

Via Egnatia case in Greece: an overview of the intervention

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Abstract. While economic growth in the modern world seems to be a one-way process, various threats for wildlife and the natural ecosystems are increasing. The development of intense road networks, cause habitat fragmentation and connectivity between important habitats and consequently influence the gene flow between sub-populations of large terrestrial animals. In, Greece the construction of the new cross country four line 600 km highway VIA EGNATIA is such an example. The highway connects the Ionian Sea harbor of Igumenitsa with the Greek-Turkish borders and passes through the provinces of northern Greece (Regions of Epirus, Macedonia, and Thrace). The construction cuts through important natural areas of Pindos Mountain massif, the main habitat of large carnivores like the brown bear (*Ursus arctos*) and the wolf (*Canis lupus*). ARCTUROS, an NGO based in Thessaloniki (established 1992), seriously intervened in the plans of highway construction since 1994 and achieved to change the initial route plan for a 34 km segment in the Prefecture of Grevena a critical corridor habitat for carnivores. The intervention lead to an increase of the total length of tunnels and bridges from an initially planned 7 to almost 17 km covering 50% of the total length of the road, whilst additional construction of green bridges and underpasses were planned so as to reduce further habitat fragmentation. Moreover a 6 year monitoring program was planned, to monitor the effect of the highway on animal populations, before and after construction.

Key words: highway, habitat fragmentation, green bridges, underpasses, Via Egnatia, Greece

1. Introduction

As the modern societies are developing rapidly, there is a growing construction of large scale technical structures, such as highways. The increased density of transport infrastructures, cause pressures on natural ecosystems world wide and intensify conflicts between humans and wildlife (Boitani *et al.* 1999; Fukeda 2005; Gibeau *et al.* 2001; Graham *et al.* 2005; Mattson *et al.* 1986; McCown *et al.* 2005; Naves *et al.* 2005; Schwab *et al.* 2005).

Via Egnatia is a new cross country four lane 600 km highway cutting through North Greece, connecting the harbor of Igumenitsa at the Ionian Sea with the Greek-Turkish borders and passing through the provinces Epirus, Macedonia, and Thrace (Fig. 1). The highway is part of the Trans European Network (TENT) and has links with the international roads and railroad network as well as maritime axons (Mertzanis *et al.* 2005). The construction is implemented by EGNATIA ODOS S.A. a company created by the Ministry of Environment, Physical Planning and Public Works which is the exclusive shareholder.

The planning of the appropriate wildlife passes for the larger mammals are necessary during the pre-construction phase, at Grevena-Panagia segment due to the fact that the highway is a closed – fenced highway. This means that in the case of inappropriate construction of the fauna passes, habitat fragmentation, the loss of the geographical continuity of the distribution of the large mam-

mals will compromise their long scale survival (Beecham *et al.* 2006; Clevenger & Waltho 2000; Scheick & Jones 1998).

The absence of Strategic Environmental Assessment (SEA) in Greece (Directive 2001/42/EC) leads to separate and isolated measures and cases with no general study and relation on national level. The construction of high speed roads is expected to have a negative impact on the brown bear *Ursus arctos* and its habitat due to (Fig. 2):

- habitat loss
- disruption of habitat continuity, since artificial obstacles will limit the seasonal movements of the population as well as its expansion
- splitting of the home ranges
- genetic isolation which may lead to inbreeding therefore loss of genetic diversity
- increased the direct mortality due to traffic accidents
- behavioral changes since certain highway sections will be avoided due to disruption of continuity of the vegetation cover – «edge habitat effects»
- increased pressures due to land use changes and increased human presence at the areas adjacent to the highways.

For the minimization of the geographical and genetic isolation, it is needed to maintain and/or to create linkage zones between separate segments of the geographical distribution of an animal species. Therefore any construction must be planned with mitigation measures such as tunnels, bridges, green bridges to maintain the quality of the biotope in the neighboring areas and ensure the habitat continuity (Beecham *et al.* 2006; Clevenger & Waltho 2000; Scheick & Jones 1998). These cases could have an active and effective role as real passes.

For the correct planning of the tasks related with the large mammals there is a need of approaching at: (i) a larger scale for ensuring the geographical continuity of the national population of the species and avoid disruptions and (ii) a local scale for the most suitable design of the wildlife passes.

2. The rejection of the initial highway construction plan

The initial proposal by EGNATIA ODOS S.A. for the route of the highway, for the segment Panagia-Grevena, included cutting through the bear habitat without any special concern for the conservation of the species and its habitat.

The only one mitigation measure planned was related to the construction of few tunnels with 3.5 km total length for the safe crossing of the bear. From these, only two tunnels with total length of 1.1 km was in appropriate habitat location, while the rest were unsuitably designed mainly fitted to easy construction. This plan was unsuitable to secure the long term survival of the indigenous bear population, as the species use an extensive home range ranging 150-250 km² annually and is characterized by intense activity with large distance daily movements up of 15-20 km (ARCTUROS 2000).

On the other hand, with the construction of the highway there was a probable danger of isolation of the bear population in the mountain Hasia (220 km²), inhibiting the expansion of the species to the east. Also with no gene exchange the small isolated population in mt. Hasia was severely threatened due to inbreeding.

Additionally the highway was planned to follow quite often the valley of Venetikos' river creating serious problems both to the landscape and the avifauna.

3. Results – the final alignment

After a series of judicial activities initiated by ARCTUROS and repeated discussions with the Ministry of Environment, Physical Planning and Public Works and Environmental NGOs many studies took place (Table 1). These studies were completed after the overlook of the initial environmental terms enforce by the Council of State (highest judicial level in the country) as there were not any alternative suggestions. These studies included one perimetrical route at the edge of the brown bear habitat (Fig. 2). They were rejected since they did not reduce or circumvent the important bear habitat. On the contrary the length of the road was increased by 28 km and the nature of the hilly landscape could not allow the creation of the necessary connecting corridors for the animals. If the perimetrical solution was selected a concrete obstacle for the brown bear would created, and the re-colonization of the new areas by the species as well as by other large mammals would never took place (Bousbouras *et al.* 2006).

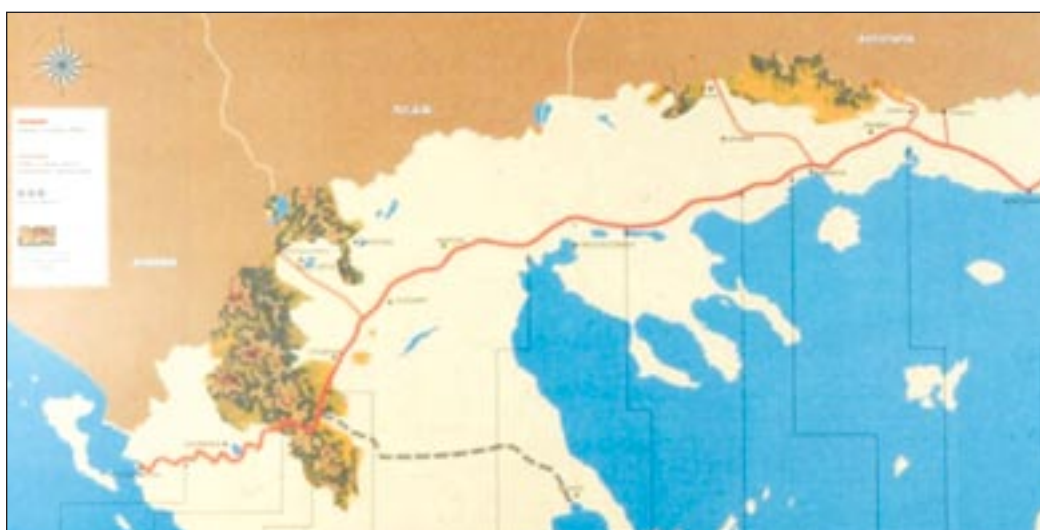


Fig. 1. Brown bear (*Ursus arctos*) distribution in Greece (Pindos, Rhodope), Via Egnatia and its vertical axons



Fig. 2. Brown bear (*Ursus arctos*) distribution in Pindos Mountain and reappearance of the species. Via Egnatia is with red line while the alternative perimetrical proposal is with violet. Red points indicate the re-appearance of the brow bear in Greece

Table 1. Short history of the case of Via Egnatia and the intervention of ARCTUROS and the other environmental NGOs

Date	Activity
1994	ARCTUROS formulated the official objection to the Ministry of Environment, Physical Planning and Public Works related to the proposed design of the segment Panagia – Grevena of the Via Egnatia. The proposed changes are supported on the scientific data of the LIFE-Nature ARCTOS project (for the conservation of Brown bear in Greece) without their inclusion in the final design. in a special memorandum of ARCTUROS to the Ministry of Environment, Physical Planning and Public Works the solution of the perimetrical lining is proposed to be studied for the concrete segment. The data and the scientific documentation were completely ignored. In the same time European Commission is informed about the case.
1995, April	The Common Ministerial Decision of the improvement of the Environmental Terms for the segment Panagia-Grevena was signed by the Ministers of the Environment and Agriculture without any preventing measure or/and confrontation of the reverberation
1995, August	Appeal of ARCTUROS, WWF-Hellas and the Hellenic Society for the protection of Nature, to the Council of State for the cancelling of the Ministerial Decision.
1996, February	The subject challenged the activity of the European Commission. A special meeting took place with representatives of ARCTUROS, team of Ministry of Environment, Physical Planning and Public Works and the E.C. (DG XVI) with newly discussion of the problematic designed lining and the reverberation to the natural environment of the concrete area.
1997, July	The decision of the Council of State (reg. num. 2731/1997) justified the appeal of the NGOs and canceled the Ministry Decision for the concrete segment of the highway, while the same time proposed the investigation of the solution of perimetrical designed lining.
1998, June	As a continuance of the decision of the Council of state, EGNATIA ODOS S.A. implemented a new Environmental Impact Assessment (EIA) for the concrete segment. The Study proposed variants of the design with some more corrective measures. The new design is draw away from the Venetikos River. The same study investigated other two alternative solution one from which is the perimetrical design and finally rejected. The same period EGNATIA ODOS S.A. asked the beginning of a series of working meetings with ARCTUROS which newly documented the environmental impacts of the highway.
1998, July	ARCTUROS submitted to the EGNATIA ODOS S.A. and the European Commission relative memorandum, noted the reservation about the sufficiency of the corrective measures.
1999, December	The subject discussed at the Council of Europe in Strasburg.
2000, April-June	Tthe relative envelope opened by the European Commission (DG Environment) and warning letter to the Hellenic Government sent. On April 6 th 2000 the co-relevant Ministries approved the Environmental Terms of the improved design (just before the National Election). The technical characteristics of the task included 13.2 km of tunnels and 3.7 km of bridges from a total length of 34 km of highway.
2000 October – 2001 November	Starting of new circle of discussion between EGNATIA ODOS S.A. and ARCTUROS with a design of the Special Monitoring Project as a result.
2002-2004	Implementation of the Special Monitoring Project funded by the EGNATIA ODOS S.A. the Ministry of Environment, Physical Planning and Public Works and the EC (DG REGIO).
2005, May	The results of the first phase of the project included proposals for small improvements of the technical characteristic of the highway with benefits for the fauna as well as subjects for land planning organization of the wider area.
2006	Installation of the constructor in the area and preparation for the second phase of the project.

At the sequential studies the EGNATIA ODOS S.A. and the Ministry of Environment, Physical Planning and Public Works undertook some additional measures:

- plan to construct the highway far from the rivers and fresh water sources
- increasing the length of the tunnels to facilitate bear movements

- construction of small animal underpasses
- hunting prohibition at a 2 km zone from both sides of the road.

The final plan included 13.2 km of 15 tunnels with length range 250-2.100 m and 3.7 km of 8 bridges with length range 250-500 m in a total of 34 km of highway stretch. These technical characteristics ensure the passes for the terrestrial fauna with coverage of 49.7% with the combination of special constructive needs.

One of the most important achievements for the environmental terms of the final improved solution was the implementation of the scientific project with title: 'project for the evaluation of the impacts of Via Egnatia at the forest ecosystem of the area with emphasis on large mammals and brown bear *Ursus arctos* in the segment Panagia – Grevena (seg. 4.1)'

The ongoing project continues for 6 years and includes three phases covering the periods before, during and after the construction of the highway. In the first phase (2003-2005) the project coordinated by ARCTUROS (as consultant and implementation body) in cooperation with the Aristotle University of Thessaloniki, the University of Thessaly and the Hellenic Ornithological Society (BirdLife partner in Greece). In this phase the project evaluated the status of the bear, wolf and ungulate population as well as the status of the important bird species in an area 10-20 km zone on both sides of the road.

The already implemented first phase of the project included surveys with different methods including bear monitoring with GPS collars, targeting on the precise movements and habitat use of the species. Based on these data at the end of the first phase special proposals for the improvements of the design were formulated as:

- changing of the position of existing fauna underpasses and creation of new as well increasing of the sizes of some of them
- planning of one green bridge for the crossing of the large mammals as ordered by the environmental terms decision
- construction of strong fence for averting bear traffic accidents
- creation of permanent wildlife reserve in a radius of 2 km on both sides of the highway
- seasonal closure of the secondary forestry road network
- land - planning regulations, which would keep the land use unaltered in the radius of 2 km on both sides of the highway
- prohibition of the construction of new forest road
- changing of the Forest management logging system from clear cutting to selective.

The technical characteristics of the highway construction works with the large length of the tunnels and bridges as well as the complementary constructions which proposed by the project ensured the communication between the large mammals population of the different sides of the highway (Mertzanis 2005). Similar construction improvements with large tunnels in other eastern position (segment Kozani-Veria) of *Via Egnatia*, ensured the movements of the brown bears across the highway.

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