NATIONAL TECHNICAL UNIVERSITY OF ATHENS

School of Rural and Surveying Engineering

Department of Geography and Regional Planning

Urban Adaptation to Climate Change in Coastal Attica

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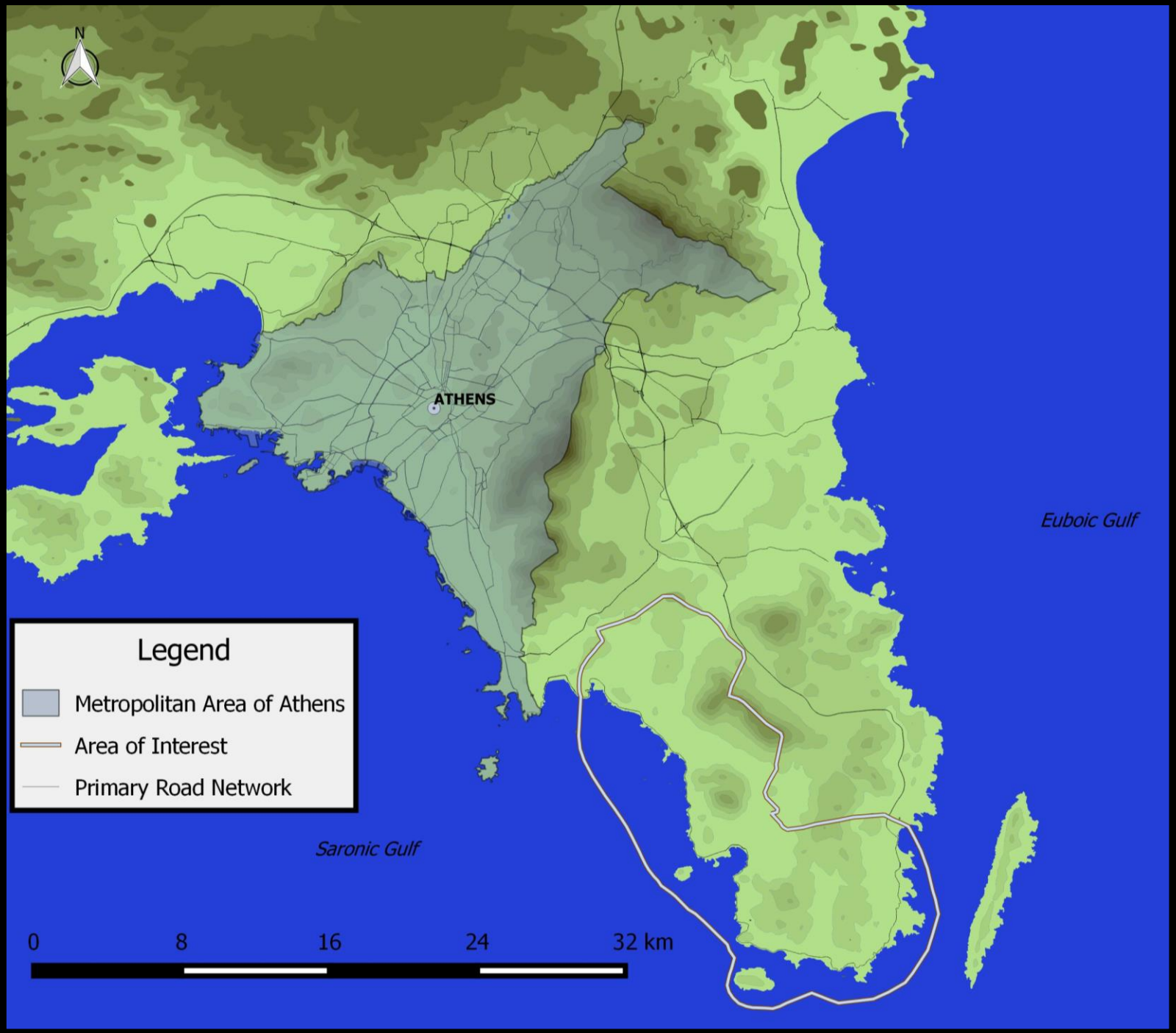
N
Florence
Athens
Scale: 1:750.000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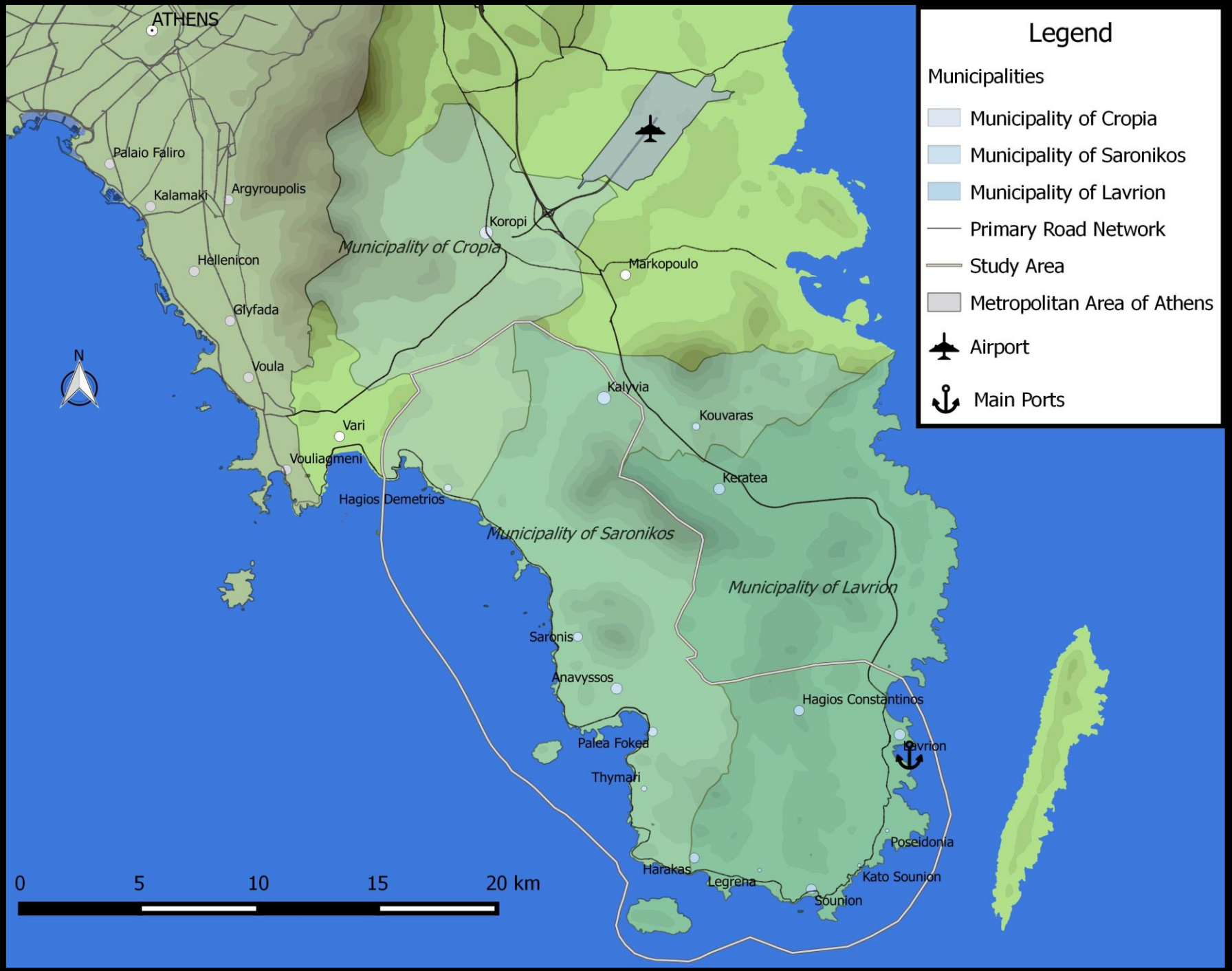
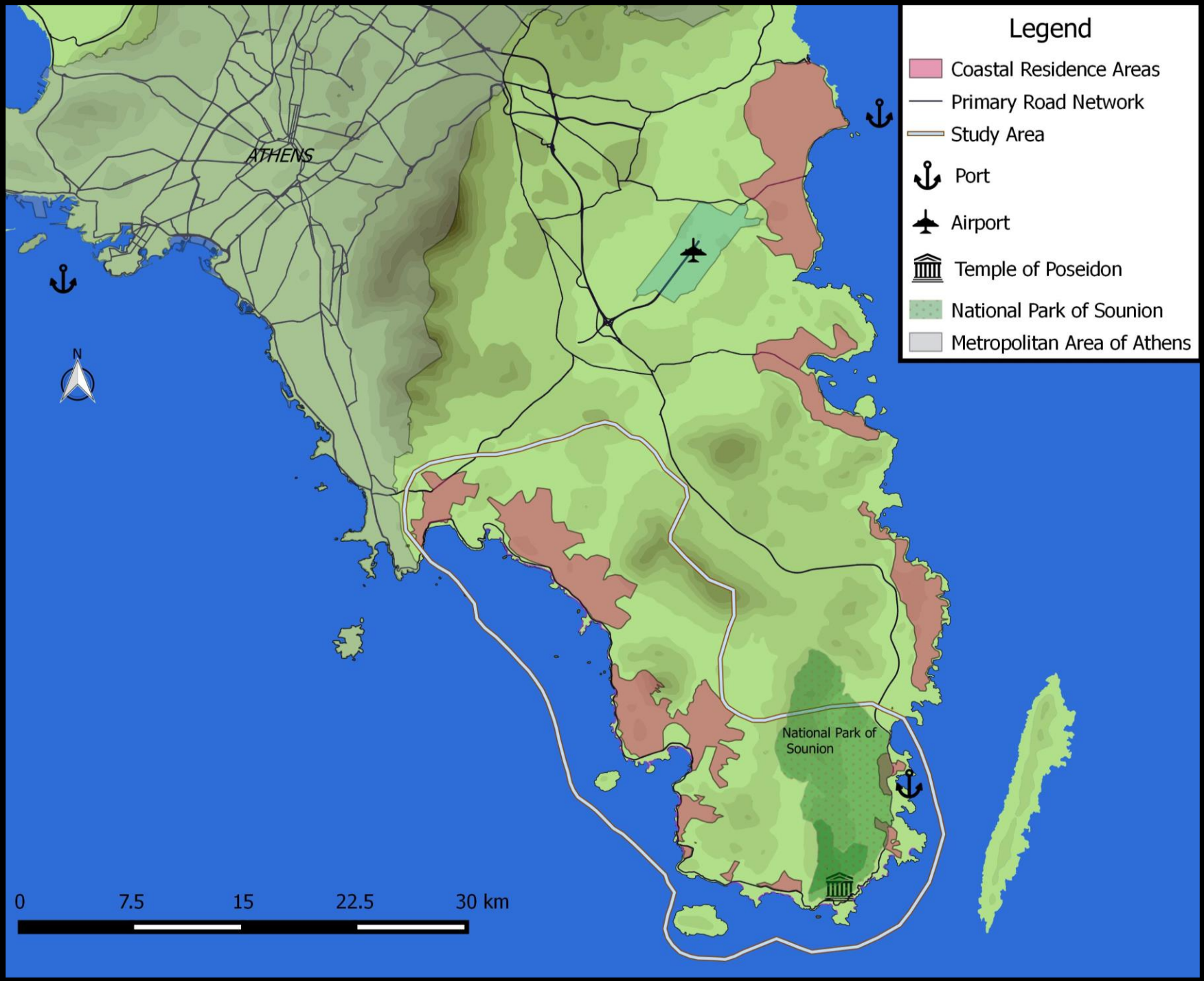
ATHENS
Euboic Gulf
Saronic Gulf
Legend
Metropolitan Area of Athens
Area of Interest
Primary Road Network
0
8
16
24
32 km


ATHENS
Palaio Faliro
Kalamaki
Argyroupolis
Hellenicon
Glyfada
Voula
Vari
Vouliagmeni
Hagios Demetrios
Koropi
Municipality of Cropia
Markopoulo
Kalyvia
Kouvaras
Keratea
Municipality of Saronikos
Municipality of Lavrion
Saronis
Anavyssos
Palea Fokea
Thymari
Hagios Constantinos
Lavrion
Poseidonia
Harakas
Legrena
Kato Sounion
Sounion
N
0
5
10
15
20 km
Legend
Municipalities
Municipality of Cropia
Municipality of Saronikos
Municipality of Lavrion
Primary Road Network
Study Area
Metropolitan Area of Athens
Airport
Main Ports

Vari
Hagios Demetrios
Keratea
N
Saronis
Anavyssos
Hagios Constantinos
Palea Fokea
Lavrion
National Park of Sounion
Thymari
Poseidonia
Harakas
Legrena
Kato Sounion
Sounion
Legend
Primary Road Network
Secondary Road Network
Sandy Coastline
Bathing Water Quality
Compliant
Not Compliant
Temple of Poseidon
National Park of Sounion
Port
0
5
10
15
20 km

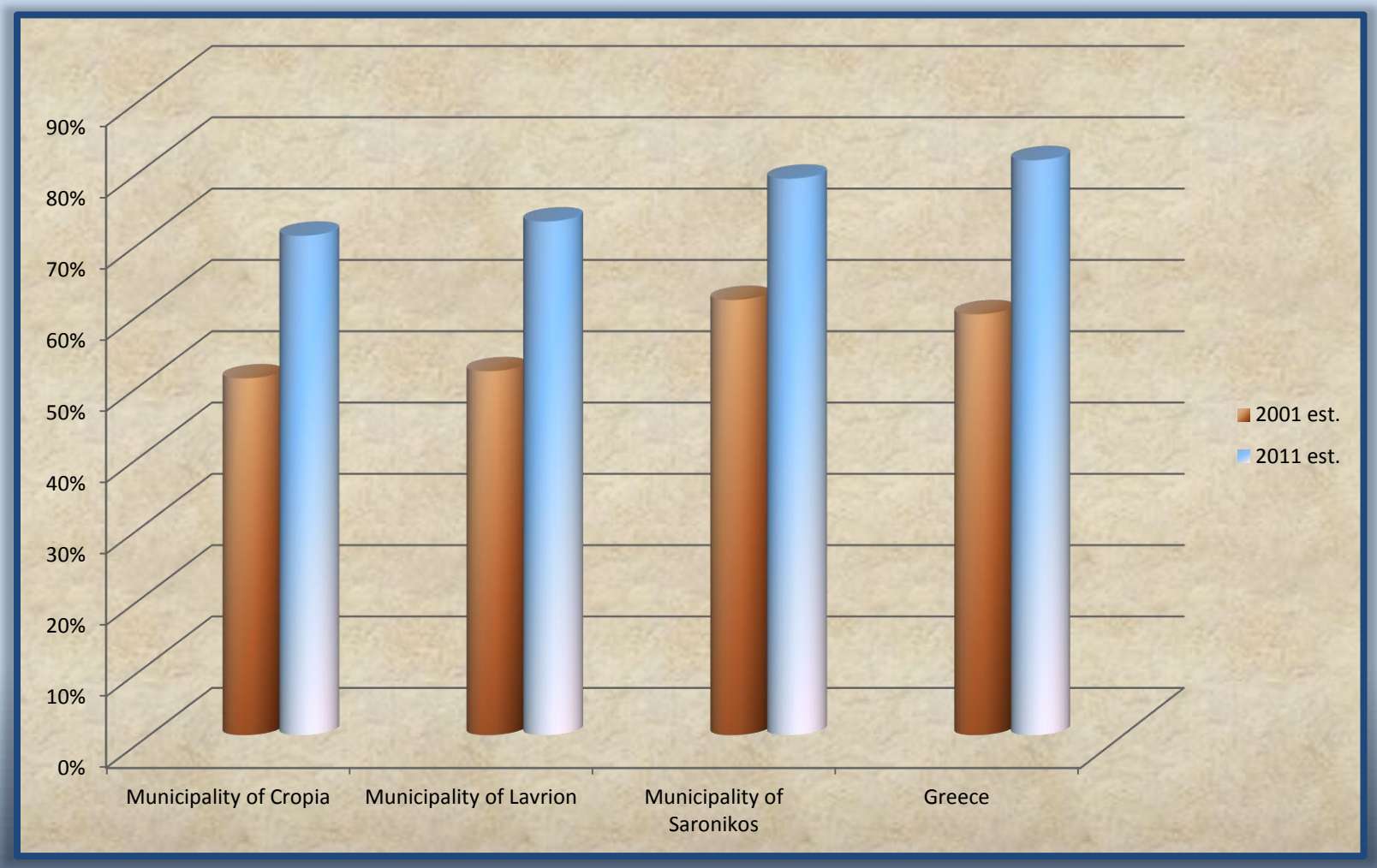
Source: atticacoast.gr/wp-content/uploads/2014/07/posi1.jpg


Legend
Coastal Residence Areas
Primary Road Network
Study Area
Port
Airport
Temple of Poseidon
National Park of Sounion
Metropolitan Area of Athens
ATHENS
National Park of Sounion
N
0
7.5
15
22.5
30 km

Additionally

- Extensive Conflagrations.
- Wide Use of Cesspits.

Tertiary Sector Employment per Municipality



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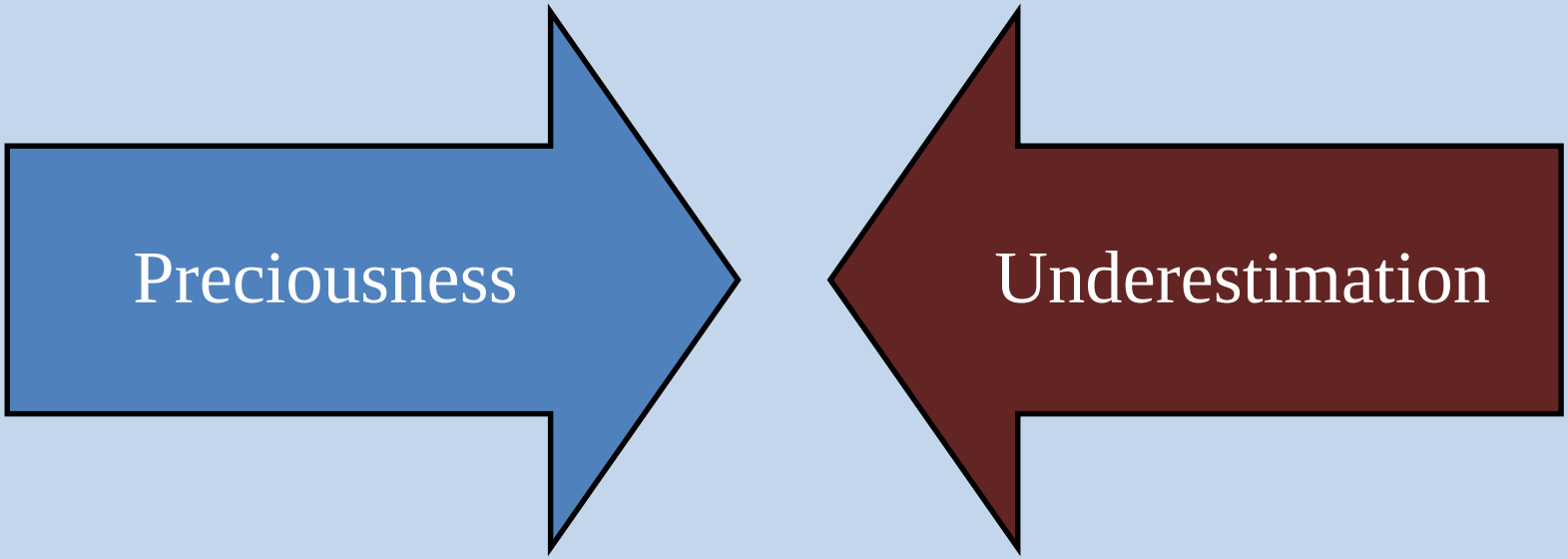
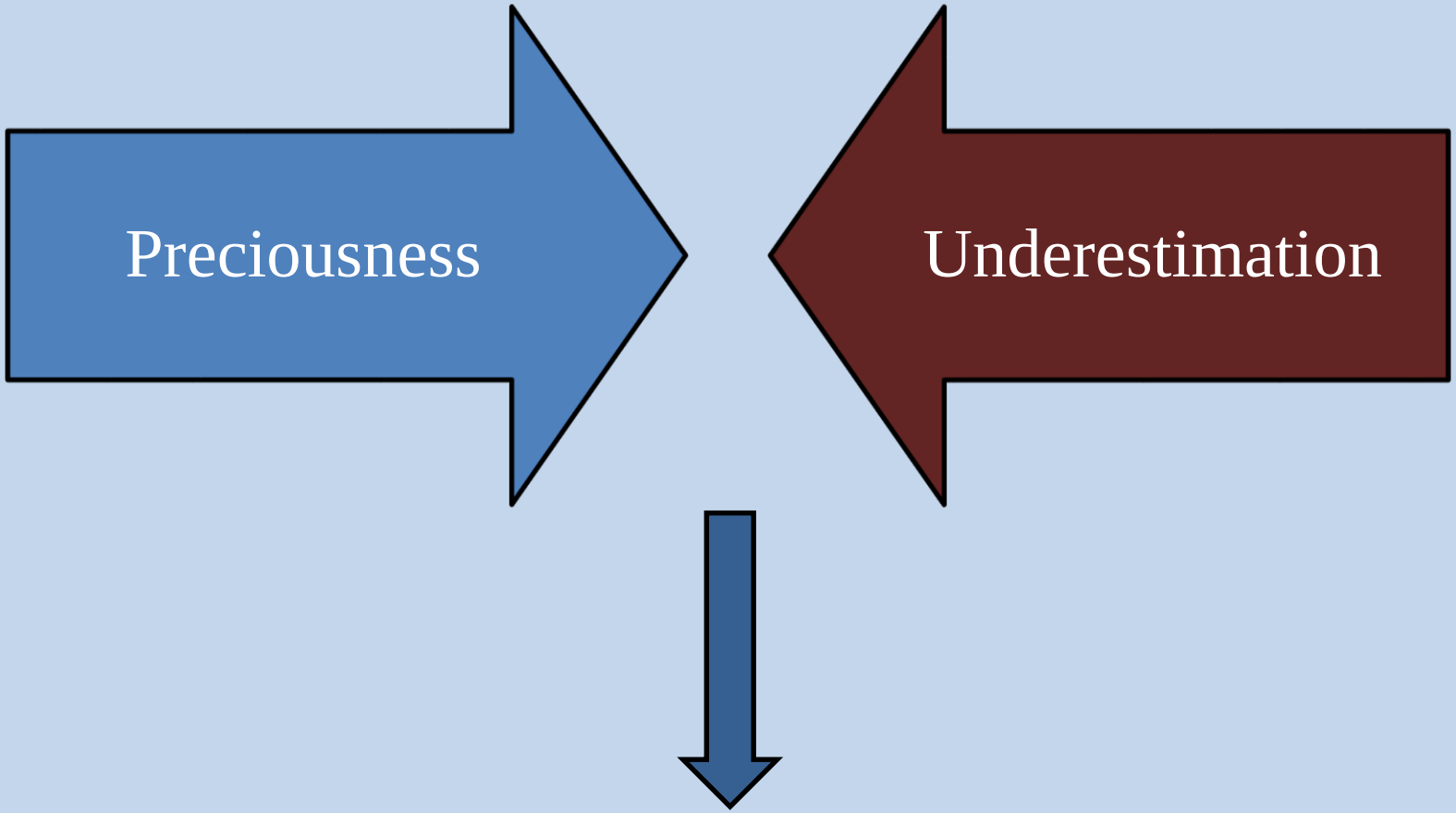

Preciousness
Underestimation



A First Step to Save Something is to Upgrade it

The Alternative Scenarios

Leopold Matrix for Scenario No 1: Promotion & Development of the Primary Production Sector

			Land Use Zones Establishment		Creation of Development Law		Agricul. Partnership		Social Infrastructure		Irrigation		Waste Management		Biolog. Agricultural Units		Biolog. Livestock Units		Low Disturbance Manufacturing Units		Export Network	
			C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.
Physical Variables	Flora		-	+	-	+	-	+	+	-		+++	+	+++	+	+++	+	++	+	+	-	-
	Fauna		-	+	-	+	-	+	+	-	+	++	+	+++	+	++	+	++	+	+	-	-
	Ground	Coasts	-	-	-	-	-	+	++	+	-	-	-	+++	-	-	-	-	-	-	-	-
		Terrestrial Soil	-	++	-	+	-	-	+	+	+	+++	+	+++	+	+++	+	++	+	++	-	-
	Landscape		-	+	-	+	-	-	+	++	+	-	+	+++	+	-	+	-	+	+	-	-
	Water Recources	Sea Water	-	-	-	-	-	-	-	-	-	-	-	+++	-	-	-	-	-	-	-	-
		Land Water	-	+	-	+	-	+	+	+	-	+++	+	+++	+	++	+	-	+	-	-	-
	Atmospheric Environment		-	+	-	+	-	-	+	++	+	-	+	+++	-	+++	-	+++	++	++	-	-
		Noise	-	-	-	-	-	-	+	-	+	-	+	-	-	-	-	-	+	++	-	-
	Protected Areas		-	-	-	-	-	-	-	-	-	-	-	+++	-	-	-	-	-	-	-	-
Anthropogenic	Enjoyment	Primary Sector	-	+++	-	++	+	+++	-	++	+	+++	-	+	-	+++	-	+++	+	+++	+	+++
		Secondary Sector	-	++	-	++	+	+++	+	++	+	++	-	++	-	+++	-	+++	+	+++	+	+++
		Tertiary Sector	-	++	-	++	-	+	+	++	+	-	-	++	-	++	-	+++	+	++	+	+++
	Public Health		-	-	-	-	-	-	+	+++	+	-	+	+++	-	+	-	++	+	+++	-	-
	Cultural Environment		-	+	-	+	+	+	-	+	+	-	+	++	-	-	-	+	+	+	+	++

Legend						Importance	
Very Positive			Very Negative			Small	+
Positive			Negative			Medium	++
Slightly Positive			Slightly Negative			Large	+++

Leopold Matrix for Scenario No 2: Formula 1 Circuit & Infrastructure Support

			F1 Circuit		Road Widening		Coastal Recast		Hotel Units Found.		Marinas	
			C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.
Physical Variables	Flora		+++	+	++	-	++	++	+++	+		-
	Fauna		+	-	-	-	+	-	-	-	+++	++
	Ground	Coasts	-	-	-	-	+++	+++	+++	++	+++	-
		Terrestrial Soil	+++	+	+++	++	+++	-	+++	-	++	-
	Landscape		+	+	++	++	++	++	+++	+++	+	++
	Water Recources	Sea Water	-	-	+	-	+++	-	++	-	+++	+++
		Land Water	+	-	-	-	-	-	+	-	-	-
	Atmospheric Environment		++	+	++	++	++	+	++	-	++	+
		Noise	+	+	+	+	++	+	++	+	++	++
	Protected Areas		+++	+++	-	-	-	-	-	-	-	-
Anthropogenic	Economy	Primary Sector	+++	+++	++	-	-		+++	++	-	-
		Secondary Sector	+++	-	+++	-	+++	-	+++	-	+++	-
		Tertiary Sector	+	+++	++	++	+	+++	-	+++	+	+++
		New Jobs	+++	+++	++	-	++	++	+++	+++	+++	+++
	Public Health		-	++	-		-	++	-		-	-
	Cultural Environment		-	-	+	-	-	+	-	-	-	+

Legend						Importance	
Very Positive			Very Negative			Small	+
Positive			Negative			Medium	++

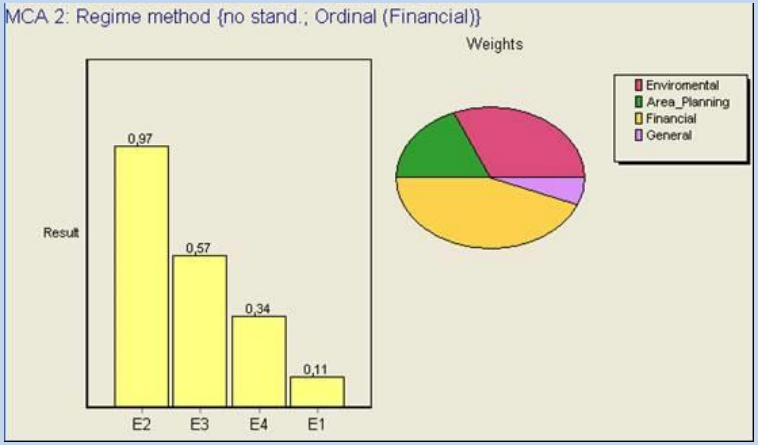
Leopold Matrix for Scenario No 3: Sustainable Development of the Touristic and Primary Sector of the Economy

			Association Foundation		Coastal Tourism		Recreat. Trails		Cycle Lane		Sea Bus Route		Old Fokaia Recast		Agricul. Partnership		Maritime Tourism		Poseidon's Temple		Sewer Connection	
			C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.	C.P.	F.P.
Physical Variables	Flora		+	-	-	-	++	++	++	-	-	-	-	++	-	++	-	-	+	-	++	-
	Fauna		-	-	-	++	++	+	-	-	-	+	-	-	-	+	-	++	-	-	+	-
	Ground	Coasts	-	-	-	++	-	-	-	-	++	++	++	++	-	-	++	+++	-	-	-	+++
		Terrestrial Soil	+	-	-	-	++	-	+++	-	-	-	-	-	-	+	-	-	+	-	+++	++
	Landscape		-	++	-	-	-	+++	++	+++	++	++	++	+++	-	++	-	-	-	+++	++	-
	Water Recources	Sea Water	-	-	-	++	-	-	-	-	+++	++	-	-	-	-	-	-	-	-	-	+++
		Land Water	-	-	-	-	++	-	-	-	-	-	-	-	-	++	-	-	-	-	-	+++
	Atmospheric Environment		+	-	-	+	+	+	++	+++	++	++	++	-	-	-	-	-	-	-	+++	+++
	Protected Areas		-	-	-	-	++	++	-	-	++	++	-	-	-	-	-	-	-	-	-	-
Anthropogenic	Economy	Primary Sector	-	-	-	-	-	-	-	-	-	-	-	-	-	+++	-	-	-	-	-	-
		Secondary Sector	+	-	-	-	+	-	++	-	++	-	++	-	-	++	-	-	+	-	+++	-
		Tertiary Sector	-	+++	-	+++	-	+++	-	+++	-	+++	-	+++	-	+	-	+++	-	+++	++	+++
		New Jobs	-	++	-	-	-	-	++	-	++	++	++	+++	-	+++	-	++	-	++	+++	++
	Public Health		-	-	-	-	-	-	++	+++	++	-	++	-	-	+++	-	-	-	-	++	+++
	Cultural Environment		-	+++	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+++	-	-

Legend						Importance	
Very Positive			Very Negative			Small	+
Positive			Negative			Medium	++
Slightly Positive			Slightly Negative			Large	+++

Regime Method (Priority to Environmental Criteria)

=		C/B	Unit	Standardization method	Minimum Range	Maximum Range	Weight level 1	Weight level 2
-	**Enviromental**						2	
	Landscape_effect		---/+++	no stand.	-	++		2
	Ground_effect		---/+++	no stand.	---	-		3
	Water_environment_effect		---/+++	no stand.	---	-		1
	Atmospheric_environment_effect		---/+++	no stand.	--	++		2
	flora_effect		---/+++	no stand.	-	+		3
	fauna_effect		---/+++	no stand.	--	+		3
-	**Area_Planning**						3	
	Accessibility_to_points_of_interest		---/+++	no stand.	-	+++		3
	Protected_areas_promotion		---/+++	no stand.	--	+++		4
	Archaeological_areas_promotion		---/+++	no stand.	-	+++		4
	Total_area_of_interference	+	Acres	no stand.	0	10		1
	Cohesion		---/+++	no stand.	---	+++		2
-	**Financial**						1	
	Financial_cost_of_interference	-	euro	no stand.	-3	0		1
	Financial_income	+		no stand.	0	10		1
	Added_land_value		---/+++	no stand.	--	+++		2
	Private_investment	+	binary	no stand.	no	no		3
-	**General**						4	
	Biotic_level_upgrade		---/+++	no stand.	--	+++		1
	Cultural_environment_effect		---/+++	no stand.	--	+++		2
	prospects_of_employment_development		---/+++	no stand.	---	+++		2

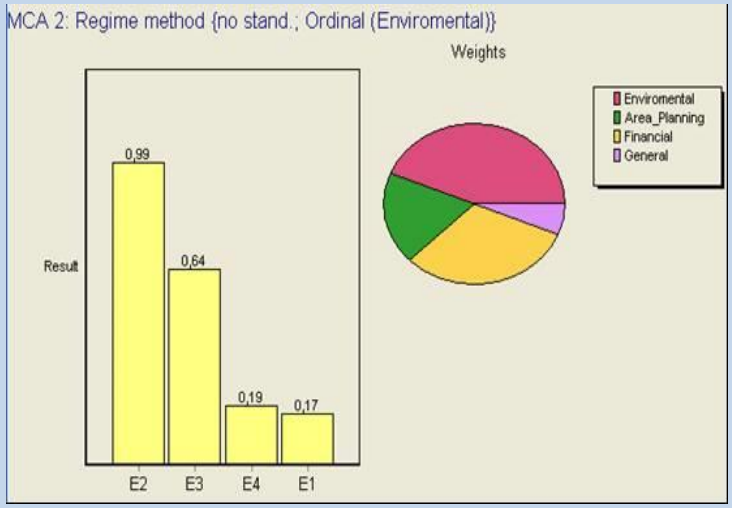


Ranking:

1	Financial
2	Enviromental
3	Area_Planning
4	General

Regime Method (Priority to Financial Criteria)

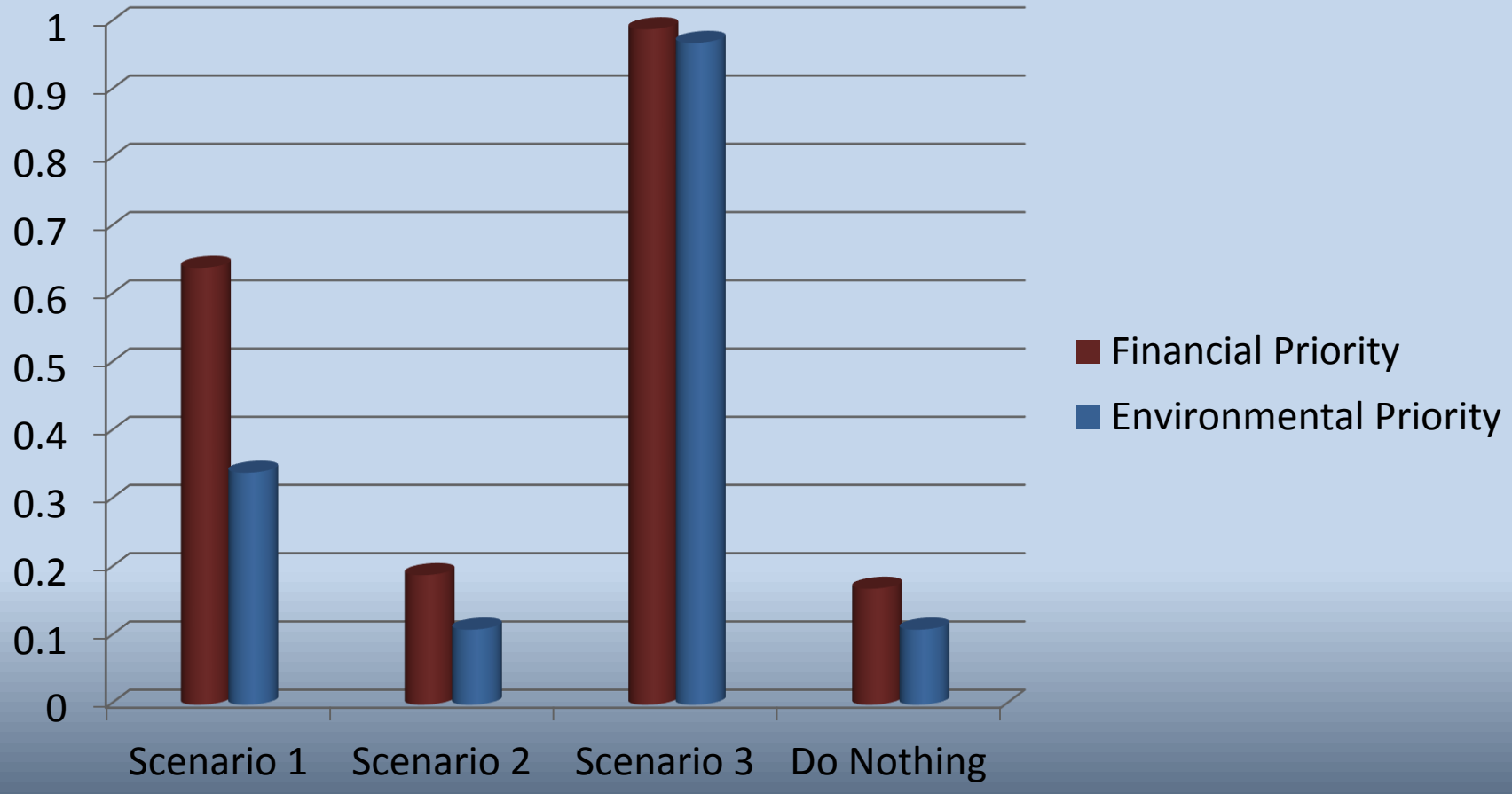
		C/B	Unit	Standardization method	Minimum Range	Maximum Range	Weight level 1	Weight level 2
−	**Enviromental**						1	
	Landscape_effect		---/+++	no stand.	-	++		2
	Ground_effect		---/+++	no stand.	---	-		3
	Water_environment_effect		---/+++	no stand.	---	-		1
	Atmospheric_environment_effect		---/+++	no stand.	--	++		2
	flora_effect		---/+++	no stand.	-	+		3
	fauna_effect		---/+++	no stand.	--	+		3
−	**Area_Planning**						3	
	Accessibility_to_points_of_interest		---/+++	no stand.	-	+++		3
	Protected_areas_promotion		---/+++	no stand.	--	+++		4
	Archaeological_areas_promotion		---/+++	no stand.	-	+++		4
	Total_area_of_interference	+	Acres	no stand.	0	10		1
	Cohesion		---/+++	no stand.	---	+++		2
−	**Financial**						2	
	Financial_cost_of_interference	−	euro	no stand.	-3	0		1
	Financial_income	+		no stand.	0	10		1
	Added_land_value		---/+++	no stand.	--	+++		2
	Private_investment	+	binary	no stand.	no	no		3
−	**General**						4	
	Biotic_level_upgrade		---/+++	no stand.	--	+++		1
	Cultural_environment_effect		---/+++	no stand.	--	+++		2
	prospects_of_employment_development		---/+++	no stand.	---	+++		2



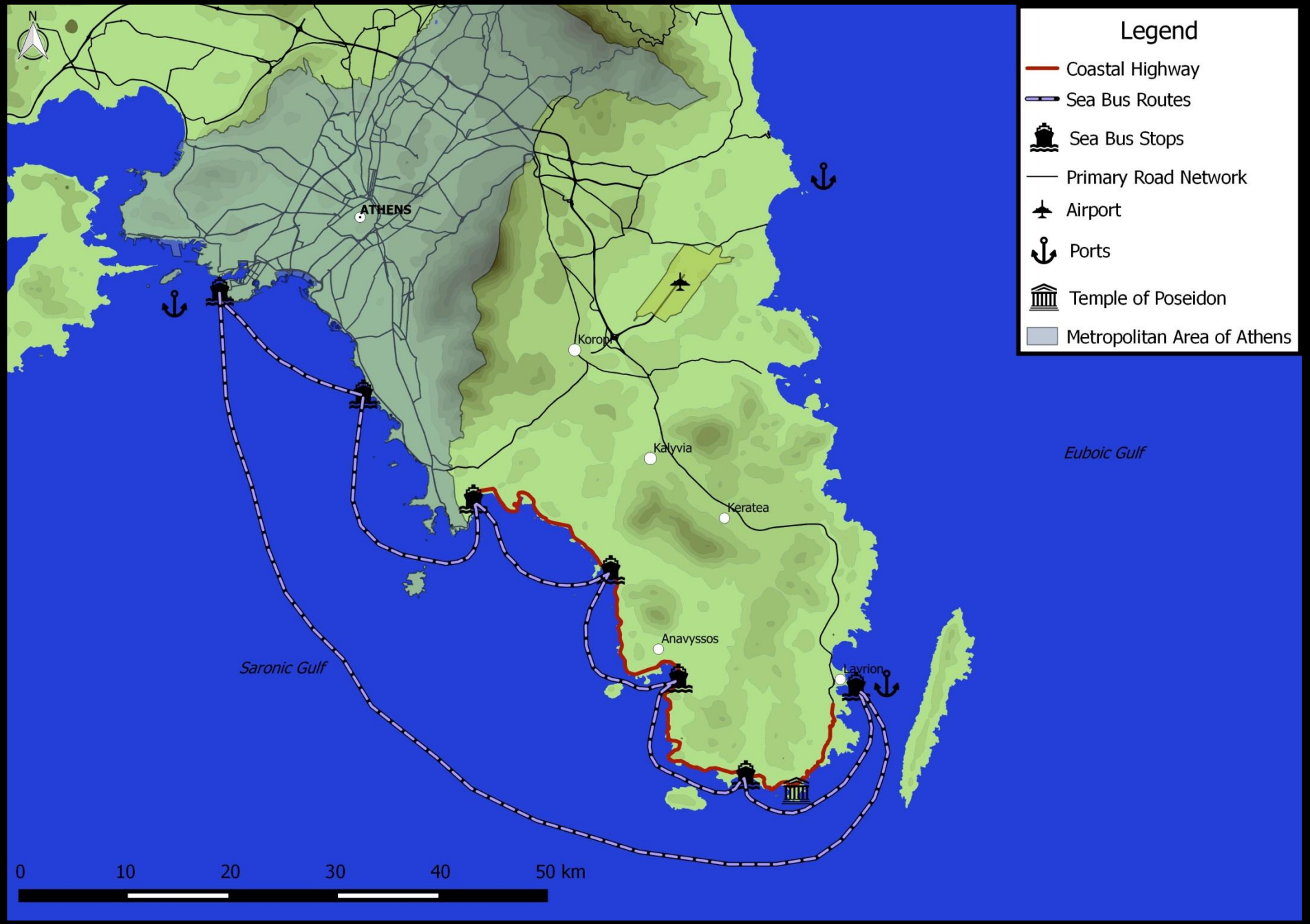
Ranking:

1	Enviromental
2	Financial
3	Area_Planning
4	General

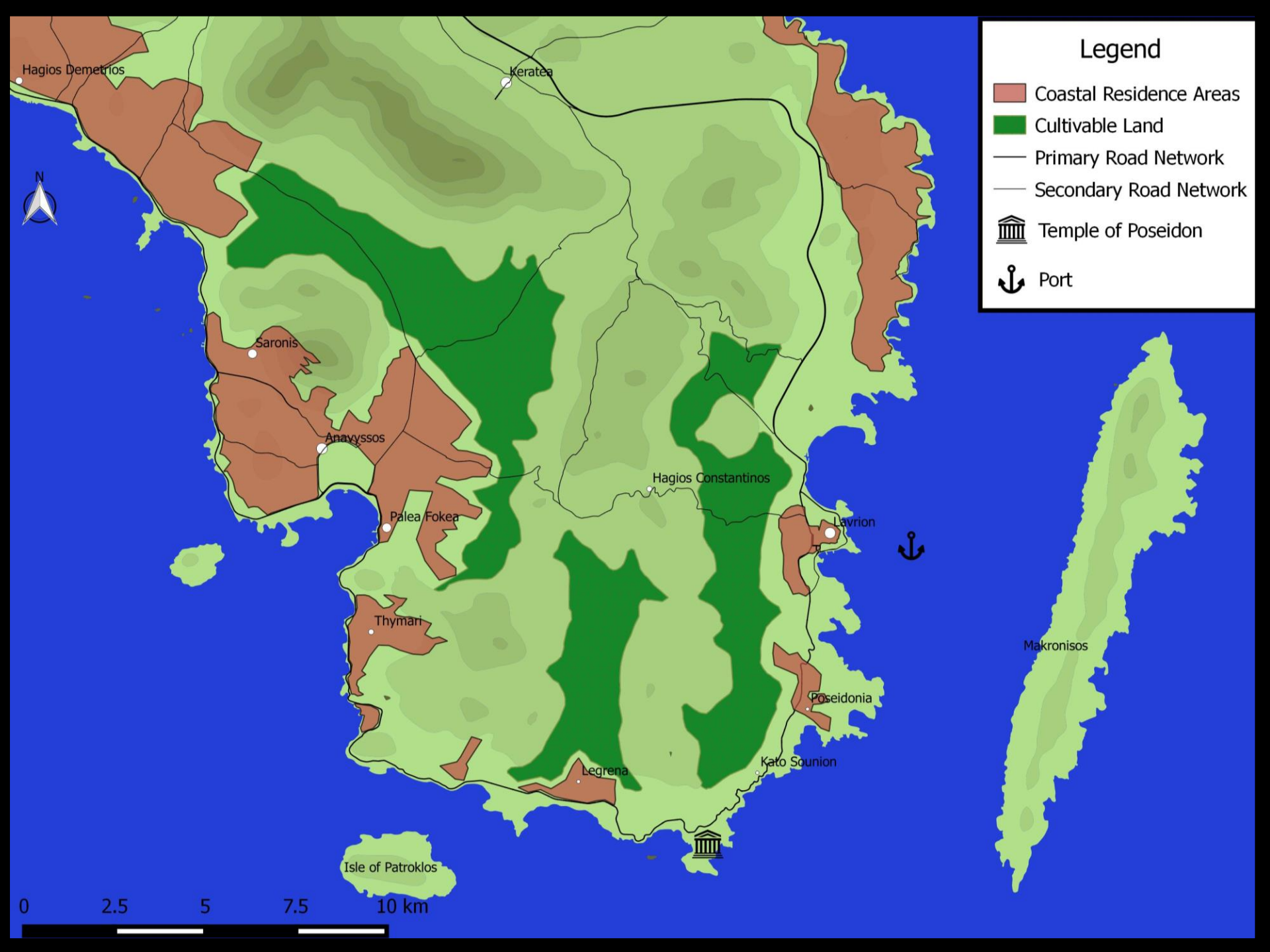
Results


1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Scenario 1
Scenario 2
Scenario 3
Do Nothing
Financial Priority
Environmental Priority

Legend
Diving Interest Points
Cycling Routes
Recreational Trails
Primary Road Network
Secondary Road Network
Temple of Poseidon
Ports
N
Saronis
Anavyssos
Palea Fokea
Thymari
Hagios Constantinos
Lavrion
Makronisos
Poseidonia
Kato Sounion
Legrena
Isle of Patroklos
0
2
4
6
8 km


N
ATHENS
Koropi
Kalyvia
Keratea
Anavyssos
Lavrion
Saronic Gulf
Euboic Gulf
Legend
Coastal Highway
Sea Bus Routes
Sea Bus Stops
Primary Road Network
Airport
Ports
Temple of Poseidon
Metropolitan Area of Athens
0
10
20
30
40
50 km

Legend
Sandy Coastline
Touristic Congestion
Primary Road Network
Port
Temple of Poseidon
N
Hagios Demetrios
Keratea
Saronis
Anavyssos
Hagios Constantinos
Palea Fokea
Lavrion
Thymari
Makronisos
Poseidonia
Harakas
Legrena
Kato Sounion
Sounion
Isle of Patroklos
0
5
10
15
20 km


Legend
Coastal Residence Areas
Cultivable Land
Primary Road Network
Secondary Road Network
Temple of Poseidon
Port
N
Hagios Demetrios
Keratea
Saronis
Anavyssos
Palea Fokea
Hagios Constantinos
Lavrion
Thymari
Makronisos
Poseidonia
Legrena
Kato Sounion
Isle of Patroklos
0
2.5
5
7.5
10 km

Port of Old Fokea

Port of Old Fokea

Tourism Management Association

Suggested Actions

- Visitor's Center
- Information Kiosks.
  - Trails - paths, Excursions, Accommodation, Attractions, Maps, Cycle routes etc.
- Scheduling Educational Visits and Tours.
  - National Park of Sounion, Temple of Poseidon.
- Environmental Education Programs For:
  - Pupils, Students, Visitors.
- Promoting Volunteering
  - Tree Planting Maintenance, Garbage collection, Designing Promotion Forms, Participation in Polythematic Events.

Conclusion

- The plan’s axes agree with those given by the Greek and European Legislation.
- Additional Studies have to be created for the feasibility of the plan.
- Opens a chance to redefine elements of the structure of a Coastal Metropolis in the temperate zone of the planet.

Thank you for your Attention

Gerasimos Balatsinos

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