Modelling and conception of hydrological data base of the watershed. Case of Sebkha of Oran (West of Algeria).

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Abstract:

The objective assigned to this work, is the modelling of the water resources of the watershed of the Sebkha of Oran (Algeria) by the implementation of a hydrological data base able to write in an adequate way constituting elements of the physical environment.

The elaboration of a computerized data bank directed to the study of the functional unity which is watershed constitutes the quintessence of this work. In the concern to study the various factors acting on the functioning of the environment, it was possible to integrate a set of data resulting from various sources, such as the satellite images and the digital terrain models (DTM), within a geographic information system (GIS).

1. INTRODUCTION

Today, the geographical information systems (GIS) appear like real tools, contributory to the understanding of the real world for a better mastery of the scheduling of his development. They permit to integrate the various data relating at the environment, some either their structure or their nature. They manipulate thus, the geographical data, destined to be drawn and the descriptive data bearers of the information relative to the first.

Depending on whether one is located of the side of the users or decision-makers, the SIG for the first is a system of database managements, for the seizure, the storage, the extraction, the questioning, the analysis and the display of the localized data (PORNON H., 1992). For the side of the second, its seen lake a set of data marked in the space, structured in order to be able to extract of it conveniently of the useful to the decision syntheses (DIDIER Mr., 1990). Concerning our work, the idea was how to simplify and to put between the hands of the decision-makers a tool that will facilitate the stain and the access to the different information. This, consist therefore in elaborating a geographical data bank, capable to describe a more advanced manner the set of the parameters, that act directly or indirectly on the working of the physical model (watershed). For that to make, a set of the geographical data, satellite images and semantics have been introduced and manipulated in a geographical information system.

2. Presentation of the study zone

The study region is situated in the external zone of the Tellien domain. It is situated between two sets of mountains, the mounts of Tessala to the south, culminating at 1061 meters (pick of Tessala) and the mounts of the Murdjadjo to the north, culminating at 584 meters to Mesabih. These two sets form between them, the big endoréïque basin named the watershed of the big Sebkha of Oran. The Sebkha is constituted of a big extended salt lake, surrounded by a set of plains juxtaposed to the north (plain of Misserghin, Amria, Bou-Tlelis, …) and to the south a very big extended plain (plain of Mleta).

Geographically, the zone of experimentation is localized between the meridians 0° 45 and 0° 55 (W) and the parallels 35° 20 and 35° 30 (N). Fig n°1.

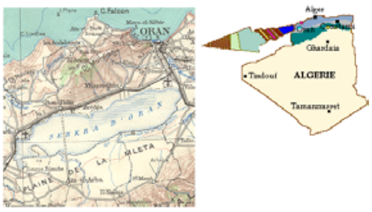

Fig n° 1: Geographical situation

3. METHODOLOGY

The methodology of our work consists to modelling the set of the elements constituting the physical environment of the big watershed of the Oran Sebkha by using a GIS. The acquirement of these data has been introduced by the different fashions (manual, recuperation of the data in vector and raster format). The general diagram of the geographical data bank elaborate can be summarized of the departure phase (seizure of data) until the construction of the data base in the following organization chart. Fig.2

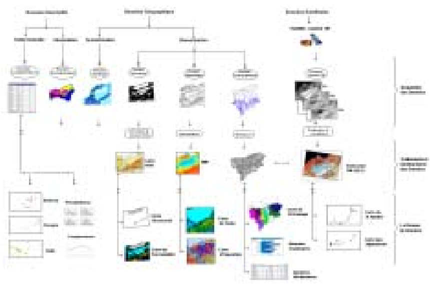

Fig. 2: flow chart of the data bank achieved.

4. Modelling of the geographic data

The data modelling designates a general description of the entire geographical objects and their relations. It tries to represent the reality more or less according to the big degree of finality. It is about a conceptualization of the reality under the shape of separated information layers, relative to different themes. According to CLARAMUNT C., 1991, the data and the processes to modelling must correspond as closely as possible to the objective reality.

4. 1 Conceptual Model

The conceptual model is the fundamental part in the architecture of a data base system. The passage from the real model to the conceptual model (M.C.D) correspond to a process of modelling where the objects of the real model are classified in categories and nominees by names. It consists in three elements of basis called entities, attributes and relations between entities. Fig3

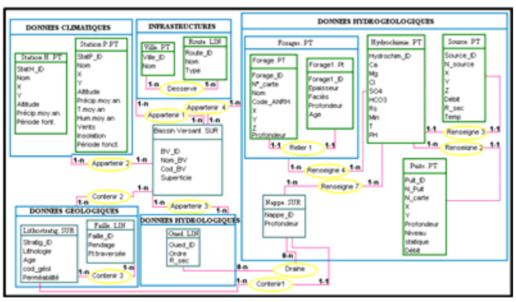

Fig. 3: Conceptual model.

4. 2 Dictionary of data

When the conceptual model is defined, its necessary to structure the data and the processes identified, this step permits the physical implantation of the conceptual model in the informatics corpse of the SIG (CLARAMUNT C., 1991). Thus, will be defined the files that contain the information, the attributes connected to these information, to get this one, in brief, everything that will contribute to make the system a real tool of management and analysis.

The dictionary of the data contains all information on the entities of the data base (names, definition, spatial reference, ...).

Example:

WATERSHED: WATERSHED

Definition: set of the slopes toward a same river. These basins separated by lines of shared waters.
Attributs:
BV_ID: unique Identification
Nom_BV: Name of the basin
Cod_BV : Number of the basin
Superficie: surface of the basin in km²
Relations:
To contain -2: Geological Data
To belong 1: infrastructural Data
To belong 2: Climatic Data
To belong 3: Hydrological Data
To belong 4: Hydrogeological Data

4. 3 Logical model

The logical model is a representation of the (M.C.D) according to the possibilities of the status of the technological material. (DELOBEL C. and al., 1992).

The entities and the relations described in the conceptual model of data are transformed under tables form. Identifying of the relations is gotten by concatenation of the identifying of the entities that participate in the relation.

Example: relations types

Relation one to one:

Case of a relation between the lithostratigraphy_Drilling_ table and the drilling table: the two tables are joined by the key Drilling_ID. Fig. 4.

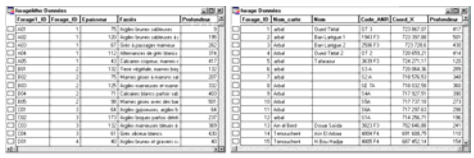

Fig. 4: Example of relation type one by one.

Relation one to several :

Case of a relation between the Hydrochimical table and the well table. Fig. 5.

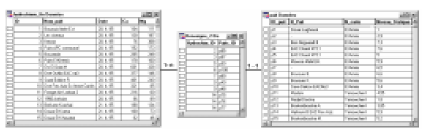

Fig. 5 : Example of relation type one to several.

Relation several to several :

Case of a relation between geology table and the watershed table. Fig. 6.

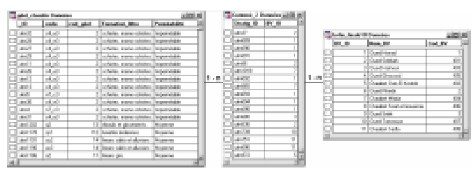

Fig. 6: Example of relation type several to several.

4. 4 Physical model of data

The physical model corresponds to the structure of storage of the data. It permits therefore, to describe the data as they are stocked in the machine

Name of the table : watershed
By the attribut: BV_ID

CHAMPS	TYPE	LARG EUR	NOMBRE DECIMAL
BV_ID	Entier		
Nom _BV	Caractè re	35	
Cod _BV	Entier		

Fig. 7: Example of the physical model.

5. CONCLUSION

The modelling of the hydrological data we permitted to have a global vision of the set of the data constituting the physical environment.

The fast access to the data and the possibility to produce different types of scripts give the advantage to the specialists of the domain to predict the different critical situation types in the working of the physical environment.

This modelling has the advantage to give some fast answers and useful to our decision-makers in order to answer the different better requests.

This work constitutes a link of a long chain that will treat the development of the management model of the watershed.

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