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Urban Water Management at the Time of Natural Disasters

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ABSTRACT

Since natural disasters occur, facilities which are related to this vital element are underground so, it is difficult to rapid access to correct, accurate and reliable information of urban water distribution network. Therefore, this article has done operationally in Boukan city which is located in Western Azarbaijan of Iran and it tries to represent by using rules and data of construction management, urban designing and capabilities of Geographical Information system (GIS) in urban water management at the time of natural disasters. Structure of this article is like that in first we established a comprehensive data base related to water utilities by collecting, entering, saving and data management, then by modeling water utilities we had practically considered its operational aspects related to water utilities problems in urban regions.
KEYWORDS: Natural Disaster, Geographical Information system (GIS), Construction Management, Urban Designing, Modeling and network analysis

1. INTRODUCTION

The most effectiveness factor of natural hazards which threaten people and damaged persons is water. This problem threatens people's safety before and after the fracture. Damaging water source such as spring, wells, aqueduct's breaking ground source and aerial, breaking the source of drinking water and sewage tubes, damaging constructions and pumps that always confront with cutoff electricity and have been discomforting for habitants and can create environmental problems for government. Moreover, cause of water shortage and penetrate unclean water and sewage to the water source which has hygiene efficacy on the (watery animal) so the (trauma) obliged people refer to septic water which derives to broadcasting fatal and contagious watery diseases in the region. Because water plays an important rule to bail the bacterial diseases directly and indirectly such as: paralysis or palsy , cholera, chemical venom and etcetera. In periods that natural hazard occur one of the problem in urban water management in tend of the expanses of the networks and water and sewage utilities is to be unreachable to correct tender, confident information. In order to the importance of reachable data also cause of the oldness of the utilities of the water and sewage companies which done not have any reachable, accurate and reliable information in this case. So, it is necessary to schematize data according to CIS standards and collecting needful data as their precedence. [18].

2. Case Study

The Boukan county which located in same mountain and temperate region that Surrounded by Myandouab county from the North and Saqqez county from the south and to Shahindezh county from east and from west to Mahabad county. The capital of this county is Boukan city. The Boukan city located in 36◦ 31' North latitude and 46◦ 12' east longitude and its height from sea level is 1370 meters (Fig . 1)

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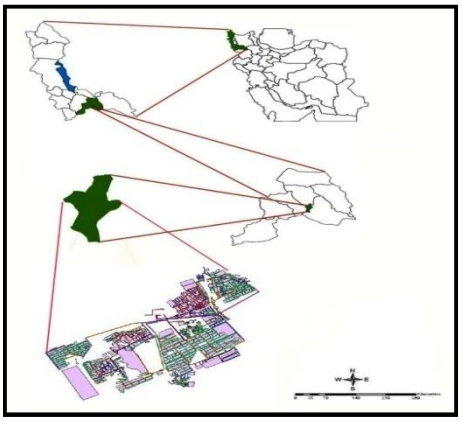

Fig. 1 Geographical position of study are

3. MATERIAL AND METHODS

In this research after collecting unpractical data which relates users' relation and distribution networks and maps related to water network distribution, we have to import format and enter data to system and after managing database process with modeling in GIS , it is time to analysis the various parts of the water distribution network. At the end we gain the result that we were waiting for. (Fig. 2) .

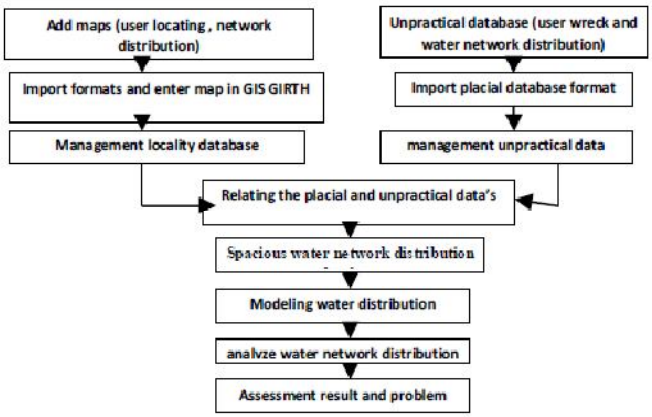

Fig. 2 water distribution network modeling process

At first those maps which were paper sheets scanned, thus maps digitalized in AutoCAD area. In order to the high precision accuracy that AutoCAD software has, this process will be done in this area. Then the prepared map should correspond with the current city map and be georefrenced. After gathering information about network components such as valves (which have identity), pumps (which have catalogs), tanks and pipes, the information entered in a software database area such as Access. It is mentioned that in the digitization of paper maps, all features were coded according to the coding system then, the maps for final corrections were entered in Arcinfo8.1and the network topology was built on it. It is mentioned that if there were no mistakes on maps there is no need to make topology. So, for making objectionable network graphical area will be used. After that the current map putted on Arcview3.3 area as the current tables from the base information to make relation between them. For making hydrological network base on maps of distribution city network sump, pumps, tubes, tabs, ties placed on their own layer and the essential describable information for each of the above features entered in its table to make a model.

DWG file city that was provided on old base map edited on new city map with scale 1:2000. information layers preparation an descriptive information the first step to water and sewage companies for improve system ability and water distribution is product a georefrenced database .The aim of designing database system is the management of awful data , data management conclude definition structure of save information and represent methods for verify information [16] after scrutinizing maps and information situation of city water and sewage and products, the primary installation of water and sewage affair related GIS was done. The maps of water and sewage prepare to enter the area.

These data have been used in this research:

1) Base map of the city in scale of 1:2000 that provides with the topography organization of Iran

2) Maps of the water distribution in scale of 1:2000
3) Paper map's of the users locality that provides with the sewage company of the Western Azarbaijan
4) Map of the refinery
5) Map's of sump
6) Map's of pomp's station , tube and continuity

4. RESULTS AND DISCUSSION

In order to importance of the concept of data, the explanation of them will be study firstly. Data is the explanation of quantity of phenomena's characteristic. Also, information mentioned as the result of the processes that we do on the data to gain the communication which is depending in the data structure. In order to these definitions, information provided from processing data. The auxiliary instruments that have been used for selecting and processing systems are idiomatically known as information system. Ordinary information system is inclusive the continuum of different stages, in gaining data to analyze an use of them in decision processing [13].basically information is the first element in the any planning but, nowadays by the tremendous increase of the information mass the problem of their order is in discuss. [7] Nowadays it is clear to all of the managers and urban designers that constructions management and managing the various part of the city is impossible with traditional tools. The importance of GIS in urban planning with the speedy extension and vast decrease of information that should be processing in urban management is apparent [8].

4.1. GIS definition

In the early engender of geographical information system, cause of the splay information and different usage in other fields. Different definition of this system represented which some of them are geographical information system that for ace, maintains and also usage of cartographic data is delighted [11]. Geography information system is collection of powerful instruments for saving and retrieval of information in future commutation and display space data in real global [3] more of GIS activity began in 1980.In this period GIS appears as a dynamic knowledge with speedy growth. In the analyze processes, displaying palatial space data and displace (map, static data) have had great progression [1].

4.2. Urban and GIS

Aim of GIS urban system gain the comfortable and claw in use of urban facility and available relative and landform usage in two teaching: inner dispelling teaching with harmony with external system in environment.

System's external rhyme teaching for orchestrating their roll with the inner environmental system. form the latest decade GIS have roll in urban effects works in the world . specially in French (urban planning in Lion) in urban planning locality and urbanity transportation in Holland , in field planning usage .fire station office urban firms in take main USA are samples of using of the GIS in planning .Choosing a place to create a store , choosing route for driving to gone the work station and home transportation infrastructure find solution for increase spatial problem decide to land use , locate product center and activities , choose economic an environmental solution and choose urban and regional solution is some of GIS usage [15].

A. GIS information source

Entry information to geographic to geographic information system can be divided to two parts.

A) Spatial information spatial information are the entire geometric information realty to the locality, place or point coordinate that will be distinct by geographical longitude and latitude (y,x,z).

B) Unspatial information: the spatial information are the entire information about vilifies, characterizes and trait's of exist elements in the earth , this information composed static list , exploitation : picture and film's of phenomena [17] more of than 80 percent of information in the geographical locate toward others phenomena [10]. Fig. 3-4 displey the relation this component in the entire of this system

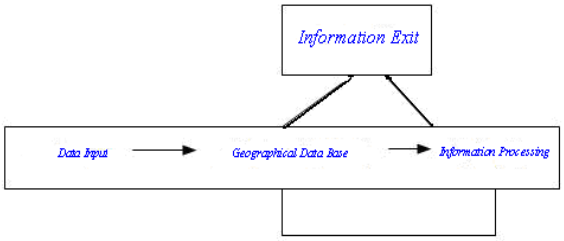

Fig. 3 displey entire component of GIS [12]

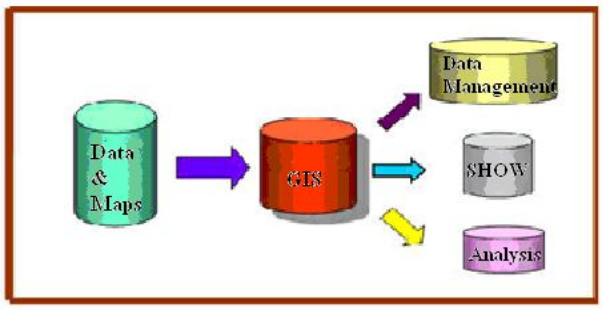

Fig. 4 the GIS processes

4.3. Process of the analyze information in GIS

GIS is an computer system that provide four basic ability in relation to dereference data

1- Data input 2- data management 3- process and analyze 4- output data

GIS composed of some handwave and software and users that the end of use GIS should be cleavly distirct because of this system require so much cust and fasilities for use of GIS this syatem should be capable to recive all of necessery information and so product information compeletly [9]. output and input envirous are the relational way to connect GIS with real global [2].the companies of water and sewage have two sort of information the undergrount infor mation and the information about user so this coucept that management of this mass of information with handle and tvaritioual method is very difficalt because of this necessy of a codifid system to collect information and maintain and update them is and cause of the awfull relation of the companis and units they should have database bank [5].

4.4. Making topology

Topology is making of palatial relation between geographical phenomena in real global in database back with use of mathematic relation's and the ordinary method is cottage spatial relation in GIS. Topology is the mathematic method for definition spatial relation one of the advantage of making topology is that the spatial analyze problem without using the coordinate some of spatial audios as neighborhood, proximity and continuity can be done just with the topology data. this character stoppage the time consuming calculates for obtain spatially relation data are save without using the topology model result this more of this operation and spatial analyze in GIS base on topology is more effective . But make topology structure cost more energy and time cause of the new map enterer change the topology should be change [4]

Though the topology have so much premium but must indicate this that in water network modeling cause of too changing in network and so specific structure network (for example in some case the tubes pass over other without ever crossover) using of topology structure is not commodious and useful further used of graphical model with snap space for join the borders (fig.5)

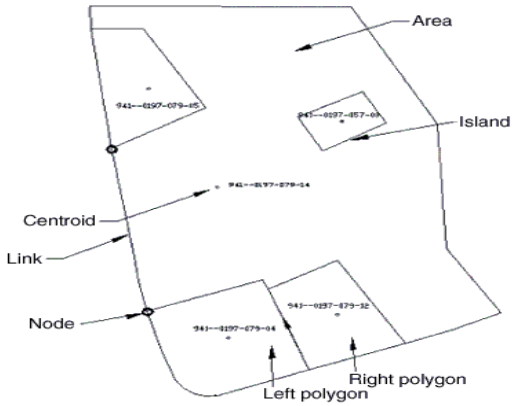

Fig. 5 topology structure

4.5. Network analyzing

One of the importances of extension of GIS software is networker analysis. This extension make the possibility analysis geographical phenomenon that have network mould (street, telephone network, water and electricity).Analysis like water network analysis and distinct the nearest to the place of juncture is available by network analysis [6] (figures 6, 7 and 8).

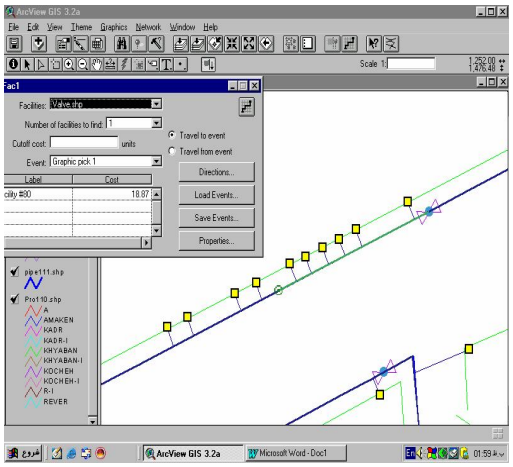

Fig. 6 nearest to the place of juncture

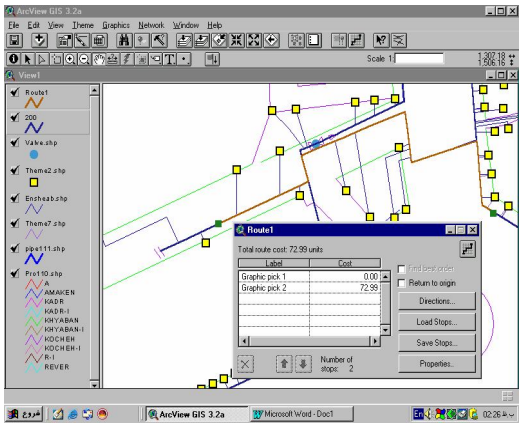

Fig. 7 shortest route between to spot from network with display distance

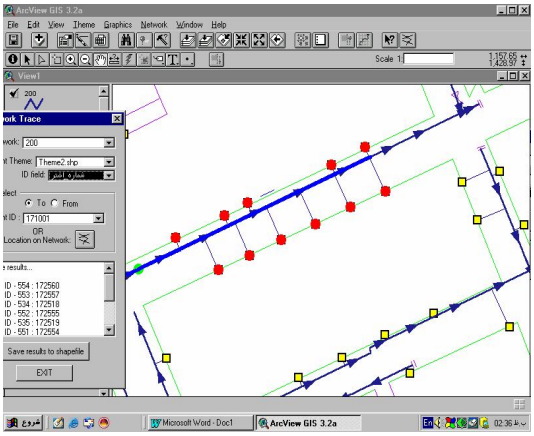

Fig. 8 Users whom lose their water cause of an incident which occurred in the water network, displaying according to their name and their distance from the incident.

5. Conclusion

Due to of the high extension of networks and underground installation that composed from statistics, Information and saving processes, base analysis management on our information for distinction and correct planning using GIS in the time of occurrence of environmental incidents is impossible in this article. The ability of GIS investigated as a capable instrument and some of its ability that are used in water management in the time of natural hazard occurring are explained. In attention to exposé complicated and urban installation in Iran using GIS in the field of urban installing is vital.

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