

LIS/GIS FOR THE DANUBE DELTA

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The Danube Delta, as a biosphere reservation, has called both the Romanian government and international institution attentions to itself. The Danube Delta should be thoroughly investigated to carry out any efficient work. Till now, various cartographic documents have been compiled, but the classical cartographic products cannot answer the present-day and future requirements any longer. This paper describes LIS/GIS which are under development for the respective zone,

Key Words: Cartographic, GIS/LIS, Remote Sensing Application.

The Danube Delta is the Danube River mouth into the Black Sea. It is the second European deltaification as against the Volga Delta. The delta is the newest Romanian land, which landscape is featured by a moisture and flooding land permanently changeable under the influence of both the fluid flow (about 200 cubic km. water) and the solid one (about 60 M. to/year alluvial deposits). The Danube River is 2860 km. long and has a 800,300 sq.km. reception basin.

That delta is extending over its three branches, i.e. Chilia, Sulina and Sf. Gheorghe, near-by the Northern 45° parallel. The whole delta surface covers about 5000 sq. km., out of which 2540 sq. km. are delineated by its three branches. Some other times, that delta entirely belonged to the Romanian territory; nowadays, only 4340 sq. km. are to be found within the Romanian boundaries. (see Figure 1).

The Danube Delta with a 0.52 m. average height shows a general tendency to extend itself, owing to:(1) a continental platform just at the river mouth discharging into the Black Sea;(2) the large alluvial deposits which the river carries;(3) very small tides (about 10 cm); (4) favourable marine currents.

Inside the delta there are pre-deltaic land islands, fluvial and fluvial-sea banks showing a dune-like relief, many lakes, pools and marshes, backwater, channels and canals, large areas covered by water vegetation (reed, rush, sedge) and forestry vegetation, as well. The swamp vegetation is prevailing. The lands ever-covered by water amount to almost 80 per cent of the delta area. There are various species of birds and fishes all over the delta. There are to be found some human settlements, i.e.

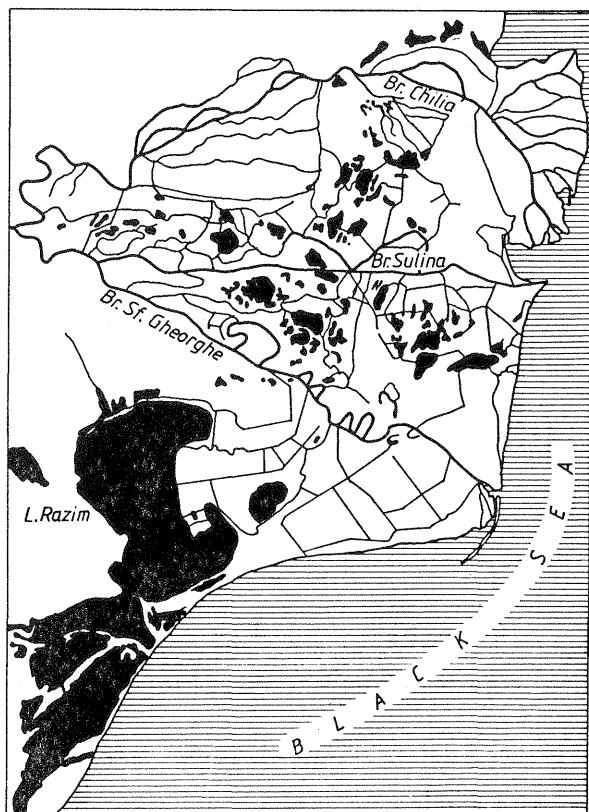


Figure 1. The Danube Delta Sketch

a small town and 28 villages over the deltaic steady lands. For some years, five natural ornithologic and forestry reservations over large areas (more than 400 sq. km.) have been established; since 1991, the whole Danube Delta has been stated as a biosphere reservation. Indeed, it is the largest biosphere reservation in Europe, as well as, the most beautiful and interesting one all over the world.

To know and protect the delta proper to its new state-of-art, it is a sine qua non condition to develop a LIS/GIS providing information required, firstly, by its environmental monitoring and, secondly, by many institutes and bodies undertaking activities within the respective zone.

In the last decades, the geodetic and leveling networks have been established, aerial photographs for various purposes, topographical ones mainly, have been periodically

taken, satellite imagery, large scale (1:5,000 and 1:10,000) topographic and cadastral maps, as well as, mean and small scale (1:25,000; 1:50,000 and 1:100,000) maps have been compiled over the Danube Delta territory.

The late requirements, which many institutes interested in the special fields of activities within the Danube Delta have asked for, have entailed an unitary concept on their present-day achievements and the other ones coming into being. This concept shows the need for a LIS (considering cadastre as a base) and GIS having the following thematic contents: cadastre, land cover (forestry and water vegetations, lakes, pools, backwater, channels and canals, agricultural lands, settlements, roads), soils, pollution features, tourism, a.s.o. The Territorial (cadastral) Information System is to be integrated into the national one (through the national geodetic and levelling network, the cartographic grid, the basic topographic and cadastral map features).

In Romania, the basic topographic maps are compiled at a 1:5,000 scale and they are covering more than 85 per cent of the whole country territory. Villages and zones showing a special economic concern are covered by 1:2,000 scale basic topographic maps, while towns are covered by 1:1,000 scale and/or even 1:500 scale topographic maps.

The small areas within the Danube Delta are generally covered by 1:5,000 and 1:2,000 topographic and cadastral maps; but the 1:10,000 scale topographic and cadastral maps are prevailing over such a zone, being considered as good enough until now.

Based on the geodetic and levelling networks, the existing cartographic documents, the requirements of the main fields of activity taking a special interest within the delta, as well as, other information, a LIS/GIS has been completed (see Figure 2).

Explanatory notes for LIS/GIS diagram.

- (1) the photomap consists in 1:10,000 scale map sheets, having a mean 45x50 cm. size;
- (2) a point by point (vectorial) digitizing; the digitized detail coding is made at the same time, to compile digital maps;
- (3)-(5) the photomap contains planimetry as a photograph delineating digitized elements and toponomic names graphically. The relief is represented by 0.50 cm. equidistant contour lines (and bathymetric ones) and heights;
- (6)-(13) the themes, which have been mentioned, are showing some branches interested in developing a LIS/GIS;
- (14) the national geodetic and cartographic data base provides geodetic control network, heights and the existing maps for documentation, as well; at the same time, the new geodetic and levelling control points and a 1:10,000 scale photomap are input into the above mentioned data base, which is a constituent part of the National Geodetic and Cartographic Fund.
- (15) the data base stored the 1:10,000 scale digital map and the thematic infor-

mation geometrically established (to be updated); at the same time, the data base has also generalizing functions at 1:25,000; 1:50,000 and 1:100,000 scales required by GIS;

(16) LIS/GIS-DD (The Danube Delta) (15), provides and receives data and information from other compatible GIS;

(17) LIS/GIS-DD (15) is a constituent part of LIS/GIS-R (Romanian) when it is operational.

The whole LIS/GIS-DD information capacity amounts to 40.10^{-6} .

"The Danube Delta" Pilot-Project for scales smaller than 1:10,000 is to be developed by I.G.N France International, The Institute of Geodesy, Photogrammetry, Cartography and Land Management (IGFCOT) - Romania, and SCOT Conseil France. This pilot-project has in view to compile a 1:50,000 scale map over the Danube Delta, based on SPOT multispectral digital image processing. A 1:50,000 scale photomap over Caiaciman zone compiled within the Danube Delta Pilot-Project, is illustrated in Figure 3.

This map is compiled in UTM projection, "Europa 50" Geodetic System, 5 km. cartographic grid and 0.05' geographic grid, 2B image primary processing level. The above mentioned maps will be used to classify and evaluate land cover areas and as digital maps in GIS-DD.

It is worth mentioning that, after the Danube - Maine Rhine Shipping Canal will be opened up (see Figure 4), as an European lane, among Constanța harbour (through the Danube - Black Sea Canal) and Sulina (harbour on the Danube and at the Black Sea), and Rotterdam, the touristic and economic interests in the Danube Delta will increase tremendously.

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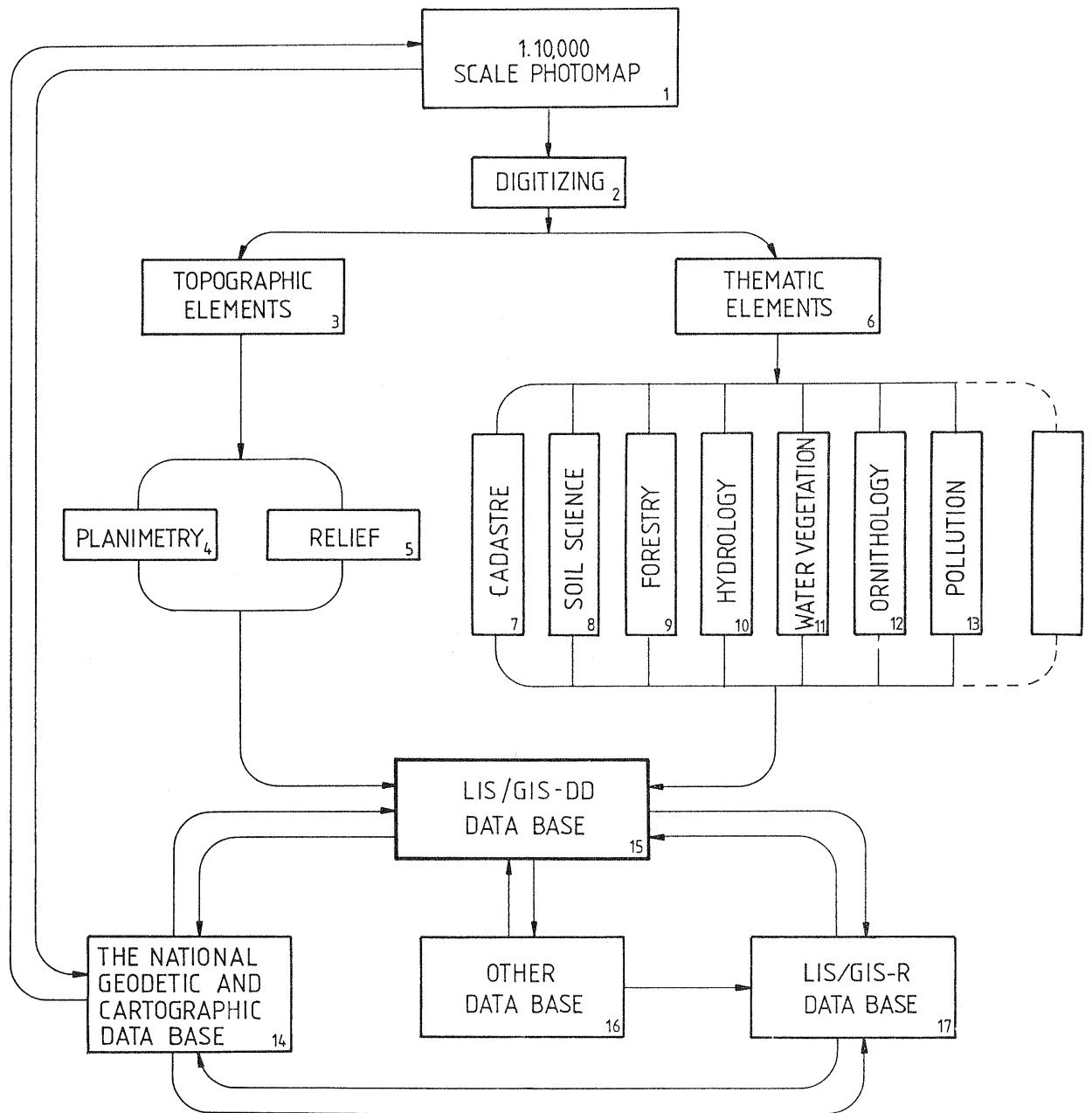


Figure 2. The Flow Chart for LIS/GIS Development

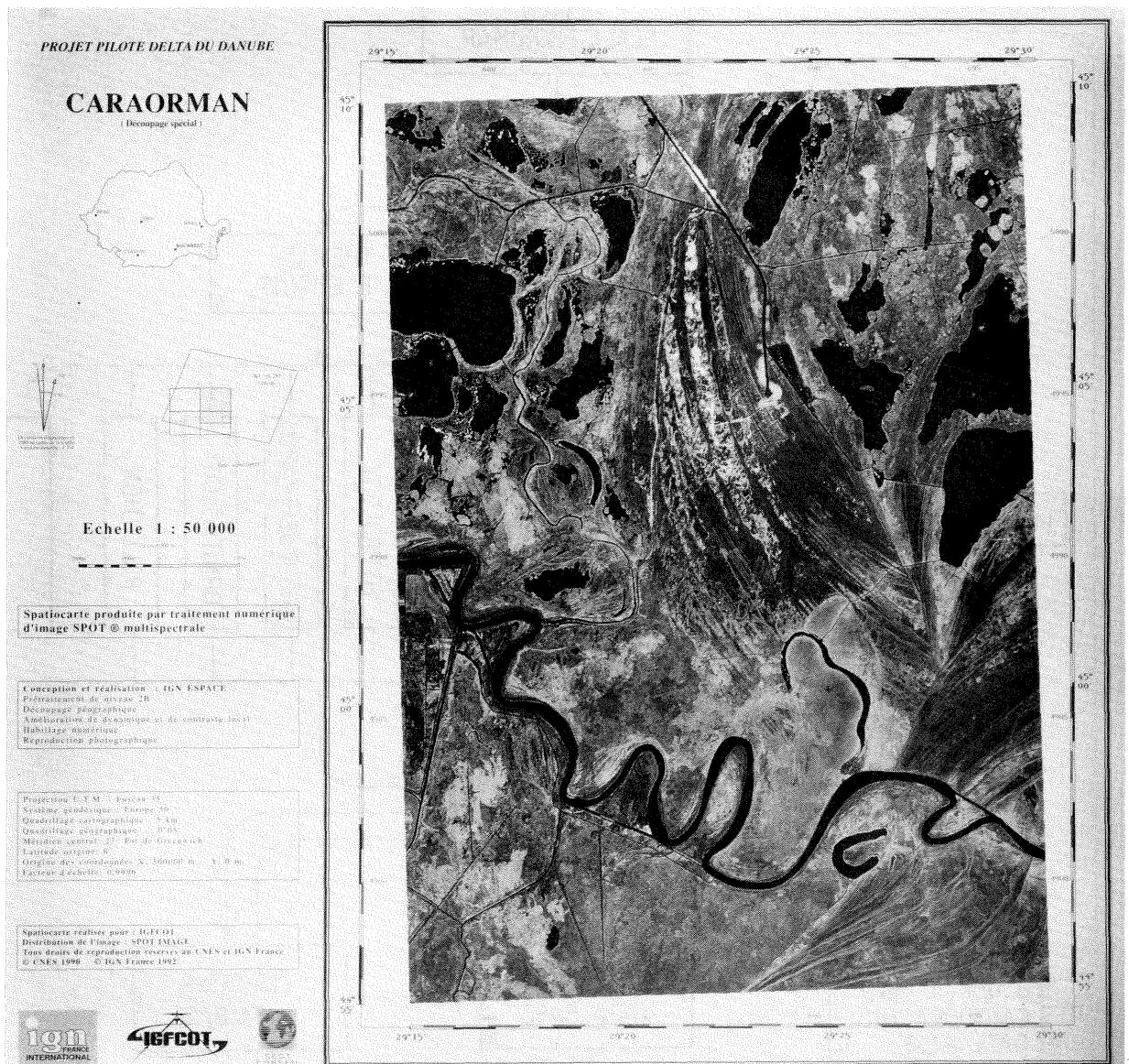


Figure 3. Space Map Derived from SPOT Multispectral Images for Caraorman Zone

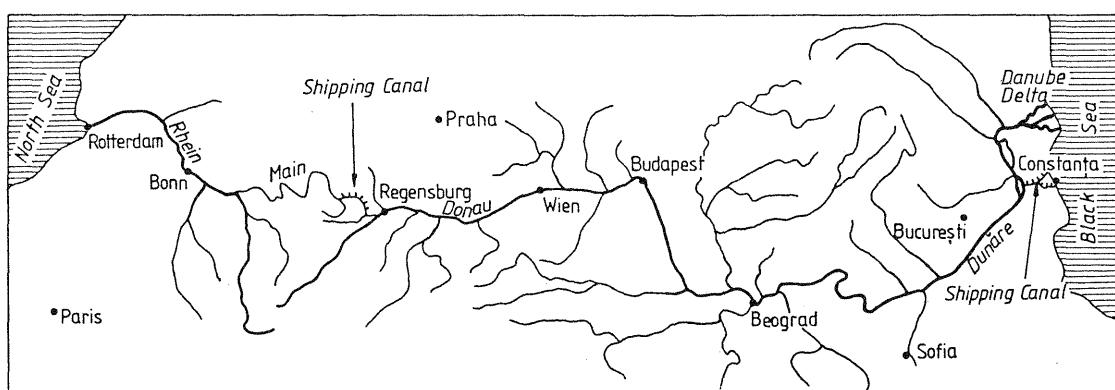


Figure 4. The European Lane between the Black Sea
and the North Sea