

FISCAL AND SOCIAL ASPECTS OF THE HELLENIC CADASTRE

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ABSTRACT

More than three years have passed since the institution of the Hellenic Cadastre Project. In the meantime a great deal of organizational, administrative, legislative, technical and fiscal activity has taken place concerning its implementation. Special Technical Specifications are valid, and Cadastral Surveys are commissioned and executed as a Pilot Program in various areas of Greece.

This paper focuses on fiscal aspects, by calculating the implementation and operational cost of the HC. Alternative cost effective methods, without affecting the characteristics and the time limits of the Project, are investigated, and technical aspects are researched, for future consideration. An emphasis is given to the public contribution and support and to the public awareness of the benefits of such a Project, and how this affects the fiscal policy followed.

INTRODUCTION

In July 1994 both the Hellenic Government and the European Union (E.U.) ratified the Proposal for a major project: 'The Establishment of the Hellenic Cadastre' (HC). Since then an extremely ambitious project began, in Greece, for the establishment and the operation of a modern Cadastral system. This comprises the final and most important step in a very long process. It has taken more than a century of repeated legislative and technical efforts to overcome the various obstacles, (such as: the broad acceptance of its necessity, the conflicting interests, the differences between the various Public Agencies) concluding in the definite governmental decision to materialize of the Project.

There is little need to mentioning the importance of a National Digital Cadastral System for the sustainable development purposes of any country. The advantages of such a system are great, and at multiple levels. It has multiple derivative influences on various aspects of the financial and social activities of the country, such as: guarantee of land tenure, certification of the conveyance of real properties, also, better environmental monitoring and protection, urban and rural planning improvement, land use control, and in a general balanced development.

The Hellenic effort for the implementation of the HC has two major advantages:

- a. It can take advantage of the experience, proven methods and ideas from countries that have already applied digital Cadastral Systems and so avoid dangerous experimental approaches
- b. The modern technology in information systems, data bases etc, and in measuring and capturing systems (i.e. digital surveying and photogrammetric methods, GPS etc) allows not only a fast and cost effective Project execution but a more efficient system construction and operation, presuming the use of proper Technical Specifications and efficient Project Management.

Simultaneously, two more aspects of potential influence, either positive or negative, must be taken into special consideration:

- a. As it is known, Greece had already established a network of approximately 400 Mortgage Bureax (the first commencing their operation in 1856) where in all the legal rights concerning land, such as: land ownership, lease, mortgage, charge, easement, seizure, claiming etc, are registered in a person-centric system. This information is available but *not guaranteed*.

Effort now focuses on the proper use of this volume of existing data (which *must* be tested concerning their accuracy and reliability) so that the Mortgage Bureax will provide the transfer bridge from old system to the new one to a certain extent, and conflict of interests and responsibilities will be avoided

- b. There is considerable cartographic information for the whole country, which should be used properly for the more rapid and more cost-effective compilation of the cadastral maps, according to the Technical Specifications. This cartographic information consists of:
 - i. existing photogrammetric or surveying diagrams of urban areas, of high inhabitation density, at large scales of 1:500 up to 1:2000, and
 - ii. recent cadastral maps of sub-urban areas, which were compiled during the Urban Planning Implementation Acts,
 - iii. existing land consolidation diagrams, assignment diagrams, and land-

use maps of rural areas produced for agricultural purposes and programs of the Ministry of Agriculture. It is obvious that before using/updating or rejecting these diagrams, thorough tests concerning their accuracy, completeness and reliability must take place.

The Technical Specifications for the HC were compiled taken into consideration all the above mentioned. The HC is being compiled in fully digital form, making use of the related photogrammetric and surveying methods, i.e. digital orthophotography production, and GIS technology over all the jurisdiction and is going to be a modern Land Information System, which will provide legal and technical information about each landparcel, but will also contain other useful geographic and thematic information, such as buildings, DTM, land use, etc.

STATE OF THE ART OF THE HELLENIC CADASTRAL PROJECT

According to the estimates of the responsible Agency, which is the Hellenic Mapping and Cadastral Organisation (HEMCO), the HC Project will last fifteen years and an amount of money of \$180 M is assured for its compilation until the year 1999, partially by the EU (75%) and partially through governmental funding (25%). Up to the date of this article, the following have been initiated or completed:

- **legislative**, by the voting of Special Law 2308/95, which governs the Cadastral Surveys and the procedures until the first registrations on the Cadastral Books (HEMCO 1996), and the preparation of further Law, which will govern the operation and the keeping of the HC.
- **organisational**, containing the foundation of the joint-stock company KTHMATOLOGIO S.A., in April 1996, which undertook the execution of the Project, the employment of a group of specialists such as the Project Manager, in February 1997, the compilation of an organisational study for the KTHMATOLOGIO S.A. Services and its transfer and settlement in a new building, properly reconstructed for the needs of the KTHMATOLOGIO S.A. activities, etc.
- **administrative**, by publishing a Series of Decisions for the commencement, supervision and control of the cadastral surveys in various areas of the country- such as: a compilation unit is considered to be the municipality, the proclamation of a competition for the public information, related to the benefits and the implementation process of the HC, through the mass media, etc.
- **financial**, for the most effective absorption of funds following the given timetable, the financial plan of the following years, etc.

- **technical**, by compiling the special Technical Specifications for the cadastral maps of urban, rural and rest areas at a scale 1:1000, 1:5000 and 1:10000 or 1:20000 correspondingly. An effort was made in order for the Technical Specifications to specify the desired final result for its completion, content and accuracy, and not the method to be followed for its achievement (HEMCO 1997). The final products are considered to be:
 - i. cadastral diagrams in digital form, produced photogrammetrically and completed by field surveying
 - ii. topographic diagrams of urban areas, produced by stereorestitution in digital form and printed at a scale 1:1000
 - iii. digital orthophotomaps and DTM, covering the whole area of the jurisdiction, at a scale 1:5000
 - iv. cadastral tables in Data-Base form (as a component of GIS), which contain all the legal and textual information concerning each landparcel and its owner. This information will be derived mainly from the ownership statements that the owners are obliged to submit during the first stages of the compilation of the cadastral survey period.

The cadastral surveys (CS) are to be carried out by the Private Sector and, according to the timetable, will last an average of 2.5 years. They consist of:

1. the compilation phase of the cadastral surveys (maps and tables)
2. a two suspension process, for the better publicity of the results, each of consisting of a two-month period for the objection submission, the objection judgment by special committees (each having different personnel) and the correction of maps and tables
3. the final delivery of the cadastral surveys, which will be followed by the quality control of the final product, executed by the KTHMATOLOGIO S.A.

The CS of a Pilot Program are being compiled. This Pilot Program is being developed in two phases. The results of those phases, at a **technical, financial, administrative** level, and also concerning the point of **time**, will provide the information for the better organisation of the main phase of the Project.

The commissioning of the A' Pilot phase of the CS was done in Dec' 95 and Jan' 96. This phase refers to 30 CS of a total area of 226,000 he. The pre-estimated cost for this phase is \$25.5 M. The compilation work is almost completed and the stage before the first suspension has been reached.

The commissioning of the B' Pilot phase of the CS was done in the Autumn of 1997. This phase refers to 18 CS's of a total area of 120,000 he. The initially estimated cost of this phase is approximately \$12M, taking into consideration the results of the previous phase.

The areas included in the Pilot Program are scattered over most of Greece (in 34 out of 50 prefectures), so that most representative results will be achieved, taking into consideration the particular characteristics of any type (legislative, land type, etc) of the various areas.

The A' and B' Pilot phases were commissioned, based on **fixed prices**, pre-decided by the responsible Ministry of Environment, Physical Planning and Public Works, based on a Proposal made by a special HEMCO committee. This system, tested during the Pilot Program, has been substituted by a competition, based on **technical and financial tenders**.

Already the first attempt at introducing this new system, which is applied for the first time in Greece for the compilation of CS, was made in October 1997, by the announcement of the competition for the commissioning of 40 CS's at the beginning of the A' Phase of the Main Program for the HC. The total area to which these CS's refer is approximately 510,000 ha or the 4% of the total area of Greece. The suggested cost of this phase is approximately \$85M. Up to the date of this paper, the evaluation of the tenders of the competition has not yet been completed. The announcement of the next new packages of CS's is programmed to take place in frequent short periods of a few months time, so that the desired time limit for the completion of the Project is approached.

In Table 1. are shown the basic characteristics of the areas included in the above mentioned phases of the HC, that have already began.

It is obvious that despite the major efforts and the significant steps already achieved for the implementation of the Project, there are some critical aspects, which must be faced in action, so that the big Project will be fully successful. Such aspects

- have already been mentioned since the first stages of the preparation of the Project (Potsiou 1997), such as the construction of a digital GIS at national level is an extremely broad concept, which should be realised gradually in very manageable steps or that decision making should be as flexible as possible to account for changing conditions or that existing Mortgage Bureaux should be incorporated over a suitable transition period into the general system, etc.
- arise during the implementation process, such as time-consuming bureaucratic procedures, the necessity of joint multi-discipline scientific work (cooperation between surveying engineers, layers, legislators, notaries, foresters etc) for the execution of the CS's, the proper organisation of the Private Sector to face the needs of the HC (i.e. large amount of ownership statements and their control, etc)

	Total area		Urban area		Rural area		Rest area		Population	Number of Municipalities		
	K he	% jurisdiction.	K he	% phase	% total urban area	K he	% phase	% total rural area			K he	% phase
Pilot project - A' phase	226	1.7%	16	7.3%	3.1%	74	32.9%	136	59.8%	1.6%	524,250 (5.1%)	66
Pilot project - B' phase	120	0.9%	7	6.1%	1.4%	55	45.2%	58	48.6%	0.7%	295,800 (2.9%)	54
Main project - A' phase	512	3.9%	50	9.7%	9.4%	202	39.4%	260	50.8%	3.0%	1,554,050 (15.1%)	236
Areas under CS	858	6.5%	73	8.6%	13.9%	331	38.5%	454	52.9%	5.2%	2,374,100 (23.1%)	356
Total area jurisdiction	13,196	100%	530	4.0%	100%	3,942	29.9%	8,724	66.1%	100%	10,260,000 (100%)	5,922

Table 1. Statistics of the areas under CS

This paper will focus on the investigation of two categories of aspects, which must be faced effectively so that the HC will be completed smoothly and successfully. These aspects refer more or less to critical decision making on technical, legislative and administrative matters. More specifically:

- on the mean-long term face of the cost, which demands the compilation and operation of the HC
- on the short-mean term achievement of broad public acceptance and support of the HC. HC should be accepted not only by the Government or the related professional specialties, where of course its acceptance is presupposed for the continuation of the Project, but by all citizens and users involved, as well.

FISCAL ASPECTS OF THE HELLENIC CADASTER

The estimates for the implementation cost of the HC started as soon as its basic principles, purposes and content were defined. These estimates vary from very rough and ready to the highly analytical and documented (i.e. HEMCO 1988, Potsiou 1996). Yet, all of them contain some kind of personal estimates and an arbitrary approach, as they had preceded the Pilot phases of the Project, and consequently revisions or regular corrections, or even new approaches are necessary, so that the new information derived from the compilation work done is to be taken into account.

The estimation method, that will be followed here, is based on the assumption that the CS's cost depends mainly on the size of the area and the type of land use of the area under CS. It also depends on the number of people who have legal rights on the real estates at that area. So, a mathematical approach to the cost estimation per municipality consists a 1st degree polynom:

$$A_u x_1 + A_a x_2 + A_r x_3 + A_p x_4 = C$$

- where:
- A_u -the area value of the urban area of the municipality, in he
 - A_a -the area value of the rural area, in he
 - A_r -the area value of the rest (water surface is not included) i.e. pastures, forests and other land types, in he
 - A_p -the number of registered inhabitants of the municipality (which comprises a better general approach to the number of owners, which is really needed)
 - C -the compilation cost of the CS's, in million \$
 - x_1, x_2, x_3, x_4 -the unknown parameters: x_1, x_2, x_3 represent the unit cost for urban, rural and rest land and x_4 the cost for registering the right per owner.

A polynomial of a higher degree or a more detailed classification of the area

under examination (i.e. density classification of urban areas or fragmentation classification of rural areas or detailed classification of land use) was not used, because:

- the available sample is still too small
- the area values of the classified areas and the estimates of the population are derived from the 1991 census, and they are supposed to have changed significantly since then.(i.e. increase of area value of urban areas, land use changes, alteration of population data, etc.)
- a significant percentage of unforeseeable expenses exists, depending on the special characteristics of some areas (concerning the ownership status, the terrain relief, the inhabitants mentality, etc)
- there are several expenses, which are claims for additional fees for the CS of the Pilot Program, made by the contractors, but which have not yet been finalized by the supervising service.

For these reasons any effort to use a more detailed mathematical model might lead to results with bigger uncertainties and strong correlations of the unknowns. Consequently, at this stage, the suggested model is considered to give more reliable results.

In Table 2. the values of the unknown parameters of the above polynomial for the cost, together with their variances, as they derive after the application of the least squares method, for the areas included in the three first phases of the HC Project, are given. The a posteriori standard deviations of the three solutions are mentioned. By using these values, the final cost for the total amount of the CS's for the whole jurisdiction (of 5,922 municipalities), can be calculated. The total cost is shown in Table 2. and it is approximately of \$1100M. It is to be noted that this estimation is reached both by using data coming from the Pilot Program and by the estimated cost for the CS's of the Main Phase, which will start now, despite the fact that different calculation methodologies for the cost have been followed. Indeed, for the A' Phase of the Pilot Program fixed prices were applied for the calculation of the fees for the CS's work (i.e. compilation of the photogrammetric diagrams, collection of ownership statements etc) and their quantities are known precisely. On the contrary, for the calculation of the cost of the CS's of the Main Phase, that has not yet started, some estimations were made by the KTHMATOLOGIO S.A. based on the available information (i.e. statistical data, diagrams, etc), on the inspection of recent airphotos, land use maps, etc.

It must be noticed that the total cost for the CS's, as derived from this mathematical model is almost equal to the estimated cost given in (Potsiou 1996), estimated before the beginning of any CS phase. That was estimated through a detailed analysis of all the separate stages of work of the CS. An area classification

	Pilot Project		Main Project	
	A' phase (30 studies) value	variance	B' phase (18 studies) value	variance
a1	0.415914	± 0.093634	0.721341	± 0.033583
a2	0.123930	± 0.017558	0.031694	± 0.024337
a3	0.037021	± 0.00739	0.033906	± 0.014567
a4	0.007009	± 0.001654	0.001845	± 0.002514
Standard deviation σ_0	\$ ±180K		\$ ±172K	
Total cost	\$ 1,085 M ± 90M*		\$ 1,160 M ± 105M*	
	± 110M**		± 135M**	

* only the variances were used in the error propagation law

** variances and co-variances were used

Table 2. Calculated values of the unknown parameters of the cost-polynomial and estimation of the total CS cost

into 7 land types was made for that (i.e. high density, low density urban, suburban, rural with a lot of fragmentation, rural without too much fragmentation, pastures, forests).

In conclusion, following the current fees policy and the current technical and legal procedures, the total cost for the compilation of the CS's is estimated to be: $\$1,100\text{M} + 18\% \text{ Value Added Tax} = \$1,300\text{M}$, with a deviation of $\pm 15\%$.

If we add to that the cost concerning the installation and instrumentation costs needed for the Cadastral Offices, the education training, the project management, the quality control of the final product, and other expenses of that kind, which can be estimated, according to international experience, to be approximately 40%-50%, of the overall cost for the establishment of HC, then this cost is calculated to be about $\$2,500\text{M}$ in total.

For the calculation of the cost demanded for the operation and the upkeeping of the HC, no available data exist through the execution of the Project. Not even the structure of the decentralized system, that has to be established, has yet been decided. So, the only information source to be followed for the calculations is the Proposal made by the Technical Chamber of Greece and the Union of Surveyors. According to this Proposal a central administrative unit, 13 regional units and 170 local units, 54 of them with full operational structure and 116 of them with limited structure (HEMCO 1988) will be created. The annual estimated expenses for these are:

- for the central unit $\$5\text{M}$, for salaries of approximately 100 employees (managers, administrators, lawyers, technicians, economists etc) and for recovery for the purchase of the instrumentation (central unit, 20 workstations, 50 PC's, software, peripheral units etc)
- for the regional units $\$2.5\text{M}$, since each unit will have 8 personnel (technicians, 1 legislative, 4 operators and administrative) and it will be equipped with 1 workstation, 5 PC's, software, peripherals, etc.
- for the local units of full structure approximately $\$10\text{M}$, since each unit will have 6 personnel and the related software and hardware
- for the local units of limited structure approximately $\$7\text{M}$, with 4 personnel per unit, 3 PC's and peripherals.

So, taking into consideration the unforeseeable expenses, which account for 10% of the cost, the estimated total operational cost will be $\$25\text{M}$ per year.

PUBLIC ACCEPTANCE OF THE HELLENIC CADASTER

For the fruitful fulfillment of the purpose of the HC and its smooth and successful operation, besides the Governmental will, absolutely necessities are the

- support of the Project from all professional unions related to the subject during its implementation period. These unions are mainly Surveying Engineers, Lawyers, Notaries, Mortgage Registers, Foresters, Economists, and people working in Informatics. Such a complicated operation demands interdisciplinary cooperation. Surveying Engineers are the first who should realize that. They can become the bridge or they can undertake a coordinating role between other disciplines, without of course to overestimate the importance of the technical part of the Cadastre.
- public acceptance and support. The contribution of the citizens to the process of information collection (ownership information, geometric and cartographic information for each real estate) at the beginning and then to the process of suspensions and publicity of the cadastral diagrams and tables seems to be 'one way road'. It is not a matter of saving time or money but a matter of the creation of a reliable Data Base, which is the essential tool for the operation of the system. Public indifference or the use of the judiciary for the solution of existing problems may lead to some kind of corruption of the system.

Such a vast Project which affects the development of the country and improves the conveyance of real estate, in a country like Greece, where people feel directly attached to their real estate property, it is possible to face conflicting interests or suspicious behavior. Until now the HC has not faced such problems at all, but it is only in the first stage of its implementation, yet! The individual reactions of some professional unions for their protection of rights or for getting extra privileges compared with others, are quite well understood and normal, and they have not caused any harm to the Program. It is however important to have direct and clearly shown results of the benefits of the HC, referring both to the main extensive users such as the State, Banks etc and to the ordinary citizens. It must be emphasized not only the benefit of securing the State-real estate property or the overcoming of the handicaps of the old system (i.e. no ownership certificate, no geographic relation, no registration control, time and cost consuming transaction process, etc), which of course is a very serious matter, but also the improvement of the private real estate property and the possibility of having financial benefits from that, as well. Above all what is really needed now, is the creation of *real financial motives* for the owners, whose property has already been registered, immediately after the gradual operation of the Cadastral in the various areas of Greece. That would expedite the feeling of facing new additional expenses for changing from the old system to the new. The adoption of the new system can neither be achieved by penalising for non registration nor by taking obligatory measures (i.e. forbidding the transactions). What is needed is *systematic information about the practical benefits of the new system*, and the priorities

during its implementation should lead to technical legal and administrative decisions that will make this purpose easier.

PROPOSED STRATEGIES

Facing matters such as those mentioned above can be achieved through effective strategic decision-making during the execution of the Project. The source of its funds for implementation for example, and then for its operation and upkeep, is a very critical choice, which influences not only the progress of the Project but its real purpose as well, and the structuring and operating the system. So far, no direct problem of that kind has to be faced due to the guaranteed funding up to the year 2000. Yet, there is not such a guarantee for an equal or similar amount for the continuation of the Project. On the other hand, this method of funding comprises a significant choice for the Project's sustainability. There is no doubt that the Cadastre is and should be treated as a social asset, so, it cannot be used as a purely financial investment. Consequently the State contribution for its compilation has been imposed and is necessary. International experience has shown that there is no other way for the construction of such systems.

The income from the operation of the cadastral system will be derived from three sources:

1. The recovery charge, which will be paid by the owners together with the acquisition of the final title (according to the HC Law for the HC it will vary between \$35 and \$1000)
2. The transaction duties, during the operation of the Cadastral Offices, since they will be authorized to sell cadastral information to the owners, such as: title copies, mortgages etc, or cadastral diagrams of the landparcels
3. The purchase of the byproducts, to be created during the compilation of the cadastral maps, according to the Technical Specifications. Such byproducts will be:
 - i. updated orthophotomaps at a scale 1:5000 covering the whole jurisdiction in digital and analog form
 - ii. digital elevation models (DEM) in digital form covering the whole jurisdiction, with an accuracy of 2m
 - iii. data base with information for each landparcel referring to the main land use, the buildings (number of floors, area value, use) and any other information that will not be considered to be secret.

The acquisition of income for self-recovery purposes for the compilation phases of the Project will only be achieved through the first of the above mentioned sources, since the other two will be used to cover the normal operational and upkeeping expenses of the system. Yet, for achieving a full recovery of the

\$2500M, needed for the compilation of the HC, through the recovery charges collected during the partial operation, to cover a loan, which might support the compilation work, the recovery charges have to be high, and extremely disproportional with the benefits so far described. Such might be considered as an additional taxation charge, which might negatively affect the land market and the Cadastre in general. An alternative solution might be a combined coverage of the compilation cost:

- through State funding, in combination with international support
- through operational agreements and cooperation with large users of the system's products. Such users are:
 - Ministries, i.e. the Ministry of the Interior for municipality development projects, the Ministry of Agriculture for better land use management, the Ministry of Finance for a more equitable tax policy etc.
 - Public or Private Organisations, which use the mapping information or a GIS at national level i.e. telecommunications, electricity support, urban planning, etc.
 - large municipalities, cities, areas of touristic interest, etc, for local development purposes
 - banks, real estate agencies
- through the recovery charges, even if they stay low, may altogether cover approximately 30%-40% of the total compilation cost.

It could be mentioned that, as a fourth way for making income, or better reducing the expenses, the choice of cheaper compilation methods in future, without reducing the level of accuracy or the reliability of the system. Indeed, by altering the present Technical Specifications so that they would really become Specifications of the final Product, it could be possible, by using methods and data which remain unused, to produce cadastral diagrams of equal accuracy but it a lower cost. Such examples could be:

- the use of photogrammetric rectification instead of orthophotos, in all rural areas that the terrain relief allows, without any error deviation larger than the one ruled by the Technical Specifications
- the use of existing analog or digital diagrams, by proper updating, instead of making new ones, especially in suburban areas, which have been incorporated into the city plan during the last decade
- the combination of existing surveying plans at large scales in real estates of high density urban areas, where the environment is more or less stable, instead of producing stereorestitutions and field completions.

It should be noticed here, that, according to our estimations, few percentage

units of the total compilation cost can be saved in that way. A more dramatic saving could be achieved either by improving the commissioning process of the CS's, so that large reduction percentages could be achieved by competing companies, or by altering the collection and control process of legal information. These aspects however also refer to the strategic policy for the compilation of the Cadastral. On the contrary, by having an efficient management, the operation and upkeep of the HC could be self-recoverable and could be achieved through the transaction duties and the purchase of topographic diagrams and other byproducts to the citizens.

The abolition of some procedures, valid today but of no meaning in future, (i.e. during the transaction process) in combination with the conception of particular motives (perhaps better loan conditions, or fair taxation policy) would significantly improve public acceptance, which must be carried out both at central and local level. The information concerning the Cadastral benefits should be incorporated into general educational concepts at the most fundamental level, e.g. at schools, so that everyone is made fully aware.

FINAL REMARKS

The fiscal and technical matters, which are analyzed here, have been based on the so far available information and the experience gained during the three years of activity on the Hellenic Cadastral Project. Much more information will be available next year, when the Main Program will be in action and a new estimation for the overall cost will be attempted. The main Program deals with larger areas, and consequently with bigger budget, too. As mentioned above, for the commissioning of the CS's of the Main Program the new system - competition based on financial and technical tenders - is used and its first results are expected.

Other interesting technical and legislative aspects, such as the establishment of the data base, the selection of the hardware/software used, the quality control of the final product, the completion of the new Law etc, will be decided and are expected to influence the implementation process very positively.

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BIOGRAPHICAL NOTES

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Since 1982, she has worked as a professional Surveyor Engineer in Greece, mainly in Photogrammetry and Urban Planning Implementation Acts. Since 1993, she works at the Lab. of Photogrammetry in the teaching of Photogrammetry, Cadastre and Surveying and in research programs. Her research activity focuses on the fields of Cadastre, GIS, terrestrial and digital Photogrammetry. She has participated in more than 15 International Congresses and has presented her work. In total she has authored 24 papers. For the periods 1992-96 and 1996-2000, she is elected member of the Council and Treasurer of the Hellenic Society for Photogrammetry and Remote Sensing. She speaks three languages: Greek, English, German. For the period 1994-97, she worked as secretary of the President of CIPA (International Society for Architectural Photogrammetry).

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Until 1996 he worked both at Private Sector and the NTUA in the teaching of Photogrammetry and Cadastre. Since 1996 he is teaching the lesson of Basic Principles of Photogrammetry, at the 5^o semester. His research interests focus on terrestrial Photogrammetry, airtriangulations, applications of digital Photogrammetry on the Cadastre and GIS. He has authored 18 papers, in the above fields, and he gave lectures in related seminars both in Greece and abroad. For the period 1992-96 he was co-chairman of the WG2-'Computer Assisted Teaching' in Commission VI of ISPRS. Since 1995 he is scientific consultant at the HEMCO (Hellenic Mapping and Cadastral Organization). Since 1997 he became member of the Directing Council of HEMCO.