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 deltaization 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, lush, 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.
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 unifying concept on their present-day achievements and the other ones coming into being. This concept shows the need for a LIS (considering cadastral as a base) and GIS having the following thematic contents: cadastral, land cover (forestry and water vegetation, 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 1:5000 scale and they are covering more than 85\% of the whole country territory. Villages and other zones showing a special economic concern are covered by 1:2000 scale basic topographic maps, while towns are covered by 1:1000 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 toponimic names graphically. The relief is represented by 0.50 cm. equidistant contour lines (and bathymetric ones) and heights;
6-10. The themes, which have been mentioned, are showing some branches interested in developing a LIS/GIS;
11. The national geodetic and cartographic data base provides geodetic control network, heights and the existing maps for documentation, as well as, 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.
12. The data base stored the 1:10,000 scale digital map and the thematic information 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;
13. LIS/GIS-DO (The Danube Delta) (15), provides and receives data and information from other compatible GIS;
14. LIS/GIS-DO (15) is a constituent part of LIS/GIS-R (Romanian) when it is operational.

The whole LIS/GIS-DO information capacity amounts to 40.10-6.

"The Danube Delta" Pilot-Project for scales smaller than 1:10,000 is to be developed by G.N France International, The Institute of Geodesy, Photogrammetry, Cartography and Land Management (IGFCD) - 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 Carrorman 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, 28 image primary processing level. The above mentioned maps will be used to classify and evaluate land cover areas and as digital maps in GIS-DO.

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.

SELECTED BIBLIOGRAPHY

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