

**Egnatia Odos Society Anonymous:
A Decade of Knowledge Production and Dissemination**

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The Project and the Company

Egnatia Odos is a modern motorway of 670 km. and is the largest of the major projects constructed in our country. Including the three vertical axes Siatista - Kastoria – (Albania), Thessaloniki – Seres - (Bulgaria) and Ardanio - Ormenio – (Bulgaria), the project has a total length of 1000 km.

This is an extremely complicated technical project due to the particularly difficult terrain it crosses and the geological problems arising thereof. Serious environmental and institutional issues had to be dealt with during construction, since the alignment crosses many environmentally sensitive and archaeological areas. It should be noted that the Egnatia motorway includes 80 km of bridges, 100 km of tunnels, 60 junctions and 700 km of auxiliary service roads.

For the people of Northern Greece, the Egnatia motorway has been a dream dating back to decades as it would connect the Regions of Epirus, Macedonia and Thrace therefore giving an end to their isolation. The integration of the motorway in the priority projects of the Trans-European Transport Networks has established it as the link between the markets of the East and the major industrial centres of the West. Being a collector axis of the Pan-European Corridors leading from North to South it is of great geostrategic importance for both the Balkans and South-eastern Europe.

Design and construction of the project started in 1970 without secured funding. As a result, only some short sections were constructed.

Many years later, in 1994, a new start was made in the context of the 2nd CSF; the construction of some sections of the axis was scheduled for a budget of 1500 million €.

Today, following the recent reallocation of the Community Support Framework funds, an amount of 6700 million € has been secured, i.e. the entire funding required for completion of both the Egnatia motorway and its three Vertical Axes by the year 2008.

Hundreds of kilometers of a modern motorway have already been open to traffic thus impressively altering the road map of the country. Every year, an average of more than 50 km of motorway and many minor structures open to traffic. The travel time between Igoumenitsa and Kipi is being gradually reduced from 11,5 hours to 6,5 hours, bringing northern Greeks closer together.

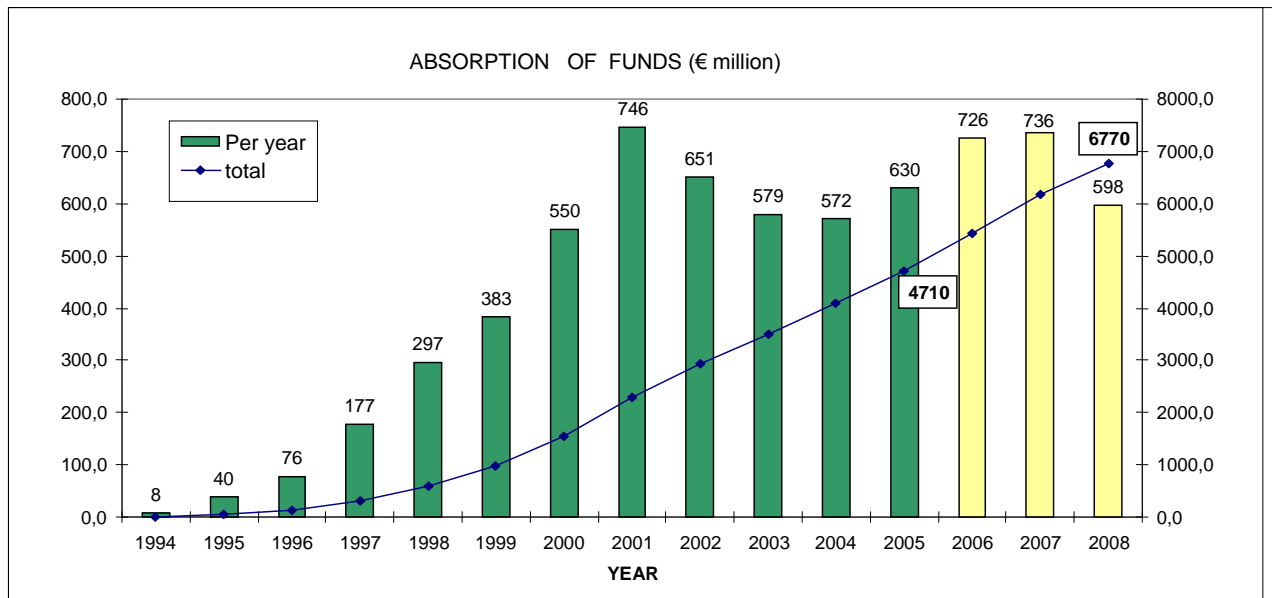
But how has such a rapid progress been achieved along with the necessary funds?

The answer lies in the way “Egnatia Odos A.E.” operates. The Company was set up in accordance with the standards applied in other European countries as a result of the negotiations between Greece and the European Community, which set as a prerequisite the employment of a Project Manager, Construction Managers and a General Manager through international competitions. The establishment of the Company was a great innovation in the field of the Greek public works management. Only then the necessary conditions for the completion of the project were created, i.e. considerable funding and modern management structures.

The Company aims at the design, construction, operation and maintenance of this vast project i.e. the Egnatia motorway and its Vertical Axes. The Company's sole shareholder is the Greek State, but it operates by private sector economic and financial criteria. The Company started to operate in 1996 and in February 1997 undertook from the Ministry of Public Works the responsibility to complete the project. The following tables and diagram present the progress of the project and the annual rate of total fund absorption.

EGNATIA AXIS	Length (km)	Cost (million € plus VAT)
Section constructed before 1994 (Ministry of Public Works)	25	
Projects after 1997 – under EOAE responsibility (Program funded by the 2 nd and 3 rd CSF)		
• Completed and open to traffic (December 2005)	428	2.500
• Under construction (to be completed at the beginning of 2006)	12	2.800
• Other sections under construction	158	
• Sections under tendering	47	600
TOTAL AXIS	670	5.900

THE THREE VERTICAL AXES	Length (km)	Cost (million € plus VAT)
Sections constructed before 1994 (Ministry of Public Works)	30	
Projects after 1997 – under EOAE responsibility		
• Completed and open to traffic (December 2005)	83	220
• Sections under construction	84	250
• Sections under tendering	53	260
• Sections under design	50	140
VERTICAL AXES TOTAL	300	870



Why is “Egnatia Odos AE” a successful company?

From the very beginning, the Company had a concrete strategy and long-term planning; for instance, all its projects were designed and scheduled in time to be integrated into the 3rd CSF against other competitive projects. Moreover, opportunities that turned up have been exploited in the best possible way; for instance, in the difficult fiscal year 2005 the Company managed to secure all the necessary funds. All personnel have been selected through a strict system of objective evaluation; team spirit, cooperation and flexibility have been strongly encouraged. Finally, the Company has always promoted an extensive training policy for its employees thus offering a comparative advantage for both itself and its personnel.

Most importantly, the Company has developed the vision to become a decentralized organization implementing modern infrastructures in Northern Greece. Without ignoring that a new organisation has to confront all those benefiting from the old structures.

The overall planning of a mega-project by a specialized, independent and flexible organization led to rational strategic decisions relating to both construction and operation and to the identity of the motorway (e.g. uniformity of technical solutions, archaeological research, landscape architecture etc.)

Production of Company Knowledge

While looking at the successful present, one should not forget the difficult past.

In February 1997, the Company undertook the responsibility to carry out the project. At that time, the Ministry of Public Works (MEPPW) transferred to the Company its projects in progress, lacking proper design, being constructed at extremely low prices and following a different philosophy concerning supervision and quality.

Meanwhile, the institutional framework for road design and construction was out of date.

Therefore, in order for the Company to build the Egnatia motorway in a timely and skillful manner, there was no other way but to introduce innovation in project design and construction and apply modern management systems.

In modern economy, knowledge is a principal source of economic development. In order for a company to succeed in the new “economy of knowledge”, it should develop and exploit its “capital of knowledge”.

In the context of globalization and international competition, technological progress and innovation become of major importance, being the key factors that ensure the viability of a company. Innovation can take various forms such as implementation of new production processes or new company organizational structures. The concept of innovation involves the replacement of “old” with “new”.

Knowledge acquisition is a demanding process in the course of which the company has to detect, select and organize all important information and expertise that are usually not organized in a structured manner thus remaining unutilized. The cohesive integration of fragmented knowledge in a systematic way produces company knowledge that can be exploited anew at any place and any time.

During the design, construction and operation of a technical project, the companies involved in the production process have the opportunity to accumulate a plethora of knowledge that is usually obtained at great human and financial cost. In our Country, very few technical companies and organizations have the structure for systematically capturing, acquiring, converting and connecting that knowledge or have any interest in doing so.

Egnatia Odos A.E. has systematically worked for the production of company knowledge in four directions:

- Design and Construction of Projects
- Protection of the Environment and Cultural Heritage
- Road Operation and Maintenance
- Decision-Making Support Systems

Brief Presentation of Papers

Ms Saridou and Mr Konstantinidis analyze the numerous procedures established for the systematic organization of design work and designer guidance that would ensure production and reviewing of studies in a uniform manner. Highway Design Guidelines (OSMEO) have been produced, including design principles and specifications for each type of study; they are updated depending on technological advances. Design checkers of international reputation have been employed. The geotechnical investigation has been distinguished from the geotechnical design, which now includes an evaluation of the investigation. Call-up contracts have been established to ensure the availability, at all times, of designers who will deal with individual problems that occur during construction. Experts of international reputation are employed in order to solve the difficult problems that arise both during design and construction. A design quality assurance system and insurance against damages have been established as additional designer responsibilities. External Design Consultants have been employed for the support of the Company personnel in design management.

Ms Kavaleria refers to the efforts of the Company towards an effective and uniform management of the construction contracts award procedure. New tender documents have been produced and standardized, fully and explicitly defining the company requirements. Standard construction specifications have been adopted based on modern technology and international safety regulations. The know-how developed by the Company (Call for Tenders, Guidelines, Technical Specifications, Price list of 900 items etc.) has been largely adopted by the Ministry of Public Works.

Messrs Pachinis, Nikitopoulos and Tenekes present electronic applications that allow a rationalised cost estimate of the activities included in a project as well as systematic monitoring of the market of building materials and machinery.

Ms Antoniou and Mr Papakonstantinou refer to the use of outsourcing in project construction management, which was an initial strategic choice for the Company. They present the operating procedures applied in the field of Construction Management regarding the cost control and time planning, the quality assurance of the works carried out and the Occupational Health and Safety in worksites. Gradually, more and more Company employees participated in project supervision. In 2004 a Construction Management Directorate was created; it has now been mobilised throughout the entire Egnatia motorway and its Vertical Axes.

Prof. Ladas analyses the amicable settlement of disputes raised between the Company and the construction contractors. Initially, disputes were settled within the framework applying to public works, specifically the three-stage procedure: objection/petition for remedy/recourse to court. The settlement is a civil law contract by which the contracting parties achieve solution of their conflicts by mutual retreat without the involvement of a third party, the court in particular. In this sense, the settlement, which is an evolved form of flexible dispute-solving means such as arbitration, opinion of committees or intervention of a third party, is a most advanced procedure which takes place based solely on the will of the two parties. It strengthens the position of the contractor, encourages cooperation with the Client and builds up mutual trust. In this way, time-consuming and costly litigations can be avoided and projects can proceed faster.

Messrs Georganopoulos and Lakakis present the European Research Programme OASYS, which attempts to assess a number of interdisciplinary methodologies and techniques of landslide monitoring and to set up relevant specifications and models for catastrophic landslide forecasting, mainly based on observational methods.

Prof. Marinos presents a research programme for the development of a Geo-information Analysis Tool for Tunnels. The system aims at storing and classifying information concerning geological and geotechnical conditions encountered when constructing tunnels, at assessing classification methods used and at linking rockmass characteristics to cost data.

Ms Sakoumbenta and Mr Charalambakis present a Geotechnical Works Monitoring System. The plethora of large-scale works required to implement the Egnatia Motorway led to installing a large number of geotechnical instruments and to developing a monitoring system thereof. The System comprises the recording, processing and presentation of those measurements, their distribution and assessment and the subsequent decision-making for the actions required.

Mmes Stefanidou and Georgiadou analyse the Landscape Guidelines aiming at minimizing environmental impacts owing to construction works. The Guidelines refer to landscape protection during construction, the positioning and form of support buildings, special drainage issues, landscape restoration through appropriate vegetation methods, archaeological excavation works and enhancement of cultural heritage, preparation of Special Implementation Studies, licensing of borrow pits and deposit areas.

Messrs Katritzidakis and Liapis describe a method to address disturbed surfaces following earthworks. Vegetation is restored by using planting material from native species. All stages of material production are undertaken by the Company (collection of propagation material, processing, conservation, seed treatment, plant production).

Mmes Valkouma and Voumvoulaki present the special Programme for the monitoring and assessment of the project impact on big mammals and habitat in the mountainous section Panagia – Grevena. The Programme is jointly carried out by the Company, NGO's and University bodies; it aims at securing the free communication of wildlife species on either side of the road, thus minimizing their mortality rates and securing a new ecological balance.

Prof. Tiverios and Ms Valkouma present the results of the systematic archaeological research undertaken prior to construction. A substantial number of archaeological sites, such as settlements, cemeteries and monuments, have been found and were added to the archaeological map of Northern Greece. In other cases, changes were made to the motorway alignment in order to protect important archaeological sites. The ongoing cooperation of archaeologists with project engineers resulted in obtaining substantial experience in the rationalised management of archaeological research and in minimizing the impact of large-scale project construction.

Ms Karakaidou analyses the motorway Maintenance and Operations Guidelines drawn up by the Company; they are based on international standards due to the lack of national regulations. Guidelines refer to capital and routine maintenance, winter maintenance, health and safety of maintenance personnel, maintenance of E&M installations in tunnels and motorway operation. The organisation of the Egnatia motorway operation and maintenance is supplemented with a system of procedures concerning the Egnatia personnel, outsourced personnel and the public. In addition, modern information technology systems are used.

Mr Panetsos presents a System for Road Bridge Maintenance Management. The system includes regular visual and instrumented inspection and a method to assess bridges and plan timely and technically efficient maintenance in the context of the optimum absorption of available resources. The application of this System on the Egnatia Motorway aims at ensuring durability, safety and satisfactory operation of bridges.

Messrs Bantelas and Barbas present an integrated Information System to effectively manage the Routine Maintenance of the Egnatia Motorway. This System is used for the first time in Greece and enables monitoring and control of works of maintenance contractors. The objective is to optimize road maintenance in terms of cost and safety. The System database stores information on geometry, highway inventory, maintenance requirements, required resources, scheduling of works, performance of maintenance crews etc.

Mr Evangelidis presents a Pavement Management System. The Company has produced Guidelines for the maintenance of pavements, laying down all necessary checks and measurements. In parallel, reference is made to warning and intervention levels. Guidelines underline that in order to determine the above levels it is necessary to carry out systematic measurements. The Company already carries out such measurements on the sections open to traffic.

Mr Tsantsanoglou analyses the road safety statistics on the Egnatia motorway. Since the Egnatia motorway started to operate the number of accidents in the road network of Northern Greece has been substantially reduced. Additional measures taken during motorway operation and maintenance to continuously improve road safety are also presented.

Mr Koutsoukos describes the methodology and principles by which incidents are safely addressed. He refers to the means (infrastructures and operation staff) and the method of information exchange between competent bodies (Traffic Police, Fire Brigade, Ambulance) and the Company. Analysis of preparedness plans to address road incidents in various sections of the road is also provided. Often the preparation of a plan is supported by specialized studies and research, such as thermal mapping for the section Grevena – Polymylos (carried out in cooperation with the AUTH) or the collection of data regarding the direction and intensity of side winds, which helps choosing suitable vehicle protection measures against snow accumulation and wind intensity.

Mr Saramourtsis refers to a number of Company actions for the systematic monitoring of E&M installations and their effective maintenance thereof. Such actions include the use of a digital equipment management inventory and the observance of a historical database of power consumption and power cost. Moreover, he presents modern systems installed along a large part of the Egnatia motorway in order to identify damages in an effective and timely manner and implement energy savings techniques.

Mr Iatropoulos explores the possibility of “Egnatia Odos AE” becoming a broadband service provider. Selecting the appropriate business model for exploiting a fibre optics network requires a strategic plan that takes into account technology issues, market conditions, cost structure, and risk analysis. Despite being based on specific assumptions, the suggested methodology is simple to apply and concise in total cost assessment.

Ms Papasiopi gives an account of how the Company organized the monitoring of its projects. She presents the special applications and the Information Technology Systems developed, as well as organizational arrangements adopted to that end.

Messrs Maravas and Kallantzis analyse the integrated information system developed and applied by the Company to monitor the time and financial progress of works. They refer to the Work Breakdown Structure methodology, the software applications used, the time and cost monitoring procedures and to the requirements in human resources and equipment for the successful application of the System.

Mmes Papadopoulou and Ioannidou present Electronic Management and Work Flow Systems for Documents and Designs. Company needs in that field are effectively addressed with the use of modern technology.

Ms Tsali presents “Odo-lexis”, a tool created by the Company for the management of highway projects technical terminology. It is available on-line in the form of a bilingual technical terminology Thesaurus (English – Greek). This is an electronic database that collected and processed in a systematic way the scattered terminology available within the Company.

Messrs Viskos and **Guy** present a System of collection, processing and presentation of traffic counts. The traffic model developed in 1997 and updated ever since was proven necessary to decisions relating to the planning of construction, operation, maintenance and exploitation of the motorway. Moreover, the resulting analyses supported the funding applications of the Company. The system of traffic counts is being developed in stages, following the completion of the Egnatia motorway sections. Traffic count sites already operate on 13 sections; the data are transferred through telematic applications and are being centrally processed.

Ms Mavridou presents the Company’s Geographical Information System. The GIS is a tool that integrates design and construction data in order to correlate the digital information obtained from multiple sources. The information kept in the database relates to axis geometry, structures, geology, funding, project records, archaeological excavations and road side installations. The System codifies, analyses, integrates and depicts in scale maps the project information.

Mr Fourkas and **Ms Papasiopi** present the Observatory of the Egnatia Motorway. The scope of the Observatory is to collect and process data and estimate indices. Indices monitor project impacts on the social and economic cohesion, spatial planning, the environment and the transportation system of Northern Greece.

One should note that the corporate knowledge presented by the aforementioned speakers was developed with the contribution of many others: Company staff, University researches and external partners.

Corporate Social Responsibility and Dissemination of Knowledge

One of the Company’s top priorities is to disseminate its corporate knowledge to the Construction Industry of the Country, as this knowledge was obtained with the financial contribution of the Greek people. Among the noteworthy activities of the Company are the following:

- Participation of Company representatives in 20 working groups of the Trans-European Networks Committee of the Ministry of Public Works. These groups processed almost all scientific topics concerning highway construction (alignments, geotechnical works, tunnelling etc.) on the basis of the Company documents in order to produce uniform national design principles. The Committee Guidelines were adopted by the Ministry.
- Supply of know-how to other bodies that carry out works (Railway Organisation, Technical Services of Regions and Prefectures, etc), such as contract documents, digitized standard solutions for culverts and retaining walls etc.
- Cooperation with the Construction Institute (IOK) to produce Guidelines regarding materials and construction methods and Technical Specifications.
- Transfer of international know-how with participation of Company representatives in the International Specification Committees of PIARC, the International Tunnels Association (ITA), the Federation Internationale du Beton (*fib*) and the International Association of Bridge and Structural Engineers (IABSE).

- Participation in the Greek Network of Construction Works Managers, along with many companies and universities, in the context of a Programme launched by the General Secretariat for Research and Technology with the aim of exchanging experiences.
- Organization of scientific conferences on specialized topics, such as tunnels, bridges, geotechnical and environmental works.
- Training of university and technical institute students and provision of information to be used in dissertations, doctoral theses and research programmes.

Today, many “Egnatia Odos AE” innovations constitute a current practice in various Bodies, Companies of the Public Sector and the Ministry of Public Works. However, many other Management Systems developed by the Company can be further adopted:

- Motorway Routine Maintenance Management System
- Maintenance System for Bridges and Bridge Inventory
- Pavement Management System
- Geotechnical Works Monitoring System
- Central Monitoring System for construction projects
- Electronic Management and Work Flow Systems for Documents and Designs
- Geographical Information System
- Motorway Spatial Impact Observatory

The Company’s effort to produce knowledge and the social responsibility for its systematic dissemination contribute substantially to the upgrading of the Greek Technical Sector.