

9<sup>th</sup> INTERNATIONAL CONGRESS  
ON TRANSPORTATION  
RESEARCH



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**Techno-Economical Evaluation of Accidents'  
Preventing Measures and Remedial Measures in  
Intersections on Existing Rural  
Two-Lane Highways.**

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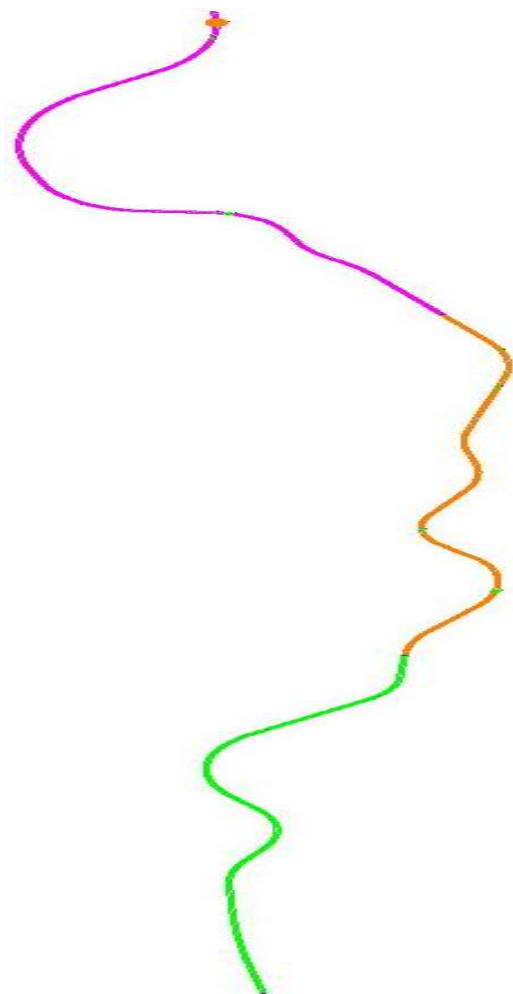
National Technical University of Athens

Department of Transportation Planning and Engineering



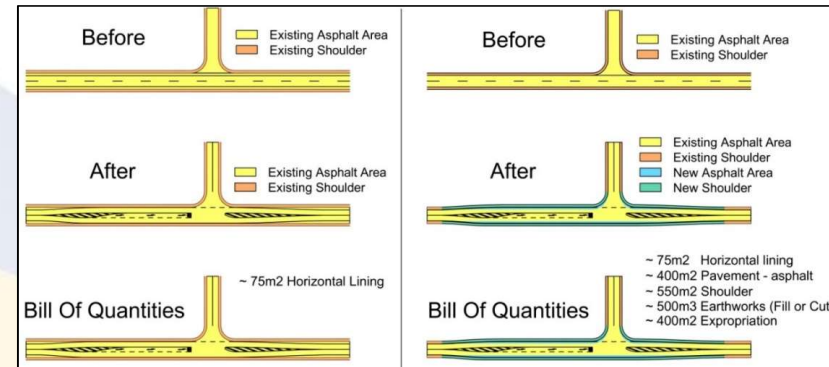
# Risk Ranking of At-Grade Intersections

- Software development that evaluates the hazard level of at-grade intersections.
- Critical Parameters
  - Required stopping sight distance and intersection sight distance
  - Required time for safe passing
  - Adequacy of right-turn and left-turn lanes
  - Existence or absence of triangular or dividing islands
  - The vertical and horizontal signage both along the major and the minor road.
  - The appropriate road lighting of the intersection
  - The operating speed  $V_{85}$  of the major road
- Score of each examined intersection.



# Financial Cost of Interventions

- Examination of the following remedial measures, regarding their impact in the provided road safety and their financial cost:
  - Placement of vertical signage
  - Construction of dividing island in the minor road
  - Construction of a separate left-turn lane
  - Construction of a separate right-turn lane
  - Changing the crossing angle between the roads at the intersection point
  - Improvement / placement of road lighting
- Design of typical drawings, in order to calculate the maximum and minimum cost of each intervention.

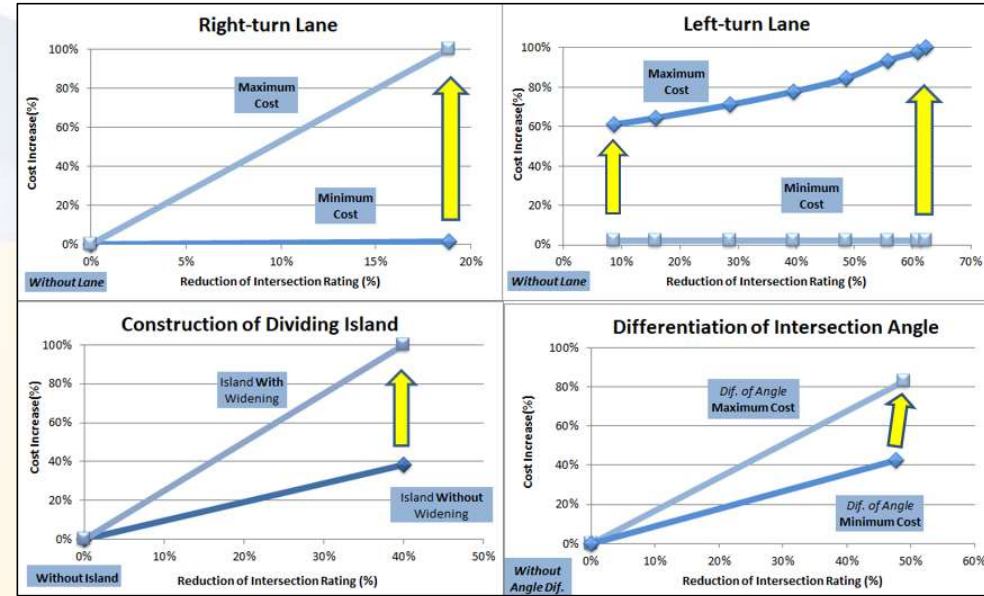


Remedial Measure		Cost (€)	
		Lowest	Highest
Construction of triangular or dividing island		2.000	5.000
Construction of left-turn lane		700	22.000
Construction of right-turn lane		150	10.000
Improvement of Intersection Angle	From 30° to 72°	15.000	
	From 30° to 90°	18.000	
	From 60° to 72°	8.000	
	From 60° to 90°	15.000	
Placement of road lighting		37.500	67.500
Placement of vertical sign posts		100	1.400



# Techno-Economical Evaluation (1/2)

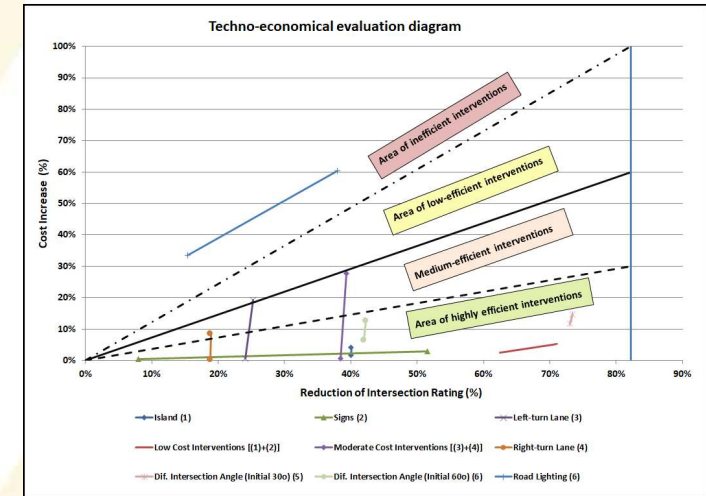
- Examination of six axis of the rural road network in Florina prefecture:
  - Total length of 50 kilometers
  - Plethora and variety of intersections
- Correlation between the score of the designed software and the financial cost of each intervention.
- Design of correlation diagrams of economic costs and road safety improvement for each intersection.



# Techno-Economical Evaluation (2/2)

- The results of each intersection were grouped in order to obtain the average of the improvement achieved by each remedial measure.
- The results were plotted in the final chart, which was divided into the following four areas:
  - Area of highly efficient interventions
  - Area of medium-efficient interventions
  - Area of low-efficient interventions and
  - Area of inefficient interventions

Remedial Measure	Cost (€)		Road Safety Improvement
	Lowest	Highest	
Construction of triangular or dividing island	2.000	5.000	40%
Construction of left-turn lane	700	22.000	9% ~ 62%
Construction of right-turn lane	150	10.000	19%
Improvement of Intersection Angle	From 30° to 72°	15.000	70% ~ 73%
	From 30° to 90°	18.000	71% ~ 75%
	From 60° to 72°	8.000	40% ~ 42%
	From 60° to 90°	15.000	40% ~ 43%
Placement of road lighting	37.500	67.500	15% ~ 38%
Placement of vertical sign posts	100	1.400	8% ~ 52%



# Conclusions

- Ranking of Interventions
  - The application of **vertical signage** as well as the construction of a **dividing island** are ranked in the area of **highly efficient interventions**.
  - The **left-turn** and / or **right-turn lane** intervention has in some cases a very positive impact, while in other cases the cost of implementation is particularly high, which makes this measure **techno-economically inefficient**.
  - Improving the **intersection angle** has a particularly high implementation cost but achieves a remarkable upgrade to the level of provided road safety. For this reason, it is ranked in the areas of **moderate** or **very efficient interventions**.
  - **Road lighting** in at-grade intersections is a measure that is particularly expensive and does not bring a significant improvement in the level of provided road safety. For this reason, the implementation of this measure is considered to be **inefficient**.
- Useful tool to help **designers** and **Project Leaders** choose the interventions that have the greatest road safety impact at the lowest possible cost while rejecting those that do not offer substantial upgrade in relation to their cost of implementation.



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