



64th ECCE General Meeting

**Round Table: “Building the future:
The road to prosperity is always under construction”**

**Planning and Designing
Infrastructure Projects
in Recession Times**

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INTRODUCTION

The economic crisis in Greece is unprecedented.

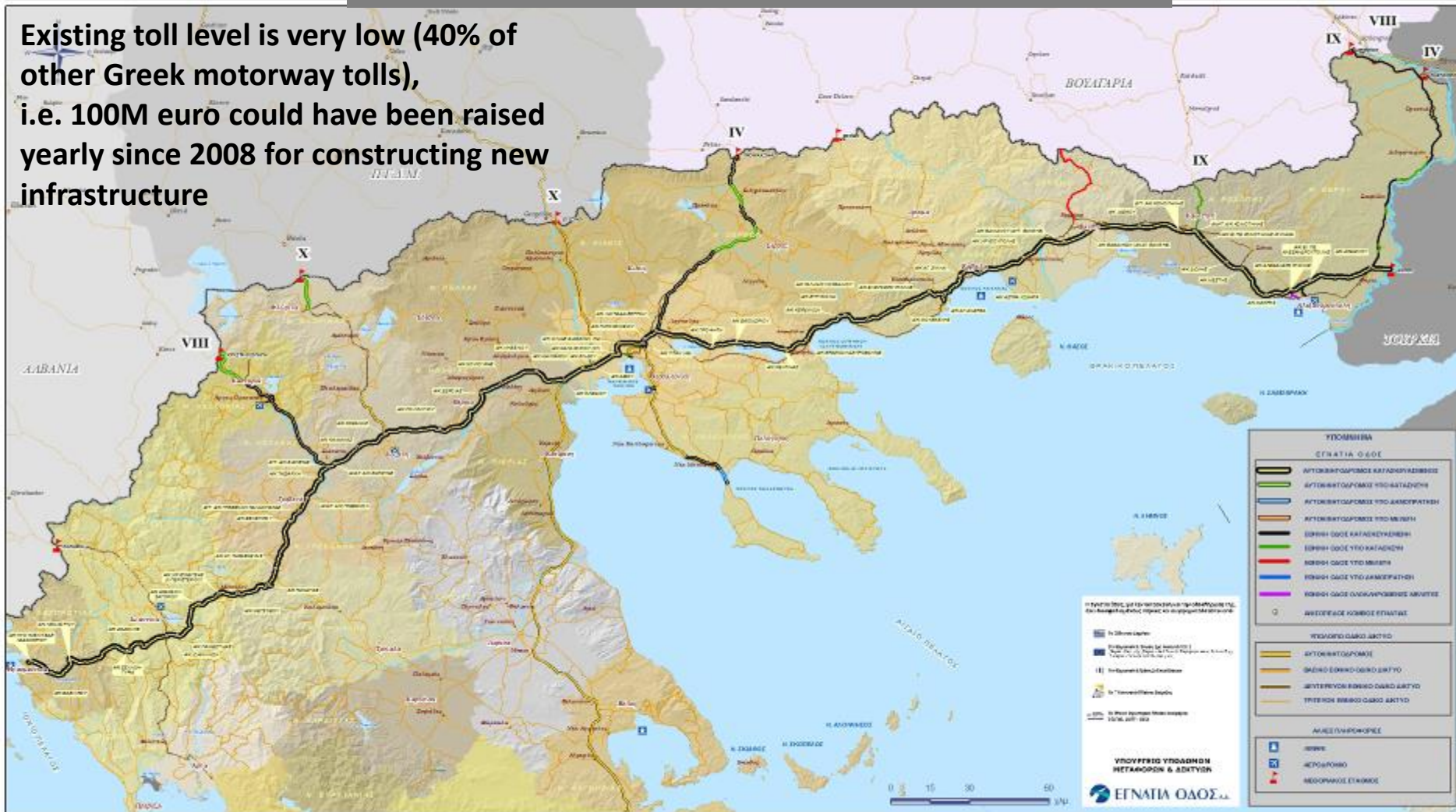
**Restricting the discussion in Infrastructure issues,
what can be done?**

- **Find possible financing resources**
- **Exploit better existing infrastructure through small additional investments**
- **Plan on the basis of sound Cost Benefit Analyses**
- **Design according to Value for Money**
- **Reform Civil Engineering studies and curriculum**

Find possible financing resources

Egnatia Odos and perpendicular axes

Existing toll level is very low (40% of other Greek motorway tolls),
i.e. 100M euro could have been raised yearly since 2008 for constructing new infrastructure



ΓΕΩΓΡΑΦΙΚΟ ΣΥΣΤΗΜΑ ΠΛΗΡΟΦΟΡΙΩΝ
ΚΛΙΜΑΚΑ: 1:1.350.000
ΙΑΝΟΥΑΡΙΟΣ 2012

Find possible financing resources

Attiki Odos



After 2024, 130M euro per year can be available for financing new Infrastructure

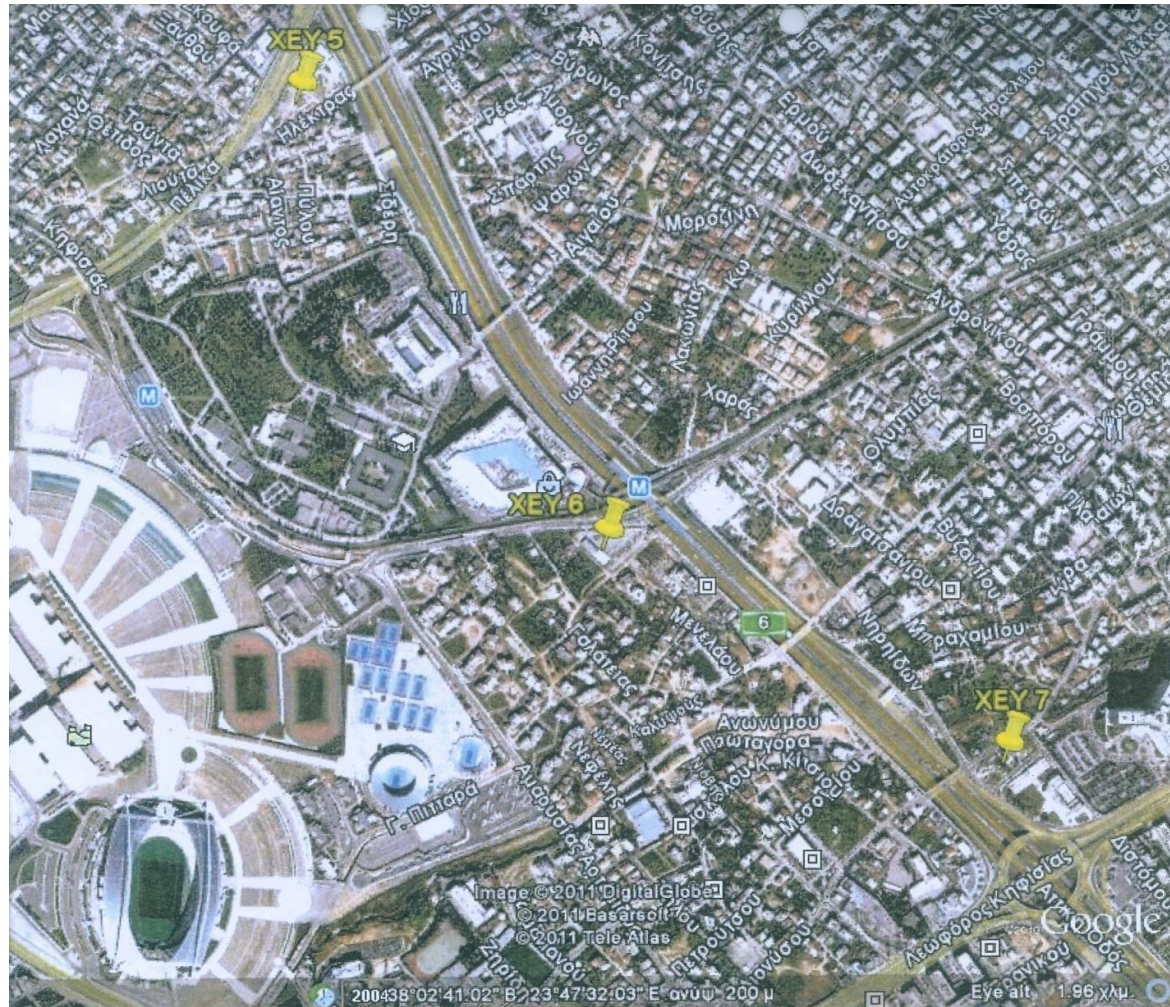
Find possible financing resources

- **To mobilize project financing in the private sector it is imperative to streamline the relevant procedures.**
- **E.g. regarding Urban Buildings:**
 - **Allow merging of adjacent apartments**
 - **Foresee simple majority of owners decision making regarding block of apartments repairs**
 - **Enable unification of adjacent buildings free spaces in order to improve environment**
 - **Promote construction of parking spaces where ever possible**

Exploit existing infrastructure

- **In the recently constructed Attica Urban Railway there is no provision for park and ride near by the stations.**
- **The expropriated construction sites, where park and ride facilities can be constructed, are for sale.**

Exploit existing infrastructure



Exploit existing infrastructure

Existing spaces- former Construction Sites

Position	(Area/m ²)
Liosion	4.600
Tatoiou	1.770
Pallini	3.500
Kantza	6.862
Pentelis	4.175
Davari Str.	7.565
Magoula	10.000
Neratziotissa	5.500
Kifisias	4.275
Plakentias	5.780

Exploit existing infrastructure

At the location of Neratziotissa, an area of 5.500 m² was sold for 1.800.000 €

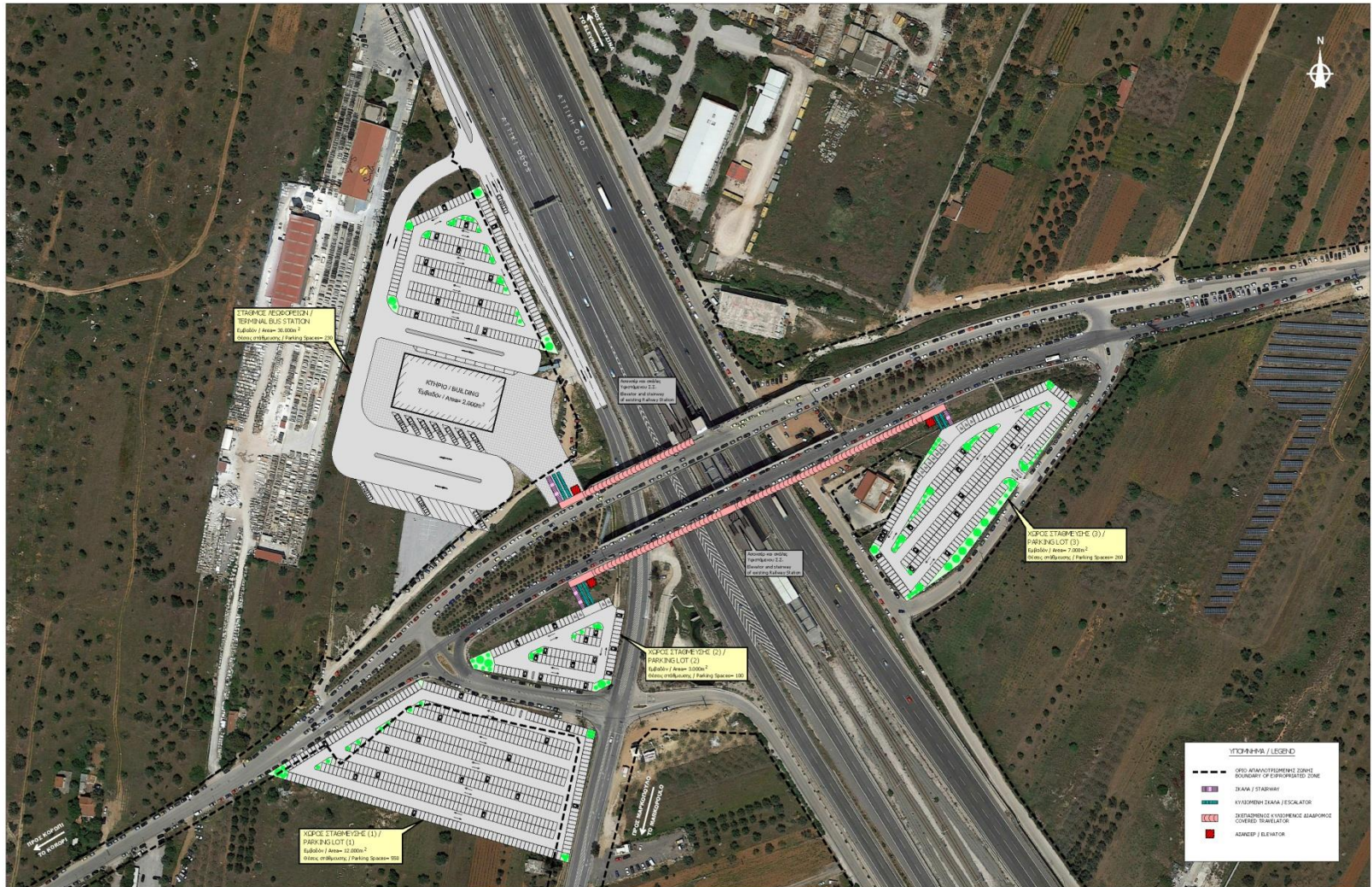


Exploit existing infrastructure

Koropi urban railway station



Koropi station: proposed transfer center

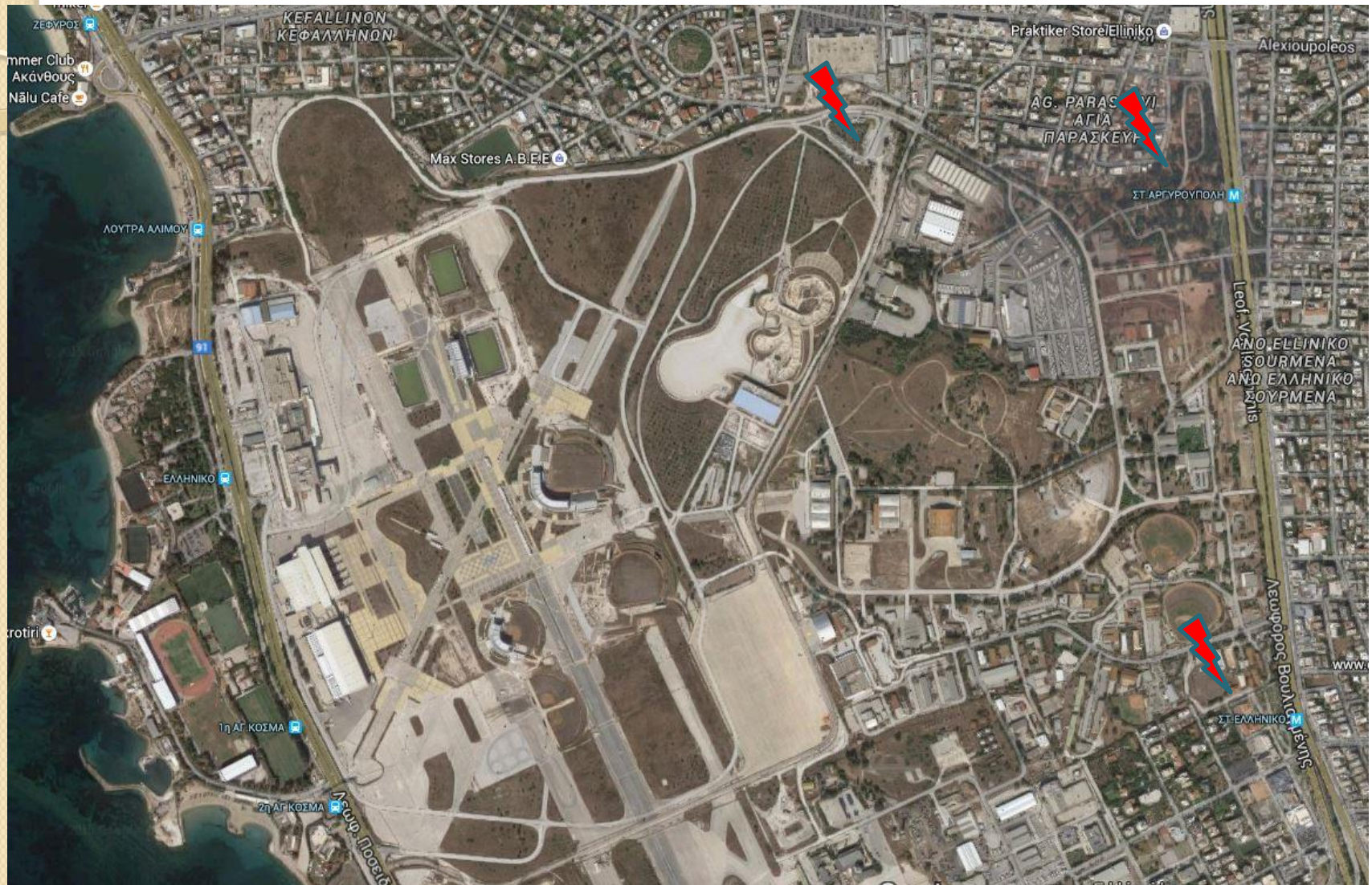


Exploit existing infrastructure



Exploit existing infrastructure

Connecting the Metro and the Tram at Elliniko



Planning

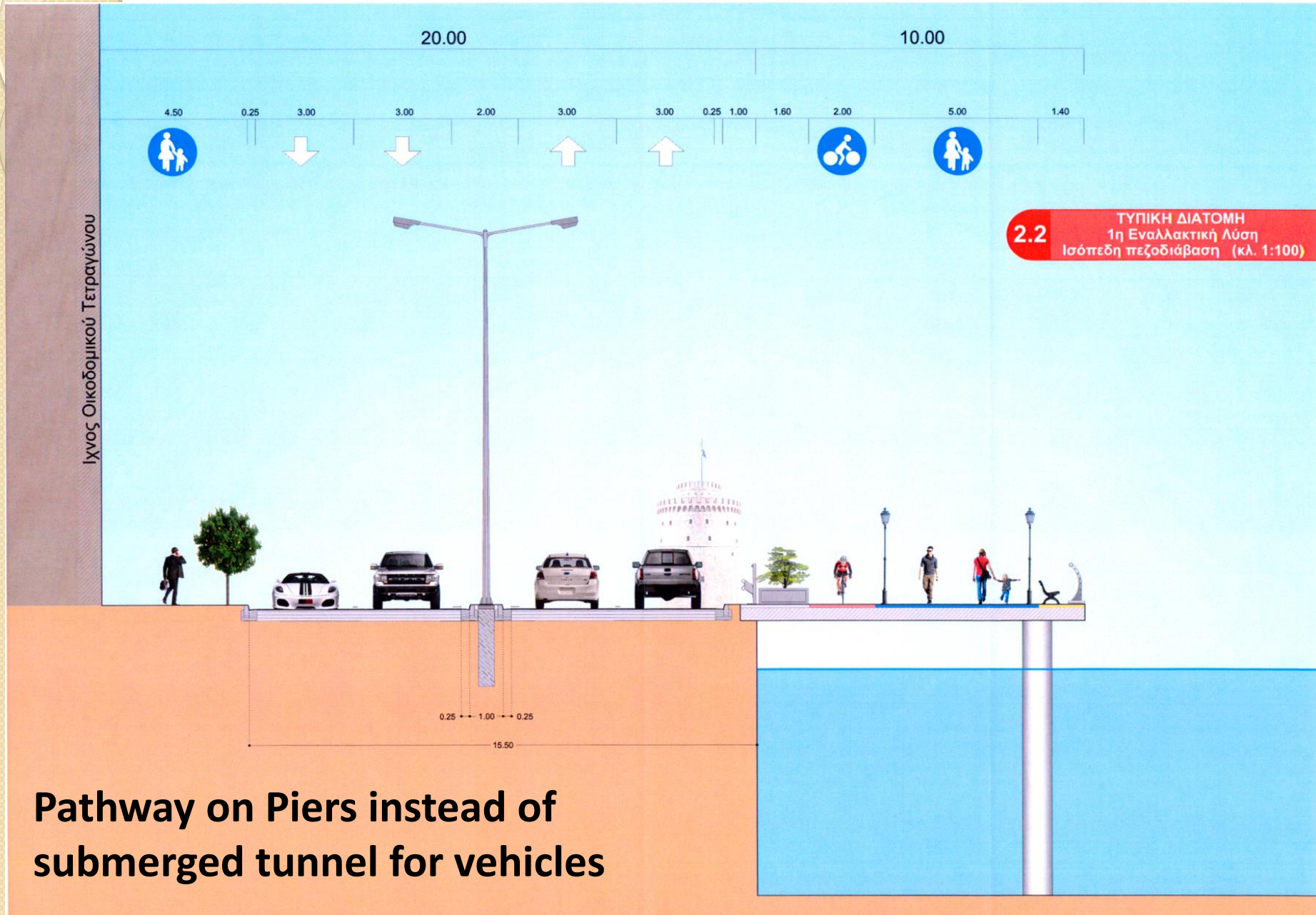
Nikis Avenue, Thessaloniki

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ΠΡΟΟΠΤΙΚΗ ΑΠΕΙΚΟΝΙΣΗ
Υφιστάμενης κατάστασης



Planning



Design

Thessaloniki bypass: The fly-over option



Design

- The initial design for the upgrading of the Thessaloniki ring road foresaw in its 8-km central section a new motorway parallel to the existing one consisting of a series of twin tunnels, covering almost all of its length. The environmental terms were approved and the design was completed.
- In line with the international experience, a fly-over was studied with its piers founded on the one side of the existing motorway, i.e. half of the width of the fly-over would be on the top of the existing motorway. The new environmental terms were approved and the design was completed.
- The construction cost of the fly-over solution is estimated to the 60% of the tunnel one; the operation and maintenance cost and the environmental impact are by far less.

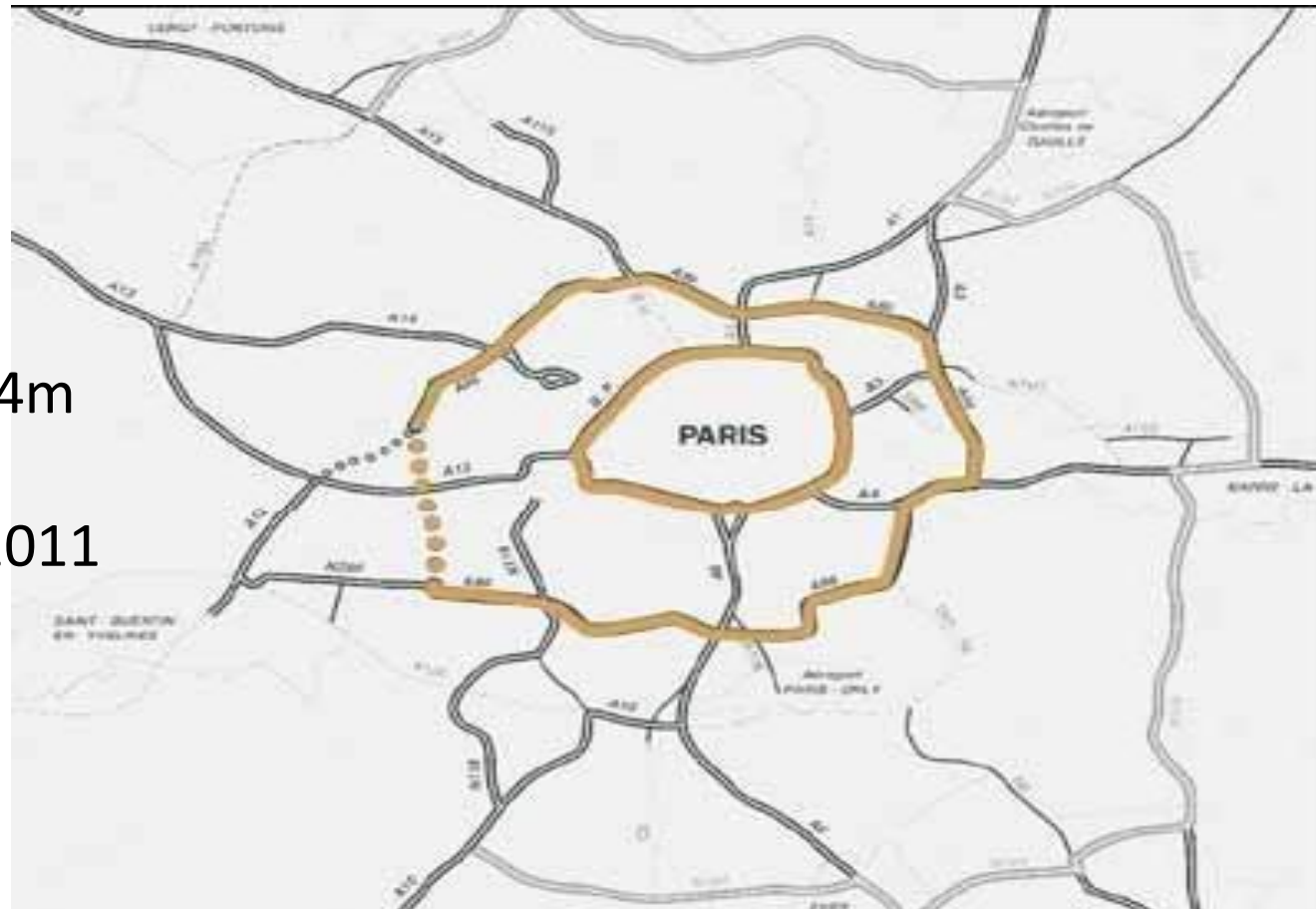
Design

Duplex A86, Paris Super- Peripherique

Length: 10km

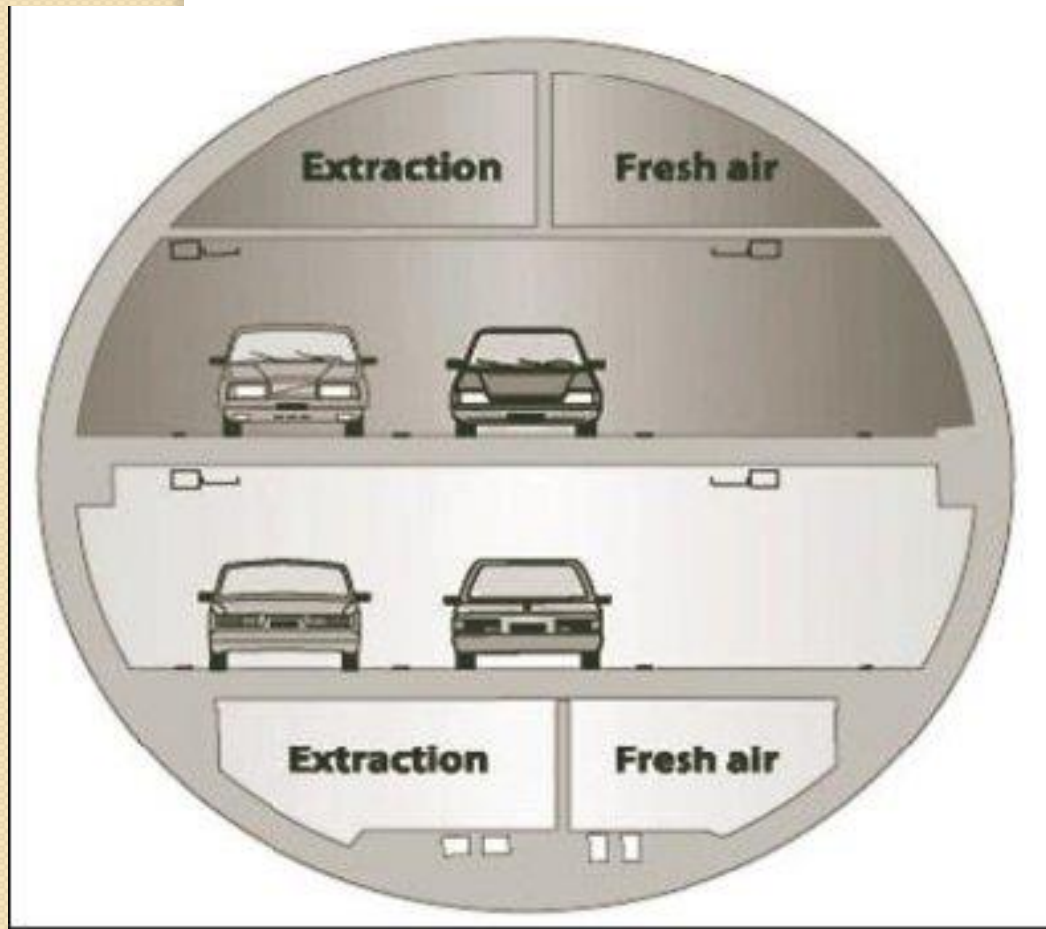
Diameter: 10.4m

Completion: 2011



Design

Duplex A86, Paris Super- Peripherique



Design

For urban tunnels, international practice reveals design solutions of great value. Such an example is the A86 Duplex Tunnel part of Paris Super-Peripherique, completed in January 2011. It is an innovative 10km tunnel, with a diameter of 10.4 m, exclusively for light vehicles and features two decks each with two traffic lanes and an emergency one. Each level is independent of the other.

Civil Engineering Studies

- **30000 Civil Engineers registered in the Technical Chamber of Greece.**
- **Civil Engineering Schools/Departments in five Greek Universities.**
- **700 civil engineers graduates each year.**
- **Additional graduates from foreign Universities.**

Career path for Greek Civil Engineers

- **Registration to the University: after national exams (scientific and technical field)**
- **Five year studies(in reality 6.5 years on average)**
- **30% of the graduates study MSc courses (most of them abroad)**
- **Professional licensing examination (chartered engineer) for private projects immediately after diploma award**
- **Public Works Designer: 4 years after professional licensing (low rank) – promotion based on experience certificates**
- **Public Works Contractor: 3 years after professional licensing (low rank) – promotion based on experience certificates**

NTUA School of Civil Engineering

- **The School of Civil Engineering is the oldest in Greece.**
- **It is subdivided into five Departments covering the different aspects of civil engineering:**
 - structural engineering**
 - hydraulics engineering**
 - transportation engineering**
 - geotechnical engineering**
 - construction engineering and management**
- **There are 53 Faculty members in the School.**
- **Their teaching and research work is assisted by 43 members of laboratory staff and scientific associates.**

NTUA School of Civil Engineering

- The national examinations qualification score required for entering the School is high; until recently it was the highest amongst all Schools of engineering, mathematics and physics.
- In 2016, it dropped in the 10th position nationwide, obviously due to the high rate of unemployment in the civil engineering sector.

Civil Engineering Studies at NTUA

- The Departments reflect the sub-disciplines of civil engineering and provide courses.
- The courses are divided into mandatory, elective and optional (non-credit). Students need to follow 65 courses during 9 semesters, i.e. 7 or 8 courses per semester. 138 courses are provided in total, most of them as electives.
- Taking into account that each course is taught for 3-5 hours per week, a student is expected to spend 26 hrs (1st semester) – 30 hrs (9th semester) every week in a lecture room or doing experimental work in the laboratory.

Civil Engineering Studies at NTUA

- Undergraduate courses regarding the four specializations, i.e. structural engineering, hydraulic engineering, transport engineering and geotechnical engineering, commence on the 7th semester and become the majority on the 8th semester; the 9th semester is fully devoted to specializations.
- In 10th semester, each student is obliged to prepare his diploma thesis, which has the content of a high level assignment. Although the completion should be feasible in one academic semester of full time work, it takes longer in practice.

NTUA School of Civil Engineering

- Research undertaken in the School is worth mentioning in both quantitative and qualitative terms: the School holds approximately 20% of the total funded research budget of the NTUA (encompassing nine schools) and its members publish every year hundreds of papers in International Journals and Conferences.
- According to the 2016 QS World University Rankings for the subject “Engineering – Civil & Structural”, the School is ranked 33rd World-wide and 8th Europe-wide.
- The objective sub-criteria of the citations’ number per paper and the h-index bring the School to a much higher place.

Civil Engineering Studies in the past

Civil Engineering Studies (CES) flourished after the Second World War as

- **There was immense need to rebuild what had been destroyed.**
- **The governments had adopted worldwide the use of public investments in infrastructure as the locomotive for development.**
- **The first positive results triggered the citizens' motivation for better living conditions and increased private investment in infrastructure.**
- **CE Departments were established in almost all Universities.**

These phenomena were more evident in the countries under development.

Recent Financial Crisis impact on CE sector and studies

- **Shrinkage of investments in infrastructure.**
- **High rate of unemployment in the technical sector.**
- **Increased movement of professionals from countries in recession to countries with sound economies.**
- **Dramatic reduction of the family budgets and their capacity to finance post-graduate studies in their country or abroad.**
- **Down turn in the quality of civil engineering perspective students.**
- **Significant limitation of university financing.**
- **Very low pace of retired professors' replacement.**
- **Substantial reduction in professors' salaries.**

Critical questions for the future of countries in recession

A series of critical questions arises for the ministers of education, the technical universities and the professional associations of the countries in recession:

- Why to continue producing CE at the same rate, given that public and private investment in infrastructure will be substantially reduced during the next years?**
- How can the fresh CE' employability be increased?**
- How their theoretical knowledge will not become obsolete, although the majority of them will not have the opportunity to gain experience in practice for a period after graduation?**
- How the needs of the 21st century CE should be better addressed?**

Civil Engineering Studies Today

Bologna Declaration:

- **The European Union endorsed the “Bologna Declaration” in 1999.**
- **The Declaration promotes the Anglo-Saxon system involving two distinct steps, i.e. bachelor degree and master’s degree, against the unified curriculum continental system.**
- **After almost 15 years, it becomes more and more clear that the Declaration, where adopted, has achieved cost reduction to the detriment of the students’ fundamental scientific knowledge, i.e. by substantially lowering the quality of graduates.**

Civil Engineering Studies Today

Moreover, in Greece:

- Basic curricula include advanced theoretical knowledge which an ordinary engineer might never need while usually ignore the necessary construction methods.
- The offered courses on management, economy, law are very few.
- The synthetic approach to projects is hardly promoted.
- The nature of academic studies is very liberal and allows fresh students to soften their efforts and fail.

The Civil Engineer of tomorrow

Market globalization provides worldwide employment opportunities for CE, when well equipped.

The CE of tomorrow must:

- fully acquire in depth the basic scientific, engineering and economic knowledge.**
- have a holistic approach to the projects, just like the CE of the past decades.**

Proposed Civil Engineering Studies Reform

Proposed lines of action:

- **Produce CE oriented both to the national and global market.**
- **Keep the five-year (and no more) unified studies.**
- **Structure them in three internal steps and provide all qualifications/awards at the end.**
- **Form a “general engineering” internal step encompassing the first three semesters (one and a half year) with no failure allowance.**
- **Transfer the students who failed the “general engineering” step to technological and other education.**

Proposed Civil Engineering Studies Reform

Proposed lines of action:

- **Provide the general civil engineering education at diploma level during the subsequent five semesters (two and a half years).**
- **Reduce the number of teaching courses substantially. No more than 25 teaching hours per week.**
- **Provide additional courses on organization, behavior and leadership, finance, law, life cycle management, maintenance and upgrading of structures, environment etc to the detriment of the traditional subjects.**
- **Provide the facilities and direct the students towards certified knowledge of foreign languages and computer programmes and applications.**

Proposed Civil Engineering Studies Reform

Proposed lines of action:

- **Ensure adequate professional training during the diploma internal step with lectures in the relevant construction techniques, case studies and failures' analyses.**

In this line, it is also proposed that the students during these five semesters are associated to a small number of projects under development, monitor their progress, be informed on the problems and solutions, study the contractual documents etc under the supervision of a group of professors.

At the end of the 8th semester the students will face an 8-hour long diploma examination.

Proposed Civil Engineering Studies Reform

Proposed lines of action:

- **Devote the last two semesters (one year) to a wealth of MSc specialization programmes taught in English in order to increase their international recognition and attract students from other countries.**
- **The student will choose his preferred specialization. Further to pass the courses, he will have to prepare an extensive specialization thesis.**
- **Many MSc should be jointly offered with internationally recognized foreign Universities, in order to increase value in the global market. The École Nationale des Ponts et Chaussées (ENPC) and the School of Civil Engineering, NTUA already provide joint studies and diploma.**

Proposed Civil Engineering Studies Reform

Proposed lines of action:

- **At the end of the 5-year studies, the successful student will be awarded both the Civil Engineering diploma and MSc.**
- **Ex-Students should also be facilitated to undertake shortly after their graduation the necessary professional exams in order to be certified in their specialization (e.g. IPMA, PMI etc certification for project managers).**

In Conclusion

- **The beginning of the 21st century signalled a sharp change to the civil engineering profession . The financial crisis led many countries into recession, which reduced infrastructure investment and increased unemployment in the sector.**
- **To cope with the drastic changes of the socio-economic environment, the civil engineering profession must adapt cleverly.**
- **Proper reform of the existing CE Studies could be the corner stone of this process.**

In Conclusion

The critical issue to discuss is the promotion of the reform.

By whom:

- **Universities ?**
- **Association of Civil Engineers ?**
- **Technical Chamber of Greece ?**
- **Ministries ?**

And How ?



*Thank you
for your attention and patience!*