GIS AS A SOLUTION FOR PERSIAN GULF RESOURCE MANAGEMENT

Ali Asghar Alesheikh [a], Ali Aien [b, *], Ehsan Mohammadi [c], AbdolReza Meshkini [d]

[a] PHD in Geo-Spatial Information Systems, Dept. of GIS Engineering, Alesheikh@kntu.ac.ir
[b] M.Sc. Student in Geo-Spatial Information Systems, Dept. of GIS Engineering, ali_aien@yahoo.com
[c] M.Sc. Student in Geo-Spatial Information Systems, Dept. of GIS Engineering,mohammadiehsan@yahoo.com
[d] B.Sc. Student in Geo-Spatial Information Systems, Dept. of Geodesy and Geomatics Engineering, reza_m304@yahoo.com
[a,b,c,d] Faculty of Geodesy and Geomatics Eng., K.N. Toosi University of Technology, Vali_asr St, Tehran, Iran, P.C. 1996715433
Tel: +98 21 8789357, Fax: +98 21 877 9476

KEY WORDS: GIS, resources, management, pollution, disaster, analysis, decision support.

ABSTRACT:

Recently bioenvironmental damages are being happened by occurrence of wars and also pollutions due to construct manufactures and huge power stations on the natural environment. On the other hand, the maintenance of valuable resources and also recognition of pollution resources are included in the main responsible of the relevant organizations. Meanwhile, using of modern and advanced technologies and facilities cause increasing speed and accurate in their investigations and analysis. GIS is a sort of theses modern technologies with a high capabilities and functionalities in the context of spatial and statistical analysis and also resource management. The evaluation project of bioenvironmental damages has been done to assess and analyze the density of pollutions in Persian Gulf by GIS functions.

1. INTRODUCTON

The decrease of biological and non-biological resources will face the world with a sudden disaster in few next years. The reasons for the decreases vary from growth of population to irregular usage of energy to global events like wars and immigrations.

Thus resource management becomes more and more important to prevent human beings from falling in the darkness of poverty and lack of energy.

GIS as a powerful system with its versatile capabilities such as spatial analysis, visualization, and spatial database management helps managers with support for making best decisions about natural resources and management of these resources (C. J. Data, 1999).

Persian Gulf as a vital resource in the region contains a large number of substances, materials and also a great deal of food. Besides there are a lot of oil wells in Persian Gulf that makes the gulf a strategic area.

Due to occurrence of many war disasters around Persian Gulf in recent decades, it seems sensible to study about the effects of wars on the pollution of the gulf and also elimination of resources.

In order to reach the aim many studies about the situation of living creatures have been made and a lot of observations about materials and substances have been collected.

Data about living creatures like fishes and planktons, and materials like carbonates and sulfates have been gathered in forty five stations.

Collected data were categorized into biological and non-biological terms. These collections have been repeated for four seasons of year and for each station sixteen layers of data have been observed.

Capabilities of Geospatial Information Systems give a powerful hand for analyzing each data layer and displaying results as charts, diagrams, and maps.

Consequently, the decreases in resources of any kind were obvious through results, thanks to GIS statistical and spatial analysis.

2. SPATIAL ANALYSIS

Even where nongraphic data has been computerized, the researcher may still have to comb through sheets of computer printouts while visually comparing the data with the maps. A GIS provides the researchers with powerful automated tools to answer these questions. These tools make it much easier to analyze the data for special studies and reports. In fact, new types of analysis that were not feasible before are now possible. The GIS can quickly search through map data, looking for features with certain characteristics, or inspecting spatial relationships among features. Moreover, graphic data and attribute data are explicitly linked. Thus, the GIS user can search for map data using attribute data as a creation, and vice versa (George, 2001).

The GIS can automatically and quickly answer requested questions, but with traditional maps, these questions would require a search through real files, follow by a visual review of other maps, and also spatial analysis which is one of GIS capabilities can be done on digital maps.

The spatial analysis is a tool for helping researchers discover and understand spatial relationships in their data. This discovery and understanding can be as simple as viewing and querying their data or as complex as creating an integrated custom application.

The main component of the spatial analysis is the grid theme. The grid theme is the raster equivalent of the feature theme. The Spatial Analysis also presents generic spatial analysis functionality on grid and feature themes that is added to special software.

With the spatial analysis, following functions will be able to perform in GIS software: interpolate grid, find distance, assign proximity, calculate density, reclassify, create contour, derive slope, and derive aspect. Much more functionality is accessible

via Spatial Analysis, such as hydrological analysis and geometric transformations.

Interpolate grid analyze is a best way to show bioenvironmental pollutions on digital and printable maps. In the implementation phase, especially interpolate grid analyze has been done to emphasize on the density of pollutions by GIS software.

3. IMPLEMENTATION PHASE

After several studies and researches about 45 suitable stations have been established for data sampling on the Persian Gulf. These stations were located by Global Positioning System (GPS) facilities. Of course, the situation of these stations was greatly depended on the various kinds of elements such as sea topography, distance from beach and other stations and etc. Distribution of these stations has been shown in below.

Sampling stations of the survey area in the Iranian waters of the Persian Gulf
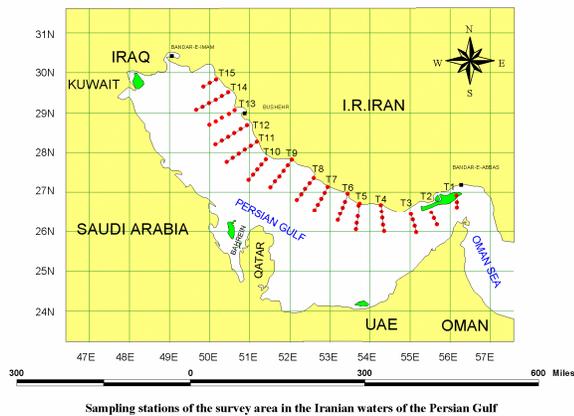
Figure 1. Sampling Stations

Regards to some factors and elements, a number of these stations were chosen for each sampling, so these stations are different in various sampling.

Data gathering and sampling from various kinds of existing biological and non-biological groups has been done in the different levels of the Persian Gulf.

These data were divided to 6 various groups of physical, chemical, biological and non-biological elements.

Row data was provided after data gathering, so data processing is an essential work to prepare some efficient information. Processing of row data which provided from data sampling should be performed by experts and technical persons and methods.

And at last, map and chart productions to display distribution of biological and non-biological elements and also data analysis have been implemented by using of GIS. This section has been emphasized in this paper. So that it has been mentioned in the previous section, maps, charts and map data are easier to research, analyze, and present.

To make a good understanding of map capabilities and how they can display the pollution distribution and density, two various distribution patterns of hydrocarbon elements concentration in the sediment of the northern part of the Persian Gulf, have been shown in the following figures.
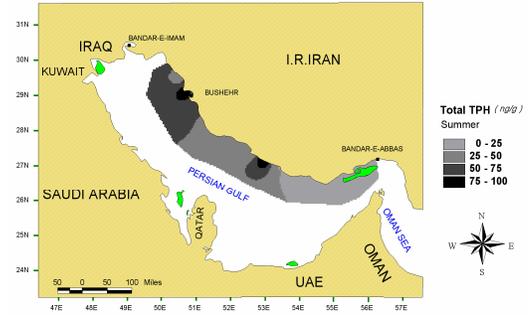

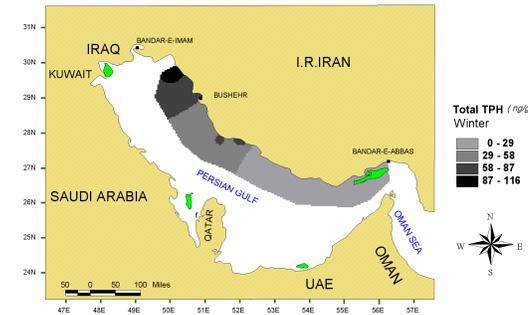Figure 2. Hydrocarbon distribution pattern in summer 2001

Figure 3. Hydrocarbon distribution pattern in winter 2001

As it is clear in these figures, density of hydrocarbon is concentrated on the northwest of Persian Gulf, and the amount of it in winter is more than in summer.

Also another tool for assessment and analysis is charts and histograms. But it is useful for separated data and it shows linear distribution. In the next figure, the distribution of hydrocarbon is displayed in a linear chart.
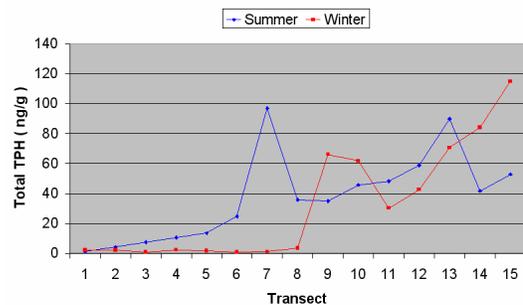

Figure 4. Hydrocarbon distribution chart in summer and winter 2001

Of course the average of hydrocarbon in each sampling station was used in the above chart, so that the column or Y axe shows the amount of average hydrocarbon and the X axe shows transects which are the sampling lines and displayed in the figure.

Six groups of physical, chemical, biological and non-biological elements have been analyzed in the form of above and they shows clearly the decreasing of biological elements and

increasing of pollutions on the northwest of Persian Gulf in 2001.

Consequently, Persian Gulf War can be an effective factor for these events.

4. CONCLUSIONS

A GIS is best suited for the analysis of geographic data. In addition to spatial data, a GIS also stores attribute data. GIS software is designed to permit the routine examination of both spatial and attribute data at the same time. Moreover, the GIS technology is supporting entirely new applications, including vehicle navigation systems, decision support systems, precision fishery and maps and charts production systems.

Evaluation and investigation on resources and also pollutions has been simplified by this new technology.

Regard to maps and charts which produced by GIS capabilities, it is understandable that the resource of pollution might come from Persian Gulf War because maps show clearly the density of pollutions on the northwest of Persian Gulf.

5. REFERENSES

C. J. Data, 1999. An Introduction to Database Systems, ADDISON-WESLEY, pp. 2-9.

George, B., Korte, 2001. *The GIS Book,* On Word Press, New York, pp. 51-52.

6. ACKNOLEDGMENT