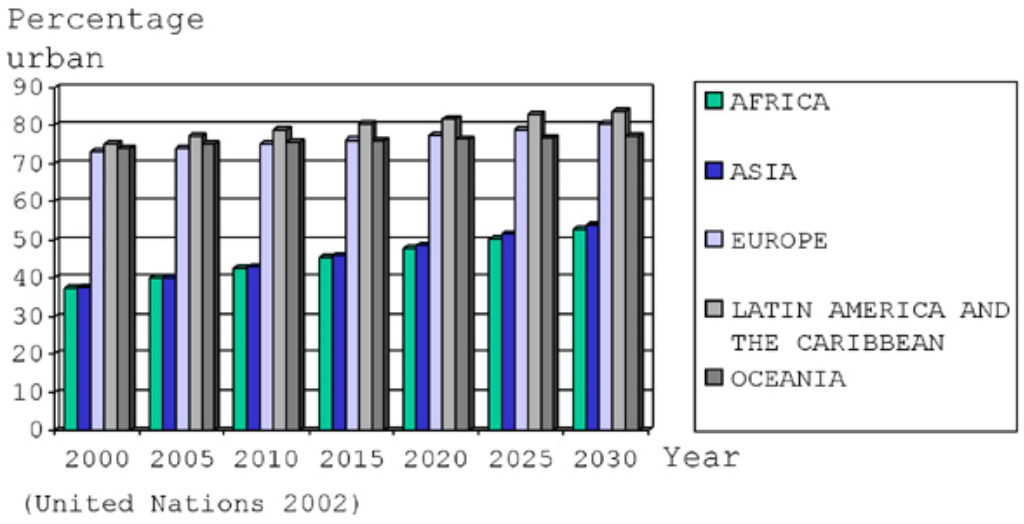
THE EFFECTIVENESS OF NEW TECHNOLOGIES FOR URBAN LAND MANAGEMENT

BAHAAEDDINE I. AL HADDAD
Centro de Política de Suelo y Valoraciones
Universidad Politécnica de Cataluña
Barcelona, España
www.upc.es/cpsv

FACTS …

Day after day, we notice the increment in the population for which a big need for providing more services arises to cope with this increment. The urban areas increase on the expense of Greenland, therefore, the science must take its position for solving such problems and predicting them before they occur. Several planning theories show the difficulty of dealing with the future extending for the big cities or supplying with the regular services to fit the continuous population increment such as the trading axis, traffic networks, agricultural and industrial areas, etc.



- World-wide cities are growing at a rate of 2% annually (UN 1999). - (60,3%) will reside in urban areas in 2030.

THINK BIG …

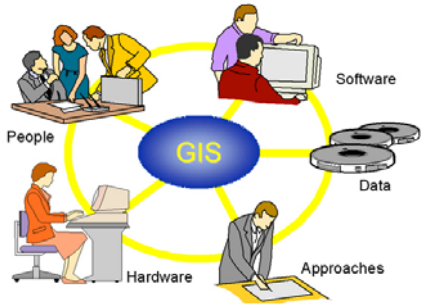
Let us assume a massive city area that needs defining the land use within it, the area percentage in every use and if this percentage is parallel to the need or we need to make more recreational areas (e.g. parks) for instance.

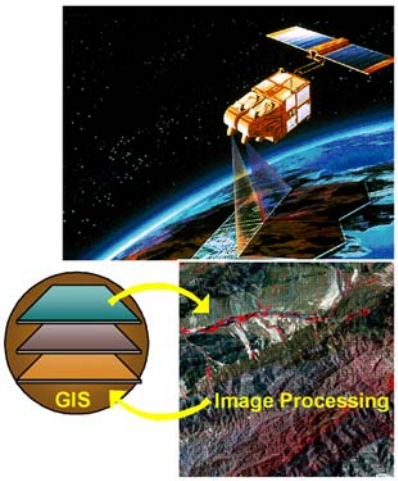
Or let us assume that we need to extend too to adapt the population increment, will we be able to succeed in selecting future extension areas or will we extend this city over agricultural lands and then to find out this mistake after decades?

As planners, can we administrate this city and suggest the services it will need such as traffic networks, schools, hospitals, etc.?

THE NEW TECHNOLOGY …

GIS and remote sensing answer …!!





WE …

… can really influence the urban planning process, future extension and the cities administration.

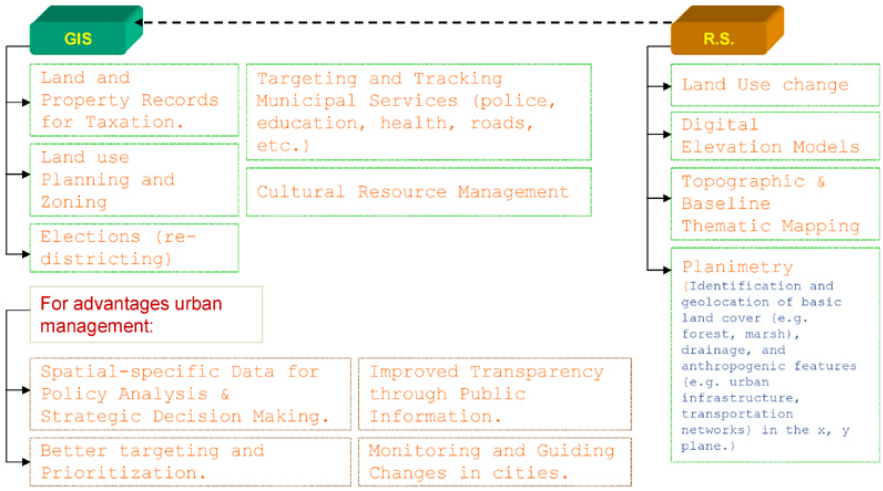
… can supply the basic information to instigate the correct urban planning in this era. Through some satellite Arial photographs, we can get a lot of data in a short time in comparison to the traditional urban planning techniques, in addition to the capabilities provided by GIS for cities administrating and development, especially the massive ones.

… can get the current and future land use with high preciseness that will allow overcoming the errors of building over agricultural areas for instance.

… also may determine the volume of required services for an inhabited area, in addition to the three dimensional modelling for the area which will allow simulating the future city buildings and masses.

WE ARE LOOKING FOR...!!

The tight relation between the Remote Sensing and GIS technology, see how they are integrated to be used as a powerful and peculiar tool and the amazing benefits gained from this gathering.
These two technologies are contributing to the Urban Land Management - ULM, because the first one provides timely and detailed information about the Earth's surface, especially in relation to the management of our renewable and non-renewable resources. After that a role for the second one comes to storing, accessing analysis and visualising the large amount of spatially related data that is used by many different participants in the planning process.



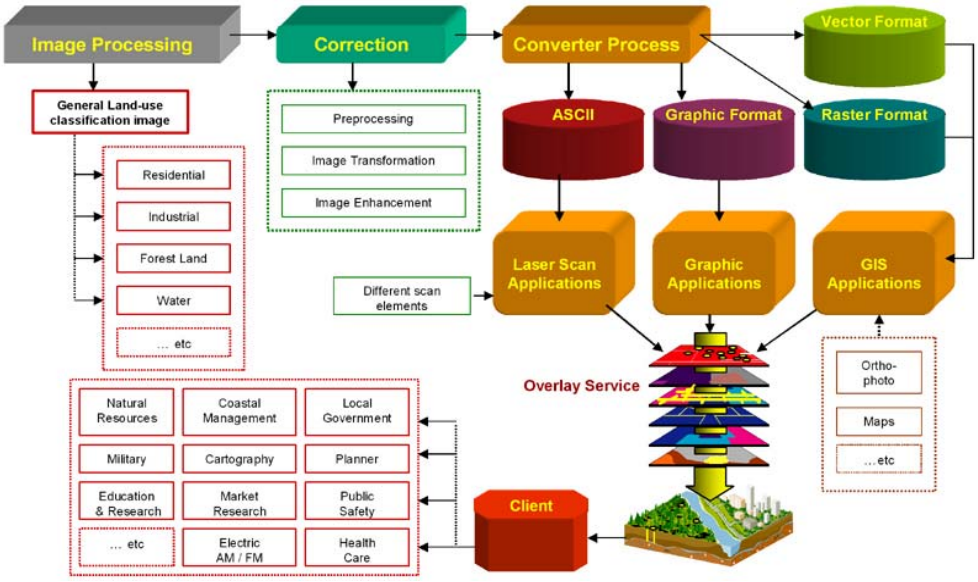
THE IDEA …
Our concept of work for Urban Land Management …!!

Our idea approaches the measurement of metropolitan urban growth from a strictly morphological perspective, drawing upon SPOT satellite imagery dating from 1995 and 2003, in order to quantify and analyse the process of 'periurbanisation' which has been experienced in Barcelona over this period.

Also assesses the increased accuracy for urban planning activities from an operational perspective, afforded by the new generation of satellite images from SPOT5, through the higher resolution of the images, for the monitoring of key urban development issues.

At the same time arriving to use the digital elevation model (DEM) for the virtual territorial models.

All within the confines new tools for Urban land management.



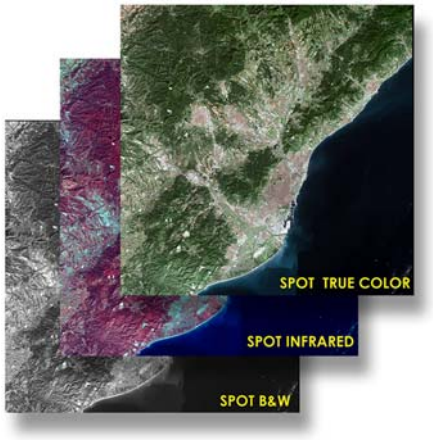
OUR CASE STUDY …
Metropolitan Area of Barcelona.

1. Data

Participation in the Spot 5 Application and Validation Programme provided us with access to a range of SPOT satellite images. The satellite images were provided dating from 1995 permitting their comparison with more recent 2003 images. Four images were used for the research referred to in this paper:

Spot 5 (2003) THR, black and white, 2.5 m resolution.
Spot 5 (2003) THR CNA C1-3, natural colours, 2.5 m resolution.
Spot 5 (2003) THX FC C1-3, false colours, 2.5 m resolution.
Spot 3 (1995) infrared, 20m resolution.

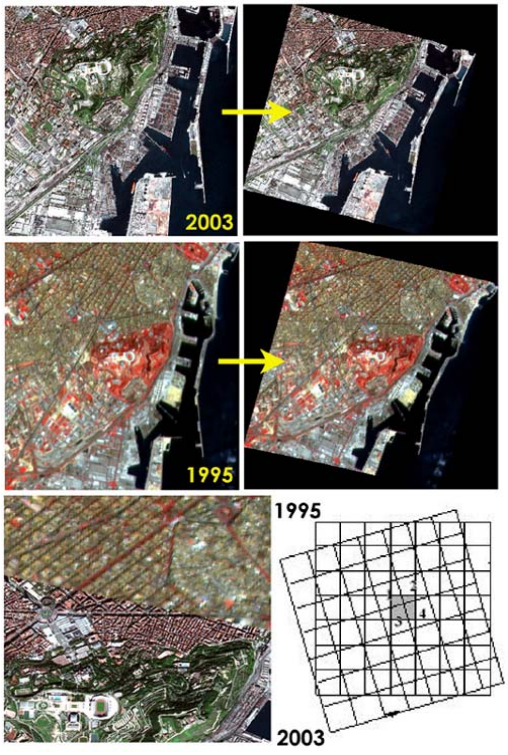
The 60km x 60km SPOT Scene extends to a land area of some 2,700 km2, taking into consideration the significant component of the sea.



2. Technical tasks

2.1 Image registration (Or resampling):

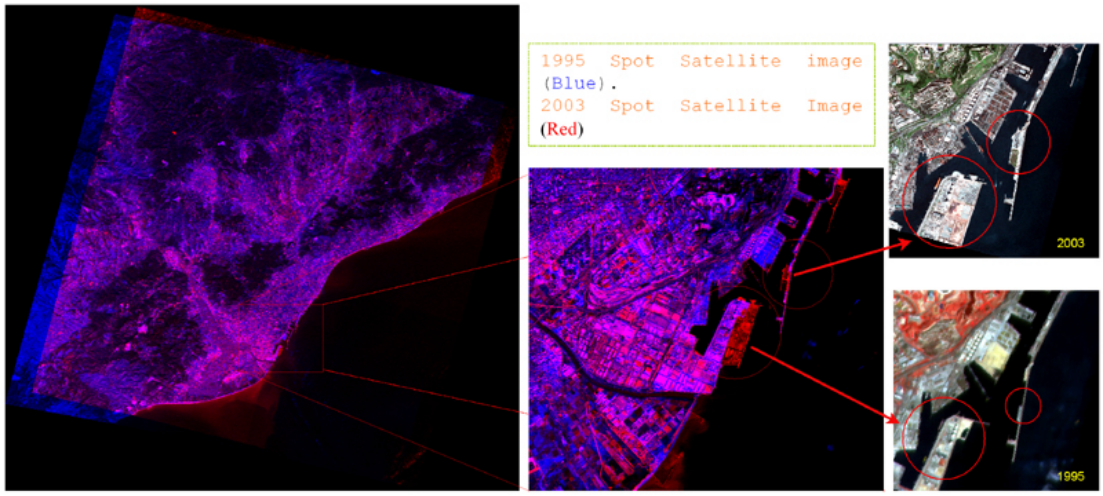
An important step to generate our data to be in reality, Figure.7 shows us our registration process for Spot 1995 and 2003.



2.2 Image processing:

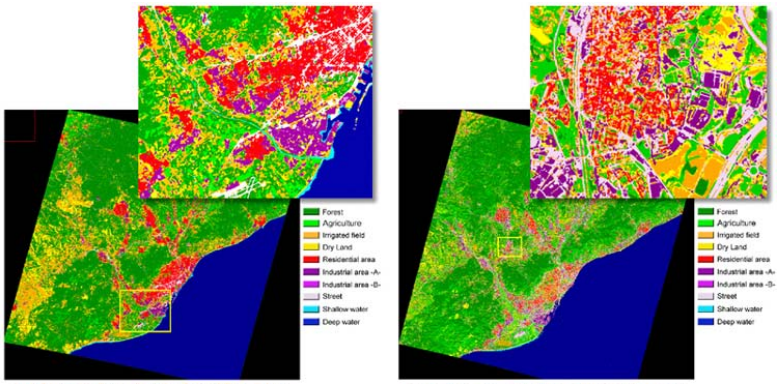
2.2.1. Comparison process:

In purely visual terms, the evolution or change in urban development over the 1995-2003 period, again in the broad sense, can easily be discerned from the super-imposition of the 1995 and 2003 images. Figure.8 clearly illustrates the existing development in 1995 in blue tones, with new and or redevelopment being represented by the red tones.



2.2.2 Land-Use Classification:

Figure.9 illustrates a detail of the final map resulting from the aforementioned supervised classification process. This task has been crucial for owing to the final objectives of the Barcelona study, in order to quantify and describe the degree of urban growth experienced within the Metropolitan Area of Barcelona over the 1995 2003 study period. It's to make the distinctions between high and low residential development, industrial, commercial and office park economic activities, and transportation and communication infrastructures. For this reason an accurate classification is essential.



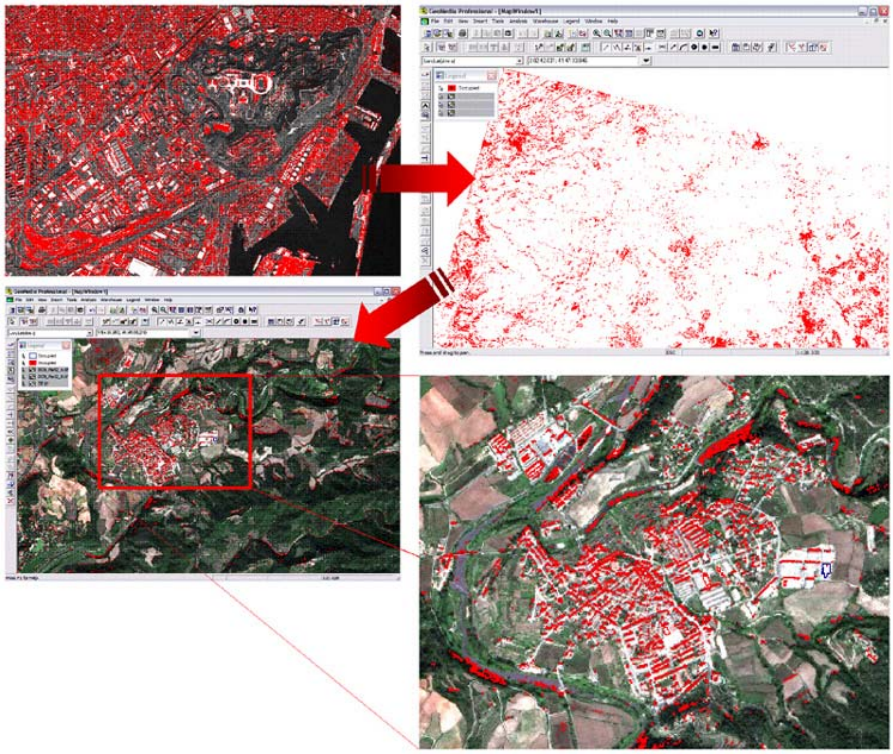
Land use supervised classification of MAB Area- Spot 20m_ 1995.

Land use supervised classification of MAB Area- Spot 2.5m_2003.

Class name	2003		1995	
	Area in Km2	%	Area in Km2	%
Green area	1832.0364	50.9	1837.582	52.05
Irrigated field	183.89405	5.1	422.7688	11.74
Dry land	193.14993125	5.36	176.4608	4.9
Residential	137.3712875	3.8	101.0256	2.81
Industrial A	100.31044375	2.8	63.914	1.78
Industrial B	8.559812	0.24	6.3892	0.18
Street	150.850812	4.2	47.9984	1.33
Shallow water	8.2945	0.23	14.8432	0.41
Deep water	985.3696	27.37	893.018	24.8

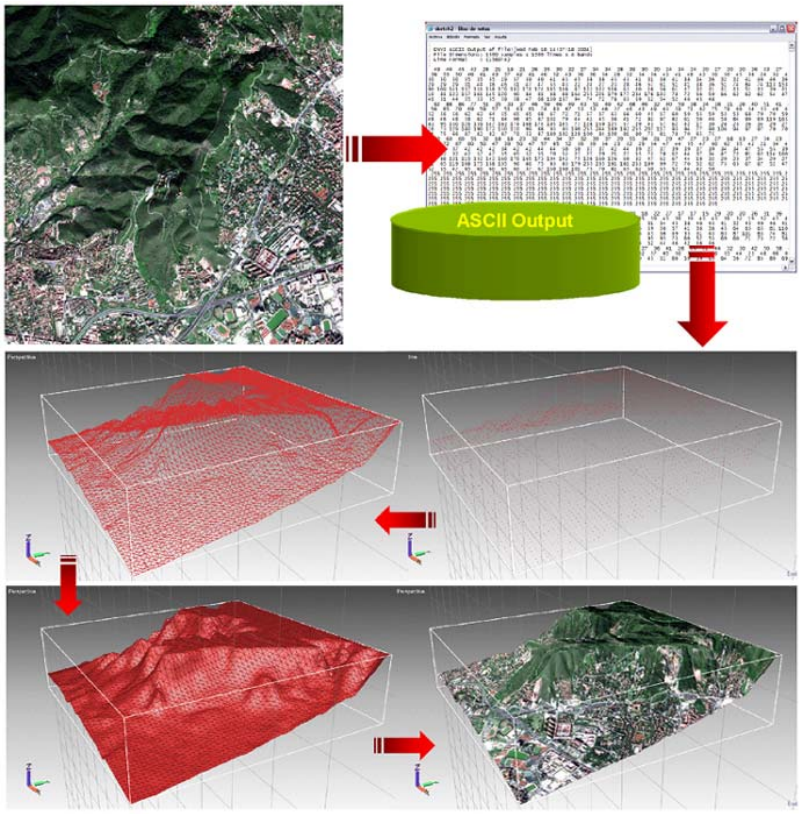
3. Converter processing (raster and vector format)

It is necessary to carry out a conversion of the images from raster data to vector data for GIS Applications, it will be easier to use with other database information and analyse it, Figure.10 presenting a converting process from residential area (Red color) to the vector an overlay this information with raster image to like a reference.



With GeoMedia professional software it is straightforward to present vector data that was converted from ENVI and ER Mapper software's, as indicated by the last example lying within the limits of the study area. Once carried out, it is a simple task to overlay the outer limits of the formal Metropolitan Area and extract and quantify the desired data contained therein.

Furthermore, when combined with an Access data base for all the accompanying relevant information, it will enable the connection with GIS data bases and 3D Models. Figure.11 is presenting different kind of conversion process, it's to the Laser Scan application one case maybe it will open a new way to connect the 3D modelling or the virtual model to be a part of our database, in this case remotes sensing data will not be limited to update GIS information; he will give high analytic accuracy and specific result.



CONCLUSION …

New technologies and means of communication have become available for urban managers in developed and developing countries. This changes the functioning of the urban economy of cities and of urban management. The advantage of the use of new technologies for urban management purposes is that they allow an integrated approach to urban problems.

Information technology can be used to deal with a range of urban issues including unemployment, poverty, participation, supplying urban services, etc. the challenge is to assess how existing data from larger information system can be used for this purpose.