

Spatial Impacts of Egnatia Odos Motorway: 1st status report

Abstract

The main aim of the paper is to present a comprehensive summary of the 1st status report on the Spatial Impacts of the Egnatia Odos Motorway. Through this report, the Observatory of Egnatia Odos attempts to estimate the development and environment status of the wider impact zone crossed by the motorway and its vertical axes. This zone consists of five of the Regions of Greece (Epirus, Thessaly, Western Macedonia, Central Macedonia, Eastern Macedonia & Thrace). The report is based on the results of 30 indicators, which investigate a wide range of issues including the traffic characteristics of the road network, the mobility of human resources, the accessibility of regions and their centres, the decrease of intra-regional inequalities, the convergence of Northern Greece with the average EU standards, the structure of the system of settlements and the environmental impacts.

The first chapter of the present paper contains a brief presentation of the Egnatia Odos Motorway project. In the second chapter the paper presents the “Observatory of Egnatia Odos”, the authorised body for the investigation of the motorway’s spatial impacts. Next, the paper develops an executive summary of the “1st status report on the spatial impacts of the Egnatia Odos Motorway”. Therefore, the paper presents and analyses in summary the results of indicators, according to four basic policy parameters – objectives: (a) mobility and accessibility, (b) economical and social cohesion, (c) balance and networking of settlements, and (d) environment quality. Finally the paper concludes by arguing for the crucial role of Egnatia Odos in terms of regional and sustainable development in Northern Greece and the wider impact zone.

The Egnatia Odos Motorway

The Egnatia Motorway is a Trans-European Transport Networks (TEN-T) priority project. It represents a major investment in the transportation infrastructure of Northern Greece assisting the development of the region specifically and of South-East Europe in general.

Egnatia Odos S.A. was created in September 1995 as a product of discussions between the European Community and the Greek Government to advance the management of design and construction, the maintenance, and exploitation of the Egnatia Odos Motorway, its Vertical Axes as well as of other projects within or outside the Greek territory. The Company's sole shareholder is the State, but it operates by private sector economic and financial criteria, under the superintendence of the Ministry of Environment, Physical Planning and Public Works. Today, the Company personnel amount to 311 employees.

Egnatia Odos (or Via Egnatia) was one of Rome's first great imperial roads, built between 146 and 120 BC. It was initially following the traces of an older, pre-Roman, road running from the Adriatic to the Aegean. Later, it was extended from the Evros to Byzantium, and eventually the name "Egnatia" was given to the entire highway, i.e. from Rome to Constantinople, in honour of the Roman proconsul Gnaeus Egnatius who built it. In 1270 it is mentioned as the road linking Dyrrachium with Constantinople, and until the 16th century was used principally as a trade route, carrying peoples, religions, social classes, ideologies, manners and customs, economies, concepts, ways of looking at the world.

The 680 km contemporary Egnatia Odos is a modern motorway that will probably be the only road (and by extension the only transport) link spanning Northern Greece from its western to its eastern border. From its starting-point at Igoumenitsa, it runs across the Prefectures of Thesprotia, Ioannina, Grevena, Kozani, Imathia, Thessaloniki, Serres, Kavala, Xanthi, Rodopi and Evros, to the village of Kipoi on the Turkish border. Nine major vertical axes provide links to Albania, FYROM, Bulgaria and Turkey, and the whole system is served by 720 km of service roads.

Egnatia Odos Motorway is a closed dual carriageway motorway with a central reserve, two traffic lanes plus an emergency lane per direction, for a total paved width of 24.5 metres over its greatest part, except for the road's mountainous sections. What makes it one of the most interesting technical projects in Greece today is the number of structures needed to carry it across the countryside. The realisation of this motorway requires the construction of:

- 1650 bridges, with a combined length of 40 km (or 80 km measured as single-carriageway bridges)
- 74 tunnels, with a combined length of 49.5 km (or 99 km measured as single-carriageway tunnels).
- 50 interchanges with the existing road network.
- 43 river crossings
- 11 railway crossings.

In fact the Egnatia Motorway and its vertical axes are the backbone of Northern Greece transport system. It shortens distances and brings areas like Epirus, Western Macedonia and Thrace out of their isolation.

The Egnatia Motorway will also be a collector route for the Balkan and South-eastern European transport system. Pan-European Corridors IV (Berlin - Sofia - Thessaloniki), IX (Helsinki - Alexandroupolis) and X (Vienna - Belgrade - Thessaloniki) all end at the Egnatia Odos Motorway.

The nine vertical axes linking Greece with the Balkans are: Ioannina - Kakavia (Albania), Siatista - Krystallopigi (Albania), Kozani - Florina - Niki (FYROM), Thessaloniki - Evzoni

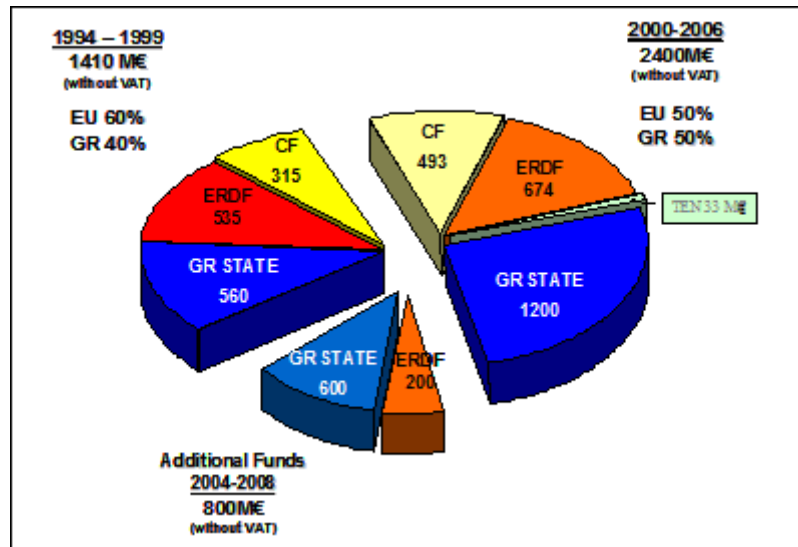
(FYROM), Thessaloniki - Serres - Promachonas (Bulgaria), Drama - Nevrokopi - Exochi (Bulgaria), Xanthi - Echinós (Bulgaria), Komotini - Nymfeá (Bulgaria) and Ardanio - Ormenio (Bulgaria).



Project Funding

The Egnatia Motorway main axis is co-funded - the funds being in the order of 50% - by the European Union. The secured funding for the axis, including the 2nd and 3rd CSF and the additional national funds, amounts to 3800 M €. In particular, 2050 M € constitute the EU Funds contribution, 1210 M € are obtained from the European Regional Development Fund (ERDF), 810 M € from the Cohesion Fund (CF), and 30 M € from the Community Budget lines in the field of Trans-European Transport Network. (TEN-T).

The above funding concerns the construction of 527km long new motorway sections, while the funding schemes do not include projects budgeted at approximately 800 M € over a motorway length of 59km. At the end of 2003, additional funds in the order of approx. 500 M € were secured for the Egnatia Motorway. In addition, funds in the order of 350 M € have been secured from the 2nd and 3rd CSF (Regional Operational Programs and Community Initiative Interreg) for the financial support of works carried out on the Vertical Axes and the service roads linking the Egnatia Motorway with the Trans-European axes, ports and airports. The European Investment Bank has also granted five loans, in the order of 1.950 M €, for the works carried out on the Egnatia Motorway and in order to cover part of the national costs.



Project Status

By December 2004, a total of 487 Km have been opened to traffic (approximately 72% of the total axis length).

PROJECT PROGRESS OF EGNATIA AXIS	km
Sections of Egnatia constructed before 1994	94
• Motorway	25
• National Road	69
Projects after 1997	586
• Completed and opened to traffic (by the end of 2004)	393
• Sections under construction	192
TOTAL OF MAIN AXIS	680

The Region of Eastern Macedonia and Thrace has 44% (174 km) of the sections that have been opened to traffic, Central Macedonia has 28% (112 km), Epirus has 12% (45 km), and West Macedonia 16% (62km). Serious technical challenges have been encountered in Epirus and Western Macedonia in order to deal with geomorphological problems and environmental concerns. However it is envisaged that the remaining sections of Egnatia Odos will be open to traffic by 2008 at the latest.

Axis of growth and collaboration

The Egnatia Road does not only constitute an important axis of transport, but is expected and drawn to play a much wider developmental role, as one of three main gates and connections

of Greece with the European space . Besides, the Greek land-planning has seriously taken into consideration the role and the operation of Egnatia Odos motorway.

Consequently, the total evaluation of the project and in particular the assessment of its' spatial effects must be based not only in terms of transport infrastructure and the operation of road network, but also in relation to the economic, social and spatial cohesion, the environmental quality, and in general the sustainable development of Greek regions.

The Observatory of Egnatia Odos

Due to the significance of the project and the need to further exploit the motorway's contribution to the development and cohesion of a wider area, Egnatia Odos S.A. established the Observatory of the Egnatia Odos Motorway to record and study the spatial impacts of the road axis' construction and operation.

The Observatory develops a comprehensive methodological and operational framework, which applies well-documented scientific methods and modern GIS & Internet infrastructure, in order to collect and provide reliable and updated information and data for the monitoring and assessment of the Egnatia Odos Motorway's spatial impacts. This information concerns:

- the cohesion of Northern Greece and the narrowing of intra-regional inequalities,
- the competitiveness and accessibility of regions and urban centres,
- the access to product markets and services,
- the structure of the urban network,
- the development of the transport system, transportation infrastructure and operation of the road network, and
- the protection and enhancement of the natural and cultural environment

The Observatory records traffic data, environmental effects, socio-economic and land-use changes, and scientifically analyses and assesses the impacts of the Egnatia Odos Motorway in the areas influenced by its construction and operation. Such a procedure constitutes a prerequisite for achieving a rational planning of future investments and developmental actions in Northern Greece.

In general, the Observatory has adopted methods and techniques used by similar initiatives assessing the impact of other Trans-European Transport Networks. It should be mentioned that the Observatory's work programme involves various partners from the public and private sector, such as research centres, universities, consultants etc.

The recording, monitoring and analysis of the Egnatia Motorway spatial impacts is based on a System of Indicators. The Indicators of Spatial Impacts monitored by the Observatory fall into three major groups: Socio-Economic, Environmental, and Road Infrastructure and Network Operation. In total, there are approximately 50 indicators that are updated and

appropriately adapted according to the scientific and operational requirements. The table below presents a summary description of the System of Indicators monitored by the Observatory of Egnatia Odos.

Socio-Economic Indicators
Benefiting Population
Market Size
Gravity of Cities
Level of Development and Welfare
Level of Unemployment
Accessible transportation modes (ports/airports/railway stations)
Accessible Industrial Areas
Accessible Areas of Tourist Interest
Change of Population within Impact Zones
Change of Population in Urban Centres
Hierarchy of Urban Centres
Population density
GDP Composition by Sector
Labour Force
Composition of Employment by Sector
Environmental Indicators
Population exposed to noise
Quality of atmosphere in tunnels - Levels of CO
Reduction of settlement cohesion and viability due to their isolation caused by the axis
Population not exposed to noise
Level of Landscape restoration
Fragmentation of forests and areas of natural beauty
Pressures for the change of land uses.
Indicators Assessing Road Infrastructure and Network Operation
Traffic Volumes (AADT)
Traffic Composition
Average Vehicle Occupancy Rate
Travel speed
Travel time
Number of travellers
Commercial transportation
Travel time between major origins and destination
Generalized cost of transport
Road safety
Traffic capacity
Level of Service
Induced traffic
Traffic at the border stations
Combined mode transport
Service Areas
Housing changes in the axis zone
Changes in the industrial development of the axis zone
Changes in the value of road-side plots in the axis zone
Trip generation rates due to special land uses
Changes in the selection of settlement location (home) and production location (work)
Changes in the modal split.

In addition, the spatial impacts of Egnatia Motorway are assessed at Five Impact Zones. Impact Zone I refers to the area of 500-1.000 metres either side of main alignment. Impact

Zone II refers to the area of the Prefectures crossed by the motorway. Impact Zone III refers to the Prefectures crossed by the vertical axes of Egnatia. Impact Zone IV refers to the Regions crossed by the Egnatia Motorway axis and its Vertical Axes. The fifth zone covers the wider area of Greece and the Balkans affected by the changes caused by the axis in the structure of the overall transportation system, and by the increasingly decisive role played by the transportation network in Northern Greece.

The overall objective of the Egnatia Odos' Observatory is to:

- Produce direct and continuous output on an annual basis.
- Promote the cooperation and networking with similar organizations both at a national and international level, as well as with developmental agencies in the wider impact area of the motorway.

Spatial Impacts of Egnatia Odos: 1st Status Report Summary

The 1st Report on the Impacts of the Egnatia Motorway is an attempt to estimate the development and environment status of the wider impact zone crossed by the motorway and its vertical axes. This zone consists of five of the Regions of Greece (Epirus, Thessaly, Western Macedonia, Central Macedonia, Eastern Macedonia and Thrace) and represents:

- 50% of the Greece's total area,
- 36% of the Greek population,
- 33% of the country's total GDP,
- 60% of the country's total energy production,
- 45% of the country's exports,
- 35% of the country's workforce,
- 36% of the Greece's Gross Value Added,
- 69% of EU25 average GDP per inhabitant.

The report is based on the results of the calculation of 30 indicators, which investigate a wide range of issues including the traffic characteristics of the road network, the mobility of human resources, the accessibility of regions and their centres, the decrease of intra-regional inequalities, the convergence of Northern Greece with the average EU standards, the structure of the system of settlements and the environmental impacts.

The indicators adopted by the Observatory were classified and evaluated according to their relation with four basic parameters that are also the main objectives of the relevant European policy:

- (a) mobility and accessibility,
- (b) economical and social cohesion,
- (c) balance and networking of settlements, and
- (d) environment quality.

The next chapters of the paper develop and analyse briefly the results of indicators, according to the four policy parameters – objectives mentioned above.

Mobility and Accessibility

The presentation of the results of indicators related to the parameter of «mobility and accessibility» includes traffic volume and composition, travel speed, time-distance, etc. From the traffic counts carried out by Egnatia Odos during in 2004, the Annual Average Daily Traffic was calculated for a number of sections along the Egnatia axis. The highest traffic volumes were recorded along the sections that are located in greater urban area of Thessaloniki. Comparing the actual traffic volumes with those forecast for 2010 it is worth noting that on almost all sections of the Egnatia Motorway, the 2004 traffic volumes are already at least 80% of the volumes expected by 2010. In some cases the 2010 forecasts have already been exceeded.

It is also estimated that the composition of traffic across the Egnatia axis is relatively constant; the majority of vehicles (80-90% of the total) are passenger cars or similarly sized vehicles. On most sections of the Egnatia Motorway, it is estimated that the average operating speeds of vehicles are close to the design speeds (120 km per hour). The completion of the Motorway will result in significant travel time savings across Northern Greece. It has been calculated that the travel time from Thessaloniki to Igoumenitsa (Ionian Coast) will decrease by more than 180 minutes, while the trip between Thessaloniki – Kipi (Greek-Turkish borders) will decrease by 120 minutes.

Further on, issues related to the population, the characteristics of the markets and the work force per Region that benefit from the operation of the Egnatia Motorway by means of having better access possibilities to and from other areas are examined. It is estimated that 1/3 of the population of Greece will benefit directly from the complete operation of the system of the Egnatia Motorway and its vertical axes. With relation to the indicator “market size”, it is noted that in 2002, Central Macedonia produced more than half of the GDP of the total of five Regions, while Western Macedonia and Epirus present the least contribution (less than 10%). The distribution of work force in 5 Regions follows, to a great extent, the distribution of the population and the size of the market. Namely, 50% of the work force is gathered in Central Macedonia, whereas the Regions of Western Macedonia (7%) and Epirus (8%) have the smallest share.

The unit of «mobility and accessibility» continues with the estimation of the change of the accessibility of urban centres and the produced product of each prefecture according to the SASI model, which is used by the EU for the evaluation of the effects of the Trans-European Networks (TENs-T). The results show a clear improvement of the accessibility especially of remote and poorer areas. At the same time, the Egnatia Motorway interconnects and improves the accessibility of other means of transport (5 ports, 8 airports, train network, terminals and border stations) and areas of special interest (18 Industrial Zones, a variety of tourist and cultural sights etc). However, it should be noted that the benefits for these areas mainly depend on the general parameters and policies of economical and spatial development.

Economical and Social Cohesion

The critical indicators for the economical and social cohesion are initially the level of prosperity GDP per capita and the levels of unemployment, while important information is given by indicators such as the composition of production, the composition of employment and external trade. For all these figures, the existing status, the basic changes in relation to the previous five years or ten years are studied along with the relationship with relevant figures on a national and European level. In 2002, on a regional level, Western Macedonia had the highest GDP per capita, followed Central Macedonia with a small difference, while East Macedonia had the smallest GDP per capita. With respect to the degree of convergence with the European standards, Western Macedonia and Central Macedonia are on a higher level compared with the total of the Country (80.7% and 79.1%). The poorer ones are the Regions of Thessaly, Eastern Macedonia and Thrace, and Epirus where the GDP per capita is significantly lower than the national and European averages. However, during 1996-2002, Epirus presented the greatest annual rate of change of GDP per capita and the greatest improvement as far as convergence with the European standards is concerned. The export-import ratio in the zone of the five Regions is equal to 0.86, whereas for the total of the Country it is equal to 0.40, a fact that reflects the significance of Northern Greece as an exporting centre.

According to the data provided by the National Statistical Service of Greece, the average percentage of unemployment for the total of the five Regions in 2001 was almost 12%. Western Macedonia (16%) had a significantly higher percentage than the average level of unemployment, while Thessaly (11%) had the lowest. The results of the «composition of production» indicator show the clear domination of the tertiary sector, since this sector has produced almost 2/3 of the total of the Gross Value Added (GVA) of the five Regions. The secondary sector follows with 24.4% of the total GVA, while the primary sector has produced 10.6% of the total GVA. With relation to the composition of employment, it is observed that 54% of the population of the five Regions is employed in the tertiary sector. The second most important sector of employment is the secondary, which collects 24% of the employed and the last one is the primary with a percentage of 22%, which is nevertheless high enough in comparison to the European average (EU15=4.2%, for 2001).

In total, the examination of the parameter of «economical and social cohesion» shows the domination of the Region of Central Macedonia, due to the existence of the Metropolitan Area of Thessaloniki. It is also worth noting that in sections where the Egnatia Motorway has opened to traffic, some of the macroscopic changes observed seem to be rather positive. Therefore, the true potential of the Egnatia Motorway to be the alternative axis of development against the “traditional” axis of development along PATHE motorway is made clear.

Balance and Networking of Settlements

The next section of the report present the results of the indicators and other details of studies that are related with the parameter of “balance and networking of settlements” and they are compared to figures such as the distribution and change of population, the density of population, the classification of urban centres, the attraction of cities and the movement between them. In the decade 1991-2001, the population of the five Regions significantly increased by 6.7%, a percentage that is above the double of the average of change in the 15 EU country-members (3%). It is also impressive to examine the percentages of increase in the four urban centres of Thrace (Alexandroupoli, Xanthi, Orestiada and Komotini) that vary between 16.9% and 32.1%.

In general, the system of the Egnatia Motorway with its vertical axes affects the organization of settlements, since it allows the closer relationship between the centres it crosses, by reducing the relevant travel time and distance and facilitating communication between them. More specifically, the Egnatia Motorway brings many changes to the networking of urban centres. According to preliminary analysis of the National Origin Destination study carried out by the Ministry of Public works in 2002, it has been noted that journeys on an intra-regional have increased - particularly in areas where Egnatia is largely completed. The conclusion that the journeys between Kavala – Xanthi – Alexandroupoli increased by 85% to 150% is indicative of the dynamic impact of the Egnatia Motorway on the networking of urban centres. The rural area and the smaller settlements benefit from the Motorway in a different manner. The extent to which the main axes and junctions are connected with a dense and reliable net of secondary axes and junctions thus servicing the network of smaller towns and other settlements is particularly important to these areas.

In total, the study of the parameter of “balance and networking of settlements” shows that the Egnatia Motorway creates new conditions for the inter-connection of settlements and the development of standards of spatial organization towards more polycentric systems.

Environmental Impacts

The quality of the environment is the basic component of the contemporary transportation policy, as well as of the overall policy for the economical, social and spatial cohesion in the European Union. The critical indicators for the estimation of the impacts of major road axes,

such as the Egnatia Odos Motorway, on the quality of the environment are noise, atmosphere pollution, problems regarding the fragmentation of environmentally sensitive areas, and generally the changes in the uses and the value of land.

The investigation of the occupation of land by the Egnatia Motorway per category of land uses, according to the CORINE Land Cover classification, shows that in a total length of 680 km, 68% of the axis runs through rural cultivations, 30% through natural areas, 1% through aquatic ecosystems and 1% through urban areas. The axis of Egnatia Motorway itself crosses 6% of the total length of protected areas (Natura 2000 and Ramsar). In this case, provision has been made for special technical solutions for the limitation of the axis impacts on the environment.

With respect to the indicator of noise, it is estimated that, by means of using a forecast model, the percentage of the population that is exposed to noise of more than 70 dB(A) (superior allowed limit from the Greek legislation), due to the Egnatia Motorway, within a wider distance of more than 100m from the axis, is negligible for the whole axis. The problem with noise is located to a 100m buffer zone of the motorway in the suburban area of Thessaloniki. With respect to the indicator of atmospheric pollution and along with the use of a similar forecast model, it is estimated that only on the sections of the axis in the greater urban area of Thessaloniki, where the largest traffic volume is expected, high levels will occur. With respect to the indicator of impacts to the greenhouse effect, it is estimated that the overall CO₂ emissions per vehicle/km present a relatively equal distribution between the different sections of the road and vary in a similar, yet a little lower, level (axis average: 252 tones) from those of the Country (276 tones), and also from the European Union (272 tones).

On the other hand, the settlements in potential nuisance decrease from 97 (before the construction of the Egnatia Motorway) to 75 (after the construction of the Egnatia Motorway). In addition, a quality differentiation is observed as the diversion of the traffic from the big urban centres, where the majority of the population lives, improves its sustainable operation. With respect to the fragmentation of natural ecosystems and crossing with surface waters, it is observed that the Egnatia Motorway impact is almost unnoticeable.

In total, and according to the estimated traffic volumes for 2010, the first results of the environmental indicators show that the complete operation of the Egnatia Motorway either has limited and controlled impacts, or, despite the increasing traffic volume, leads to conditions that are similar or significantly better than the condition existing before the construction of the Egnatia Motorway.

Concluding Remarks

The feasibility of Egnatia Odos Motorway as far as its developmental role is concerned is evident. Nevertheless, it results that the construction and the operation of Egnatia Motorway,

along with the implementation of other projects for the improvement of road infrastructures, should be connected with the additional measures of policies for regional development. These would support the productive structure, spatial and urban planning and the protection of the environment of the regions, especially of the weaker ones, which further on lay the most open to the intensely competitive environment of the widened European Union.

We hope that the diffusion of the Report will contribute to the dialogue and the cooperation between development bodies for the amelioration of the procedure of planning and decision-making, with respect to issues of transport infrastructures and regional development. At the same time the 1st Impact Report, is expected to form the basis for further investigation and documentation of the developmental role of Egnatia Motorway, and also, in general, to contribute towards a systematized estimation of the spatial impacts of great transport infrastructure projects in Greece.