industrial, service, agricultural). Therefore, the importance of these stations from their spatial distribution using spatial data and availability is significant. This study will provide a brief overview of the importance of the use of remote sensing in the presentation of the spatial data of these stations, as well as the use of "GIS" program to prepare spatial databases in the presentation of pollutant databases and relying on the global signature system.

2 Study problem

The problem of the study is that there are no spatial databases (spatial distribution) for remote sensing stations to monitor the pollution of the water sources of the Tigris river of Baghdad.

Therefore, modern technologies will be used to detect and identify the pollution areas of the rivers within the administrative boundaries of the city of Baghdad.

3 The objective of the study

The study aims to highlight the role that geotechnical techniques can play in the detection and detection of

pollution levels through the use of "remote sensing techniques, satellite images, GPS and GIS" through data obtained from remote sensing stations for monitoring water resources in Baghdad, Water treatment projects as well as pumping stations for the irrigation system on the "Tigris" within the administrative border of the city of Baghdad.

4 Methodology

The structure and title of the study will address the method of theoretical and library based on the collection of data on the nature of the problem of the study and then describe the modern mechanisms of collection, storage, processing and analysis of these data and show them in the form of information through objective maps of the tests on the water quality of "Tigris" river within the administrative boundaries of the city of Baghdad.

4.1 Geomatics engineering

The term Geomatics first appeared in the early 1980's in the Canadian University of "LAVAL", based on the concept that computer technology produced a scientific revolution in surveying or geometric measurements and digitally represented data to fit a large amount of data. The definition of geomantic is thus, "Integrated multidisciplinary science to select the appropriate devices and technologies to collect, store, model,

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analyze, retrieve, display and distribute spatial information resulting from several sources of specific accuracy and characteristics in a digital image. [3].

4.2 Remote sensing

The latest technology to collect data from a region by advanced devices and these devices send data to researchers automatically "for study without having to visit the area to collect the required data. A famous example of this technique is the satellite imaging where the satellite takes pictures of the surface of the Earth and then sends these images to the earth stations for analysis and interpretation of the surface form, areas of global warming, the temperature of the earth, the heat of the ocean ... etc.

We can divide the remote sensing process into two types according to the method of data collection.

4.2.1. Separate Sensitivity Process.

This process is done by placing the data collection device away from the area to be studied. The device will receive the reflected or emitted electromagnetic waves emitted from that area and convert these waves into numbers or images that the experts can understand and analyze.

Examples of this method are the astronomical observations which collect light rays from the stars and analyze them to identify the components of those stars as well as space photography where the cameras capture the light reflected from the surface of the earth convert to digital images and send to earth stations for use in various studies and research. Figure (1) below shows the Mechanism of remote sensing technique. [1].

Fig.1.Mechanism of remote sensing technique. [1].

4.2.2 Connected Sensitivity Process.

In which the data collection device is located in the area to be studied and left, where the device automatically collects data and sends it to satellites or other data transfer technology (CSD, GPRS) to researchers who are often far from the study area.

4.2.2.1 Connected Sensitivity devices (remote sensing stations)

Figure (2) below shown some of the most important components of these stations:

Fig. 2. the most important components of these Substation remote sensing. [5].

4.2.2.2 Sensors

They are optical sensors, such as the dissolved oxygen sensor in the water or the ion selective electrode, such as the pH sensor, both of which operate in an electro chemical method. The sensors vary according to the different chemicals that are detected, Figure (3), and can be immersed in the river water completely.

Fig. 3. Optical sensors & Ion selective electrode Sensors. [5].

4.2.2.3 Sonde

It's a device connected by more than one sensor. Figure (4). It transmits the entire readings from all sensors to the device that analyzes the data.

(sonde)

Fig. 4. Sonde transmits the entire readings from all sensors to the device that analyzes the data.[5].

4.2.2.4 Data Logger

This device will store the data from the sonde, which by its nature are electrical signals in the unit of measurement (mv) and digitized according to the type of variable read by the sensor and according to the units of measurement adopted globally. The mind of the substation is all the instructions issued from it, for example, the data is sent and received at specific times by instructing the transmitting device to signal the transmission of data and instructing each sensor to take reading at a specific time as well as determine the form of data sent either as tables or in the form of (Text document).

4.2.2.5 Signal Transmitter (modem)

It transfers the data analyzed by the data logger from the remote station to the main station where the data is displayed and tabulated.

4.2.2.6 Solar panels

To provide continuous power to the substation by charging high-capacity and long-lasting lithium batteries that operate the entire plant components, "which is a mechanism for the use of environmentally friendly renewable energy.

4.2.2.7 Main station

This consists of a modern and high-caliber computer calculator. It contains a signal receiving device from the substation and software that displays the readings from the substations and is able to receive data from more than one station. The software then analyzes these readings and displays them appropriately and creates graphs for each variable. The GPRS service has been adopted by mobile phone companies to transfer the signal in the form of Circuit Switch Data (CSD). This is a method of transferring encrypted information. This method has a low cost compared with other signal transmission devices and additionally efficient. Figure (5).represents a remote sensing station in the (AL Jadiriya) near the Babel Hotel.

Fig. 5. Represents a remote sensing station in the (AL Jadiriya) near the Babel Hotel.. Source (searcher).

5 Practical aspect of the study

5.1 Phase I (data collection stage).

1- Field survey phase for the purpose of monitoring the locations of remote sensing stations using GPS. Figure (6).data collection.

Fig. 6. Part of the on-site monitoring of station coordinates.

2- Desktop survey for the purpose of collecting data for laboratory tests and results of readings of remote sensing devices.

5.2 Phase II (design and construction of the GDB)

1-Field survey coordinates using Arc GIS' 9.3' are summarized on a high-resolution satellite image of '0.6' m.

2-.The geographic database is built using Arc GIS "9.3" and categorized according to the approved standard specifications, according to the 'UTM' Zone(38N) projection system, the WGS 84 Datum and the global Ellipsoid (WGS84).

5.3 Phase III (Development of the GDB)

1- The drawing of the symptoms digitizing the Tigris River and points of remote sensing stations and use of the process of topological correction (Topology) of the layers resulting from the drawing process.

2- The process of linking the field survey data and the desk survey with the geographic database for the purpose of accessing the database as final.

5.4 Phase IV (producing a digital map and thematic maps)

1- Production of digital maps in 'mxd' format that can be updated, developed and modified using Arc GIS '9.3'.

2- Production of objective maps on a specific scale for several subjects related to the study provided by the researcher (administrative boundaries of Baghdad governorate, distribution of remote sensing stations in Baghdad, average results of remote sensing readings of the value of a particular element in water, etc.) and high-resolution satellite images.

6 Outputs

Outputs are multiple thematic maps in terms of the spatial distribution of stations as well as the descriptive data of the variables of the tests obtained from the stations for monitoring the variables related to the quality of the Tigris. as shown in the Figure (7).

Fig. 7.Thematic maps in terms of the spatial distribution of stations. Source (searcher).

7 Conclusions

The researcher's approach is to compare between the concentration of Tigris river variables at the time of entering the water of the river, the administrative boundary of the city of Baghdad at the first station, the

station(Karkh) as the first monitoring point as well as the station (Madaaen) as the last monitoring station on the Tigris River before leaving the water administrative boundaries of the city of Baghdad. This will focus on the most important etiological factors that affect the change in results in a significant and steady manner.

1-Temperature variable and the measurement unit "°C".

We note that the temperature change between (Karkh) and (Madain) stations is one degree Celsius($\Delta T = +1^{\circ}\text{C}$).

2- PH variable .

We note that the amount of change in the value of hydrogen ion between (Karkh) and (Madain) stations ($\Delta \text{PH} = -0.3$). It is noted that all the results of the stations fall within the new parameters of the system of river maintenance from pollution (no. 25) of 1967 and the instructions attached thereto.

3- Total Dissolved Solid (TDS).

We note that the amount of change in the value of the TDS variable between the between (Karkh) and (Madain) stations.($\Delta \text{TDS} = (+280) \text{ mg / l}$).

4- Dissolved Oxygen (D.O).

We note that the amount of change in the value of dissolved oxygen concentration (DO) between (Karkh) and (Madain) stations. ($\Delta \text{DO} = (-1.8) \text{ mg/l}$).

5- Turbidity (Nephlemetric Turbidity Unit "NTU").

We note that the amount of change in the value of turbidity "Turbidity" between (Karkh) and (Madain) stations. ($\Delta \text{Turb} = (-9.2) \text{ NTU}$).

6- Chlorophyll variable.

We note that the amount of change in the value of the Chlorophyll concentration variable between (Karkh) and (Madain) stations.($\Delta \text{Chlorophyll} = (-1.1) \text{ mg/l}$).

7- Blue green algae "BGA".

We note that the amount of change in the value of the BGA concentration variable between (Karkh) and (Madain) stations. ($\Delta \text{BGA} = (-124) \text{ Cells/ml}$).

8 Recommendations

1-Finding suitable solutions, including the development and expansion of design energy and address the breakdown of sewage treatment plants located south of the city of Baghdad on the River Diyala (Northern Rustamiyah and Rustamiyah South), as well as the station Karkh streams that flow on the Tigris River south of the city of Baghdad after the convergence of the Tigris River Diyala River where the sewage treatment plant has been out of work since 2003 because of the acts of sabotage that followed the war.

2-Activating all laws and legislations to stop all irregular discharges from stations, for example (Abdel Mohsen El-Kazemi, PN Sidya, TS1), which are mainly designed for "rainwater drainage". The irregular packages have turned them into sewage and industrial sewage stations directly addressed to the river.

3-Follow up all industrial and service activities and impose a remote sensing mechanism on them and develop their environmental awareness and treatment of pollutants through practical and scientific methods and impose appropriate fines on the amount of pollution to the aquatic environment in case they exceed the permissible limits in accordance with the applicable laws and legislation.

The Environmental Protection Act of 2009 has many sections and chapters, including Chapter Three, Article 9, which states: "Those who produce environmental pollution shall comply with the provision of pollution treatment methods and systems using the environmentally clean technologies and their operation and ensure their efficiency and treatment of defects therein. Provide the measurement and control of pollutants and their nature and record the results of measurements and also the adoption of the construction of a database on environmental protection and includes concentrations and levels of pollution. Chapter (V) in this law states that all activities affecting the environment to slavery and in the eighth chapter, he explained the so-called compensation for damages as a result of negligence by complying with environmental laws. In Chapter 9, there were punitive provisions that authorized the Minister to give any warning to any establishment, laboratory or exporting authority for pollution to remove the polluting agent). [4].

4-To work on developing the environmental performance of the control and updating its mechanisms and keeping

abreast of the scientific development in this field, by highlighting the role that space images can play in the detection and location of pollution, as well as the daily digital surveillance technology, "digital detectors for field surveying. The enforcement of environmental laws or tax system, which is one of the important tools that can be relied upon in direct activation to address the problem of environmental pollution and will lead to a positive impact to control the values of levels of pollution through the daily use in factories and the Purification plants and power plants located on the Tigris and Diyala rivers in Baghdad.

5-Invest the political and diplomatic momentum in activating the international and bilateral agreements of the shared nature of water resources and maintaining the quantity and quality of the water entering the Iraqi border with each of countries (Turkey, Syria and Iran) because it has a direct and indirect impact on the quality of water and its ability to absorb the pollutants and purify them.

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