ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA) FOR PRINOS OFFSHORE DEVELOPMENT PROJECT

Chapter 8 Environmental and Social Baseline

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ABBREVIATIONS

AARC	Average annual rate of change
ACCOBAMS	Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic
AVHRR	Advanced Very High Resolution Radiometer
BSW	Black Sea waters
CFS	Climate Forecast System
CMD	Common Ministerial Decision
CMS	Conservation of Migratory Species
CWB	Coastal Water Bodies
DC	Coastal Detritic
EC	European Commission
EIA	Environmental Impact Assessment
EKAB	National Centre for Immediate Response
ELSTAT	Hellenic Statistical Authority
ENERGEAN	Energean Oil & Gas S.A.
ESIA	Environmental & Social Impact Assessment
EU	European Union
FIREI	Fisheries Research Institutes
GDP	Gross Domestic Product
GG	Government Gazette
GSA	Geographical Sub Area
HEDNO SA	Hellenic Electricity Distribution Network Operator SA
HOS	Hellenic Ornithological Society
HVC	High Voltage Center
IBA	Important Bird Areas
IUCN	International Union for Conservation of Nature
JMD	Joint Ministerial Decision
LONB	Landscapes of Outstanding Natural Beauty

MD	Ministerial Decision
MMO	Marine Mammal Observers
MPA	Marine Protected Area
MS	Meteorological Station
MSFD	Marine Strategy Framework Directive
NCEP	National Centres for Environmental Prediction
NGO	Non – Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
PAH	Polycyclic Aromatic Hydrocarbons
PAM	Passive Acoustic Monitoring
PD	Presidential Decree
RBMP	River Basin Management Plan
RD	Royal Decree
REMTH	Region of Eastern Macedonia & Thrace
RFPPSD	Regional Framework of Physical Planning and Sustainable Development
RINT	Rescue and Information Network
RU	Regional Unit
SAC	Special Areas of Conservation
SCI	Sites of Community Importance
SPA	Special Protection Areas
SpEA	Special Ecological Assessment
SST	Sea Surface Temperature
TL	Transmission Lines
WCMC	World Conservation Monitoring Centre
WR	Wildlife Refuges
YPEN	Ministry of Environment and Energy

8 CURRENT STATE OF THE ENVIRONMENT

The current environmental and social conditions in the Project area set the benchmark against which environmental and social impacts are considered. The collection of baseline environmental and social primary and secondary data is an important task The data collections was based mainly on secondary data (literature, past studies, research outcomes) although a number of field studies were conducted to support the assessment of the current environment (marine ecology, sampling and analysis, analytical surveys in the area of Natura 2000 to cover coastal, marine and avifauna environments).

Prior to the collection of the baseline data, receptor specific study areas were defined. Establishing the coverage of the primary study area is based mainly upon the following factors: physical attributes of the project site, physical and biological characteristics, the nature of receptors and their sensitivity, prevailing meteorological conditions and the area of potential impact. It is requirement of applicable Greek legislation (JMD170225/2014 on the environmental permitting contents) that the primary study area should be at least 1km around the project. For completeness reasons, a wider study area is also described according to desk-based information. The coverage of the primary and wider study area for each environmental and social parameter is summarised below

Table 8-1: Primary and wider study area definition for environmental and social parameters

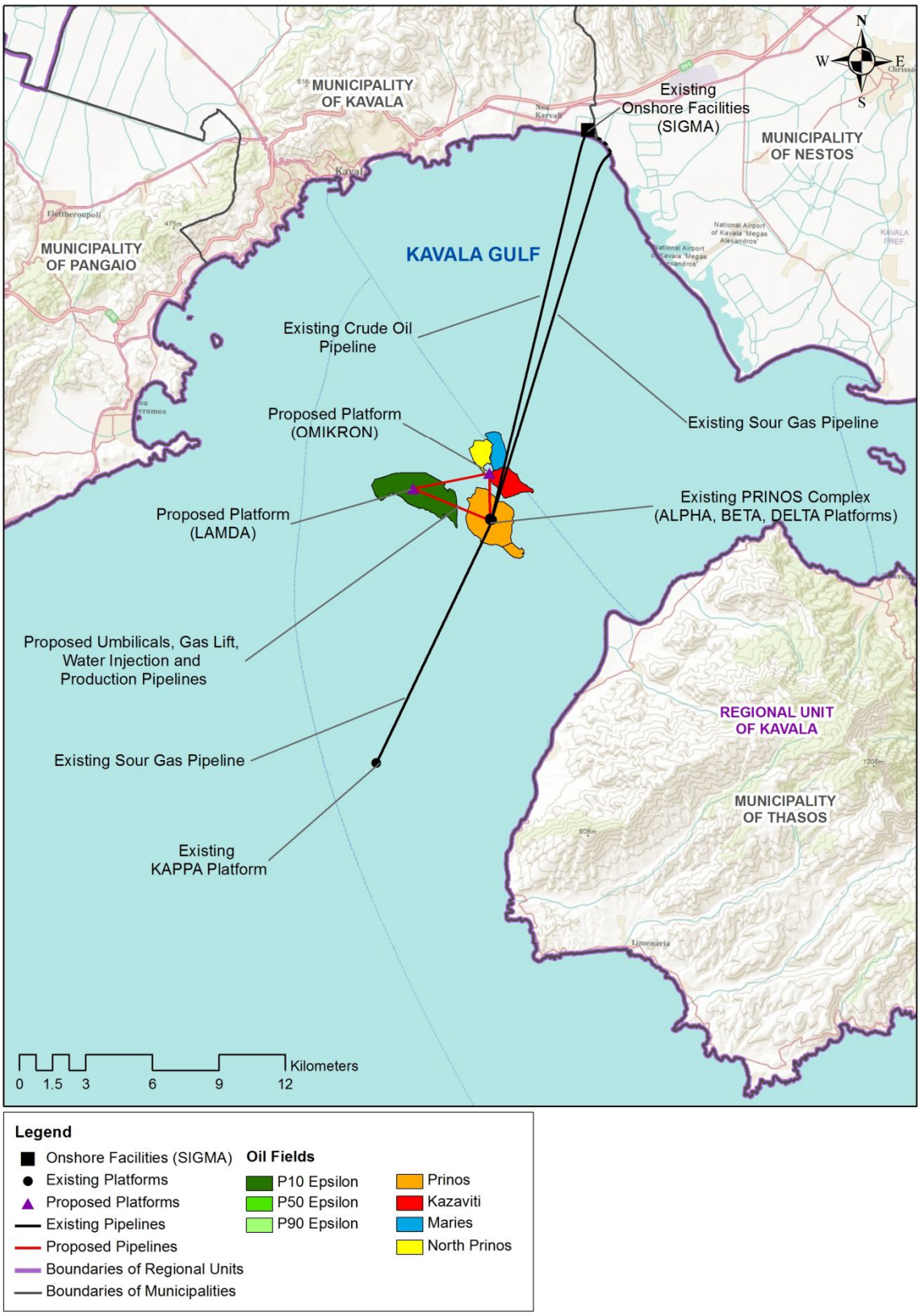
Environmental Parameter	Wider study area	Primary study area
Climate and Bioclimatic characteristics	Coastal Zone of onshore facilities, Kavala Gulf	Existing platforms (Prinos complex and Kappa) and proposed platforms (Lamda and Omicron) locations
Morphological and Topological characteristics	Coastal Zone of onshore facilities, Kavala Gulf	Approximately 1 km around the existing and proposed platforms (Omicron is not included)
Geological and Tectonic characteristics	Coastal Zone of onshore facilities, Kavala Gulf	Approximately 1.5 km around the existing platforms and proposed platforms
Seawater environment	Kavala Gulf	Approximately 1.5 km around the existing platforms and proposed platforms
Air environment	Coastal area of onshore facilities and Kavala Gulf	Onshore facilities and Existing platforms locations
Acoustic environment	Coastal area of onshore facilities and Kavala Gulf	Existing platforms locations
Biotic environment	Thracian Sea and Kavala Gulf	Approximately 1.5 km around the existing platforms (Prinos complex and Kappa) and proposed platforms (Lamda and Omicron)
Manmade environment	RU of Kavala	Municipalities of Kavala and Thassos
Socioeconomic environment	RU of Kavala	Municipalities of Kavala and Thassos

Environmental Parameter	Wider study area	Primary study area
Technical infrastructures	RU of Kavala	Municipalities of Kavala and Thassos
Existing pressures on the human and natural environment	Coastal Zone and Kavala Gulf	Coastal Zone and Kavala Gulf

It should be noted as part of the current operations, there is a prohibition area of 500 m radius over the pipeline routes and the platforms. Additional exclusion zones will be agreed as part of the new project. Therefore, before the construction of the project, a Navigation exclusion zone will be defined in collaboration with the Naval Authorities (Port Authority and the Coast Guard under the supervision of the relevant Ministries).

A current prohibition area of 39.71 km^2. With the addition of planned and potential further developments this is expected (conditional to the naval authorities' decisions) to reach a total area of 46.34 km^2.

Map 8-1: Orientation map (red circle: project area)



Map 8-2: Project area

8.1 CLIMATE AND BIOCLIMATE CHARACTERISTICS

8.1.1 Climate characteristics

At the Kavala Prefecture level, the climate characteristic of the coastal zone is classified as Mediterranean, with warm, dry summers (circulation of subtropical and warm-dry air), cold and wet winters (circulation of relatively cool air from the temperate zone) with rainfall of approximately 300-400 millimetres. The respective continental part of the prefecture tends to be different, showing a respective continental climate, characterized from cool wet winters, dry summers and rainfall of approximately double values than that of coastal zone.

8.1.2 Meteorological and metocean data

Meteorological and metocean data has been acquired from a number of sources utilizing reputable organisations both within and outside Greece, which have gathered statistical data over a period up to 50 years. The main source of metocean data specifically modelled at the existing and new platform locations has been provided by BMT ARGROSS who have used global computer simulation data based on the Climate Forecast System (CFS). CFS is a model representing the global interaction between Earth's oceans, land, and atmosphere. Produced by several dozen scientists under guidance from the NOAA's National Centres for Environmental Prediction (NCEP), the model offers hourly data with a horizontal resolution down to one-half of a degree (approximately 56 km) around Earth for many variables. CFS uses the latest scientific approaches for taking in, or assimilating, observations from data sources including surface observations, upper air balloon observations, aircraft observations, and satellite observations. To complement the CFS global data, data from local weather stations in the Kavala area (Thassos Island, Kavala Airport) and national weather stations have been used to calibrate and benchmark the computer data simulations.

8.1.2.1 Meteorological data

8.1.2.1.1 Temperatures

The data presented in the tables and diagrams in this section summarize the average monthly temperature range over a 52-year period. January is the coldest month, with an average minimum temperature of 1.7°C and average monthly temperature of 5.6°C, while the warmest month is July, with an average maximum temperature of 30.5°C and average monthly temperature of 26°C. In absolute values, for the same period, the maximum recorded temperature is 39°C during July and -8°C during January.

Although the colder months are during the winter (December, January and February), it is noted that the minimum temperature can drop below zero in March and April, due to oncoming cold winds.

The annual fluctuation of the monthly absolute Maximum and Minimum Temperatures are presented in the diagram below:

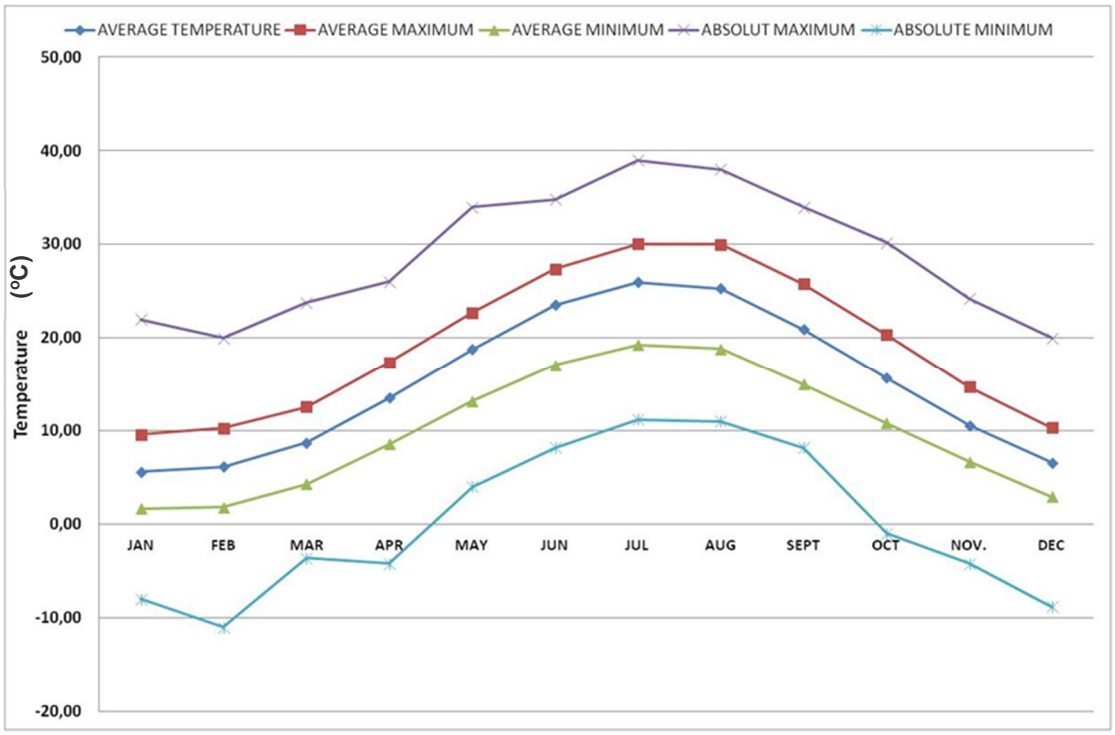


Diagram 8-1: Annual development of the Monthly Mean Maximum, Mean and Mean Minimum Temperature (°C), (*Source: Hellenic National Meteorological Service HNMS)*

Table 8-2: Temperature data of Meteorological Station of Chryssoupolis Kavala for the period 1958-2010

Month	Average Monthly Temperature (°C)	Maximum Monthly Temperature (°C)	Minimum Monthly Temperature (°C)	Absolute Max Temperature (°C)	Absolute Min Temperature (°C)
January	5.6	9.7	1.7	22.0	-8.0
February	6.2	10.3	1.8	20.0	-11.0
March	8.7	12.6	4.3	23.8	-3.6
April	13.5	17.4	8.6	26.0	-4.2
May	18.8	22.7	13.2	34.0	4.0
June	23.6	27.4	17.1	34.8	8.2
July	26.0	30.1	19.3	39.0	11.2
August	25.30	30.02	18.84	38.0	11.0
September	21.0	25.8	15.0	34.0	8.2
October	15.7	20.3	10.8	30.2	-1.0
November	10.6	14.7	6.7	24.2	-4.2
December	6.6	10.3	3.0	20.0	-8.8

Month	Average Monthly Temperature (°C)	Maximum Monthly Temperature (°C)	Minimum Monthly Temperature (°C)	Absolute Max Temperature (°C)	Absolute Min Temperature (°C)
Annual	15.1	19.3	10.0	39.0	-11.0

Source: Hellenic National Meteorological Service HNMS

8.1.2.1.2 Precipitation

The total annual precipitation of the MS of Chryssoupolis is 429.72 mm while the average days of rainfall is 91.1 per year. August is the driest month with 13.86 mm in 5.5 days of rainfall while the wettest month of all is December with 76.05 mm in average 9.3 days of rainfall. More detailed data for the precipitation in the project area are depicted in the table below (Table 8-3). In (Diagram 8-2) below are shown the data of average height of precipitation per month for the period of 1958-2010.

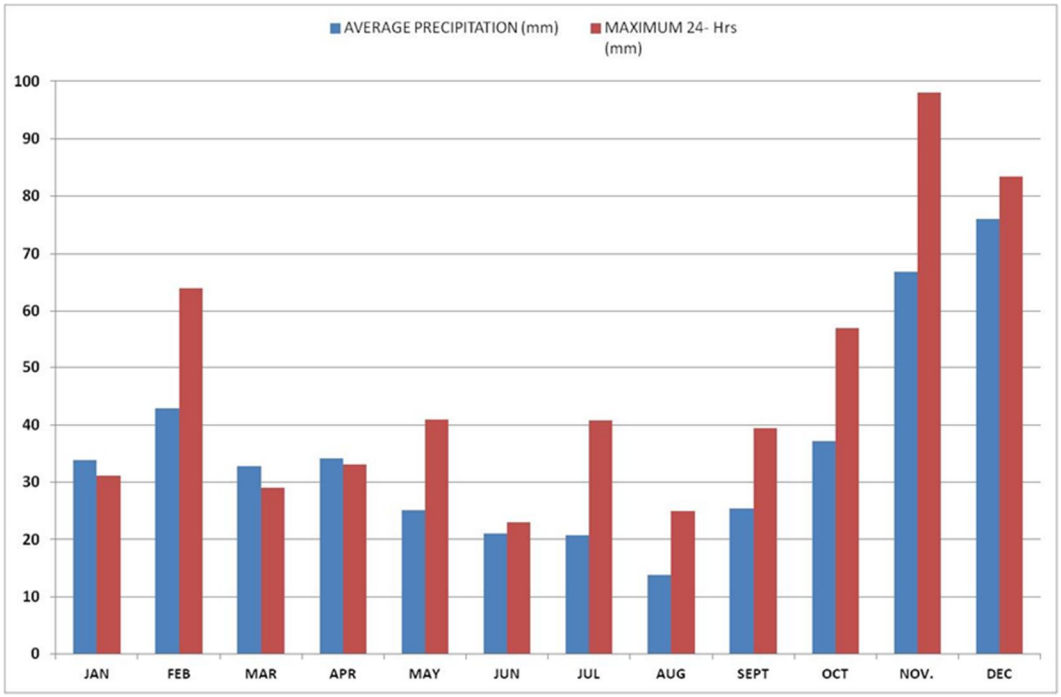


Diagram 8-2: Annual development of the average precipitation (mm) and maximum 24-hrs (Source: Hellenic National Meteorological Service HNMS

Table 8-3: Precipitation Data of MS of Chryssoupolis Kavala for the period 1958-2010

Month	Precipitation	
	Average precipitation (mm)	Maximum 24- Hrs (mm)
January	33.8	31.2
February	42.8	64.0

Month	Precipitation	
	Average precipitation (mm)	Maximum 24- Hrs (mm)
March	32.8	29.0
April	34.2	33.1
May	25.2	41.0
June	21.1	23.0
July	20.7	40.8
August	13.9	25.0
September	25.4	39.4
October	37.1	57.0
November	66.8	98.0
December	76.1	83.4
Annual	429.7	98.0

As presented below, air in the wider area of the RU of Kavala appears to be saturated with vapour of 70-75% during the winter months, when lower temperatures are observed, whereas during the summer and, in particular, during the dry months of July-September, the relevant humidity ranges at lower levels (in average 57-65%). The average monthly humidity and the annual average value are shown in the following table

Table 8-4: Humidity Data of MS of Chryssoupolis Kavala for the period 1958-2010.

Month	Relative humidity (mm)
January	75.05
February	72.54
March	71.98
April	71.86
May	66.88
June	62.46
July	57.91
August	59.53
September	65.44
October	70.54
November	75.54
December	75.56
Annual	68.79

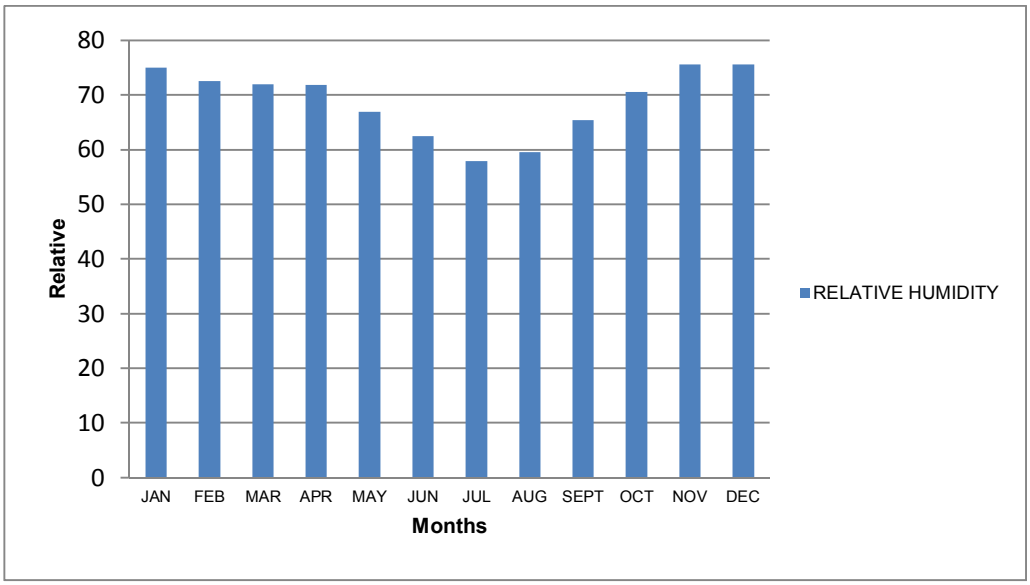


Diagram 8-3: Average monthly relevant humidity range 1984-1981, Source: Hellenic National Meteorological Service HNMS

8.1.2.1.3 Gaussen-Bagnouls climate Graph

In the Gaussen-Bagnouls climate Graph below shows the average monthly values of rainfall, in mm and temperature in Celsius degrees (oC). This graph shows in X axis the months of the year and has two Y axis. In the left side is shown the average monthly rainfall (P) in mm and in the right side the average monthly temperatures (T) in oC in double size climax from the rainfall P=2T. According to Bagnouls & Gaussen (1957) one month is characterized as dry while the total amount of precipitation is equal of lower than the double of the average temperature of the month Pmm ≤ 2T oC. When the rainfall curve is lower than the temperature curve, then there is P<2T, and this period is considered to be dry. The surface, between these two curves, shows the duration and the tension of the dry period. As it is shown in the Diagram 8-4 below, the dry-warm period, for the area of the study, lasts from the end of April until October.

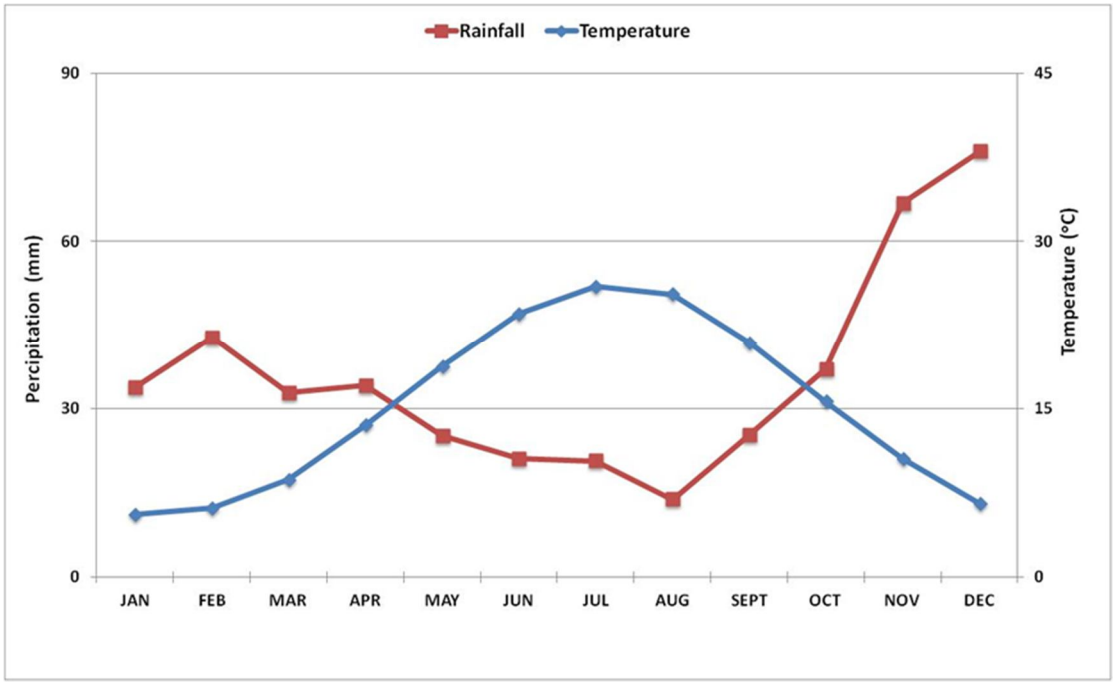


Diagram 8-4: Gaussen-Bagnouls climate Graph of Chryssoupolis

8.1.2.1.4 Winds

The annual frequency of winds at the platforms' location is shown in the table below and is complimented by below diagrams, which illustrates the wind rose % distribution of the winds.

Table 8-5: Annual % frequency and intensity of maximum wind speed per month (Source: BMT ARGROSS Epsilon field metocean report October 2015)

Speed BF	Speed m/s		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	All
11	29	30	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	28	29	0	0	0	0	0	0	0	0	0	0	0,018	0	**0,002**
10	27	28	0,018	0	0	0	0	0	0	0	0	0	0	0	**0,002**
	26	27	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	25	26	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	24	25	0	0	0,018	0	0	0	0	0	0	0	0,018	0	**0,003**
9	23	24	0	0,077	0	0	0	0	0	0	0	0,018	0	0	**0,007**
	22	23	0,018	0,039	0	0	0	0	0	0	0	0	0,018	0,035	**0,009**
	21	22	0,035	0,058	0,018	0	0	0	0	0	0	0,035	0,036	0,053	**0,019**
	20	21	0,070	0,077	0,035	0	0	0	0	0	0	0,018	0,036	0,018	**0,021**
8	19	20	0,140	0,077	0,105	0,036	0	0	0	0	0	0,035	0,073	0,175	**0,054**
	18	19	0,193	0,231	0,245	0,036	0,018	0	0	0,018	0	0,035	0,181	0,193	**0,095**
	17	18	0,351	0,173	0,386	0,018	0	0	0	0	0	0,193	0,217	0,281	**0,135**
7	16	17	0,456	0,269	0,298	0,054	0,018	0	0	0	0,018	0,158	0,254	0,684	**0,185**
	15	16	0,684	0,673	0,579	0,109	0,053	0	0	0	0	0,263	0,471	0,947	**0,314**
	14	15	1,157	0,865	0,579	0,163	0,053	0	0,018	0	0,163	0,403	0,652	1,368	**0,451**
6	13	14	1,192	1,519	0,947	0,236	0,140	0,036	0,123	0,018	0,236	0,561	0,707	1,666	**0,612**
	12	13	1,736	2,192	1,262	0,670	0,456	0,127	0,123	0,158	0,598	1,280	1,721	2,139	**1,033**
	11	12	2,332	2,558	1,841	1,069	0,754	0,127	0,210	0,421	0,978	2,367	2,681	2,753	**1,503**
5	10	11	3,471	3,385	3,103	1,540	1,069	0,417	0,544	0,912	1,775	3,471	3,333	3,138	**2,175**
	9	10	4,453	4,673	3,401	1,938	1,911	1,178	1,280	1,964	2,518	4,453	3,986	5,137	**3,070**
	8	9	6,434	5,673	4,628	3,388	2,980	1,685	2,279	2,770	4,130	5,645	5,036	6,101	**4,226**
4	7	8	7,433	6,500	6,364	4,783	3,594	3,116	5,645	5,242	5,634	6,311	5,797	7,100	**5,629**
	6	7	8,555	7,077	6,452	5,924	5,908	5,580	8,275	8,240	6,902	6,925	7,138	7,749	**7,068**
	5	6	7,714	7,404	7,696	8,116	8,310	8,859	11,799	11,729	9,801	8,012	7,917	8,310	**8,817**
3	4	5	7,889	8,115	9,537	10,815	11,606	13,279	15,305	14,919	12,428	8,994	8,351	8,292	**10,810**
	3	4	9,081	9,135	11,325	13,696	14,008	16,069	15,761	15,077	14,294	10,256	9,746	9,274	**12,321**
2	2	3	9,730	11,865	11,553	14,348	14,884	16,522	14,043	13,517	14,004	12,272	10,996	10,063	**12,811**
1	1	2	11,957	12,154	13,377	14,819	16,567	16,033	12,290	12,062	13,297	12,658	12,663	11,325	**13,265**
	0	1	14,902	15,212	16,252	18,243	17,672	16,975	12,307	12,956	13,225	15,638	17,953	13,201	**15,366**
			100	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
	Mean Speed		**5,2**	**5,1**	**4,6**	**3,8**	**3,6**	**3,3**	**3,9**	**3,9**	**4,1**	**4,7**	**4,7**	**5,4**	**4,3**
	Mean Directi		**52,1**	**53,4**	**60,3**	**66,7**	**60,7**	**40,5**	**30,8**	**37,3**	**48,4**	**52,6**	**59,2**	**54,6**	**51,3**

Legend
Common occurrences
red - 12 most common
yellow - next 24 most common
orange - next 24 most common
blue - all remaining

The directional percentages of the winds at the platform location are shown in the following diagram annually as well as for February and June (where the maximum peaks are anticipated).

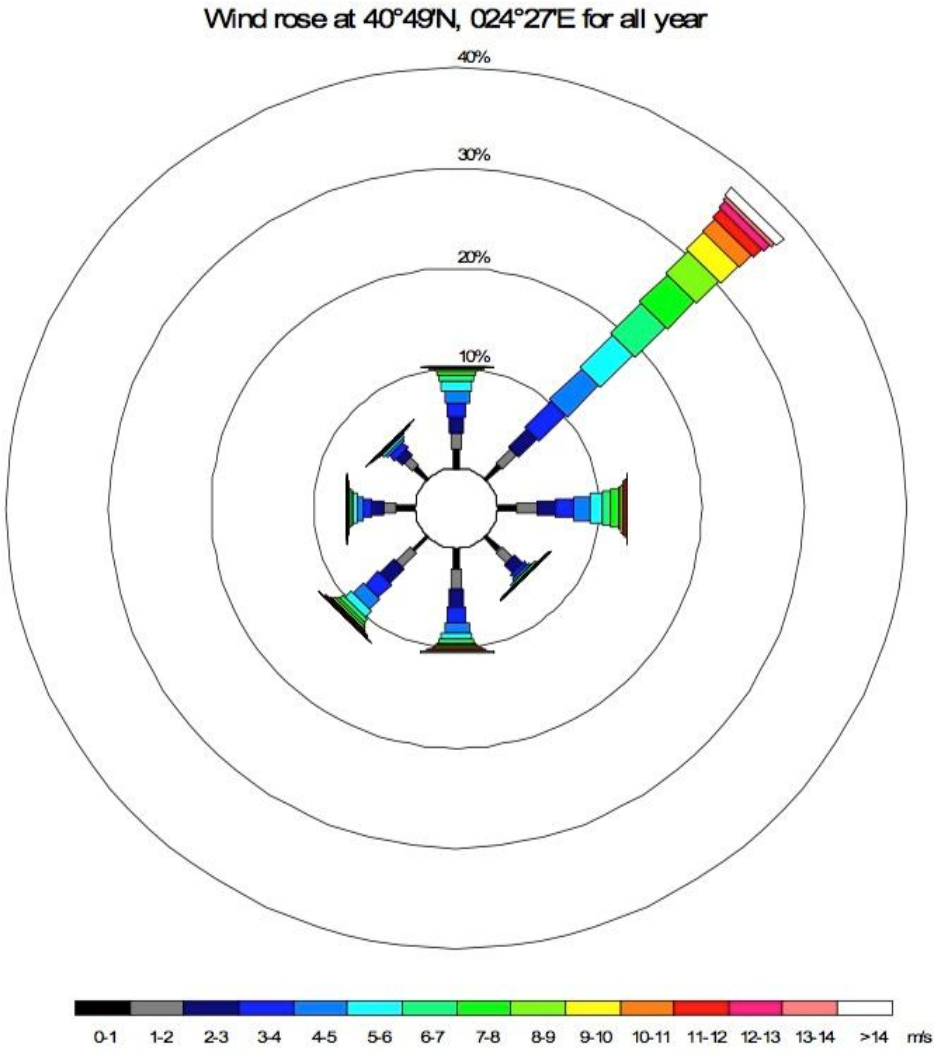


Diagram 8-5: Wind direction frequency chart (Source: BMT ARGROSS Epsilon field metocean report October 2015)

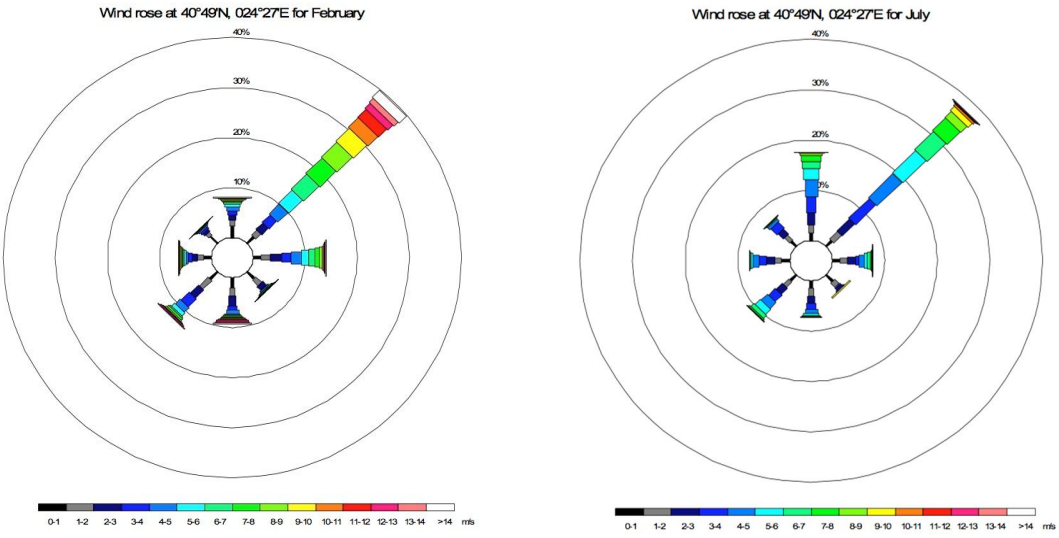


Diagram 8-6: Wind direction frequency chart for February and July (Source: BMT ARGROSS Epsilon field metocean report October 2015)

The prevailing winds through the year are in a north easterly direction and the relative wind speeds are seasonal. In the winter months (October through to April) the average wind speeds range from 3.8m/s to 5.4m/s occurring 60%-70% of the time characterised as 'gentle breezes'. In the summer months (May through to September) the average wind speeds range from 3.8m/s to 4.1m/s occurring 50-60% of the time, which are characterized as 'light breezes'.

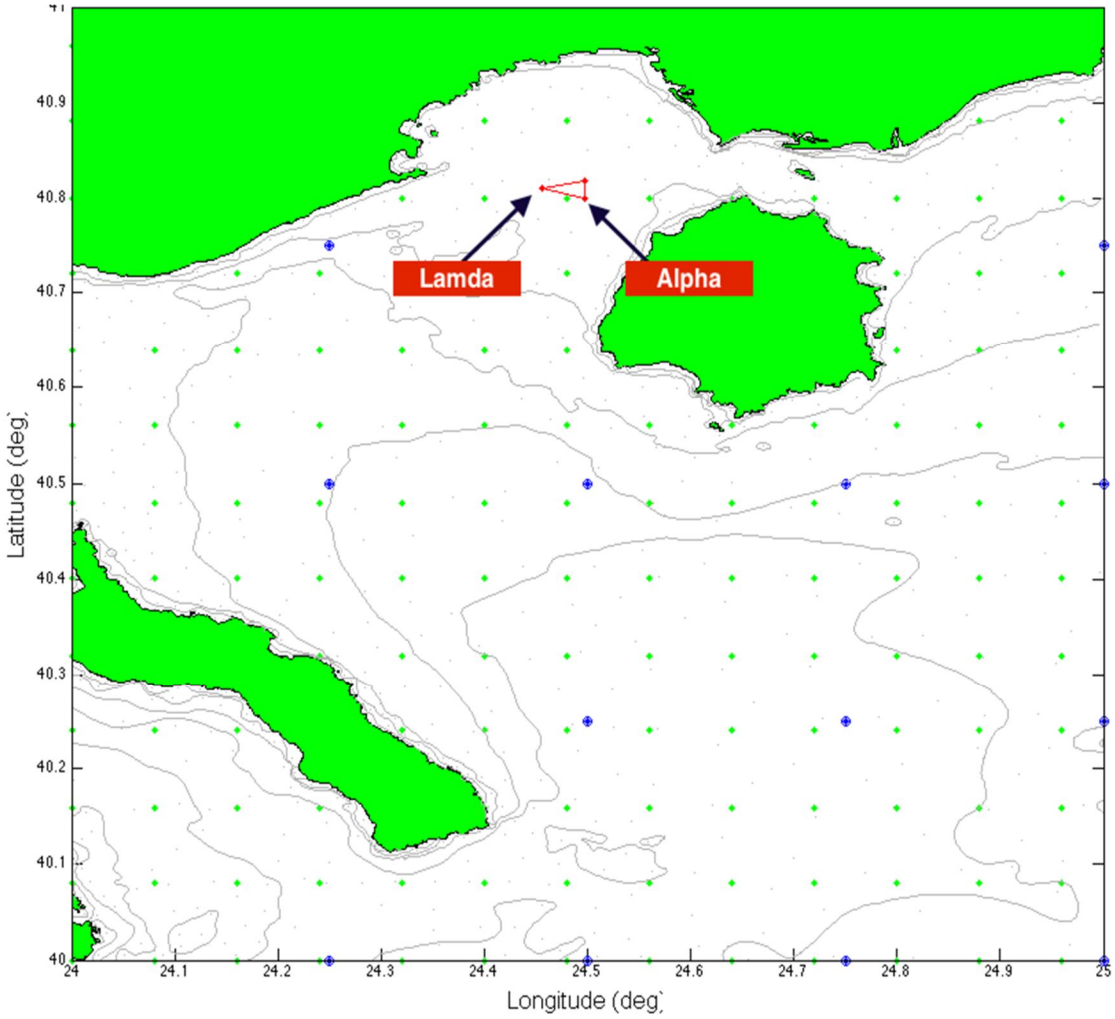
Winter is from October to April and is characterized by stronger winds, predominantly from the NE and E (more than 50% of the time). Winds from the NE dominate – around 40% of the time. The winds from the NE not only dominate but also have the highest wind speeds. Winds above 10 m/s (Bf 5) can be expected for periods of up to 48 hours in a month. Mean speeds are a little higher than in the summer. Winds blowing towards Thasos are weaker in the winter than the summer and slightly less frequent. Even in the winter the most likely circumstance is calm weather. Winds of below 3 m/s (light breeze and below) are seen for about 38% of the time.

Summer is from May to September and is characterized by light winds predominantly from the N, NE and E (50 to 60% of the time). Winds blowing onshore (to the mainland - S and SE - or to Thasos - NW) are of low strength (rarely exceeding 3 to 4 m/s) and infrequent (20 to 30% of the time). In the summer there is no significant wind (below 3 m/s) for around 45% of the time.

Stormy weather (winds above 14 m/s or anything above a strong breeze) occurs for around 1.25% of the time, nearly always in the winter months and entirely from the NE or S.

8.1.2.2 Metocean data

The design of existing facilities was based on oceanographic data based on metocean study performed by A.H. Glenn and Associates in 1974 at single location (about 3.5 km east of Lamda platform and about 0.5 km northeast from Delta. For the new development, Energean contracted BMT ARGROSS UK in October 2015 to perform a metocean study specifically at the locations of the existing platform and the new platform. The BMT AGROSS metocean report contains the necessary statistical data required for the detailed design of the new facilities, ie 1 year, 10 year, 100 year return data with the associated directions and for wind speeds, wave heights/periods, current speeds and tidal variations. In addition the study uses computer modelling to give monthly distributions of sea surface air/seawater temperatures sea water density and salinity. The basic conclusions are presented in the following paragraphs. The map below, presents the areas of interest and the reference locations.



Map 8-3: Locations of interest – Lamda, Alpha and Omicron

Key data sources used were the following:

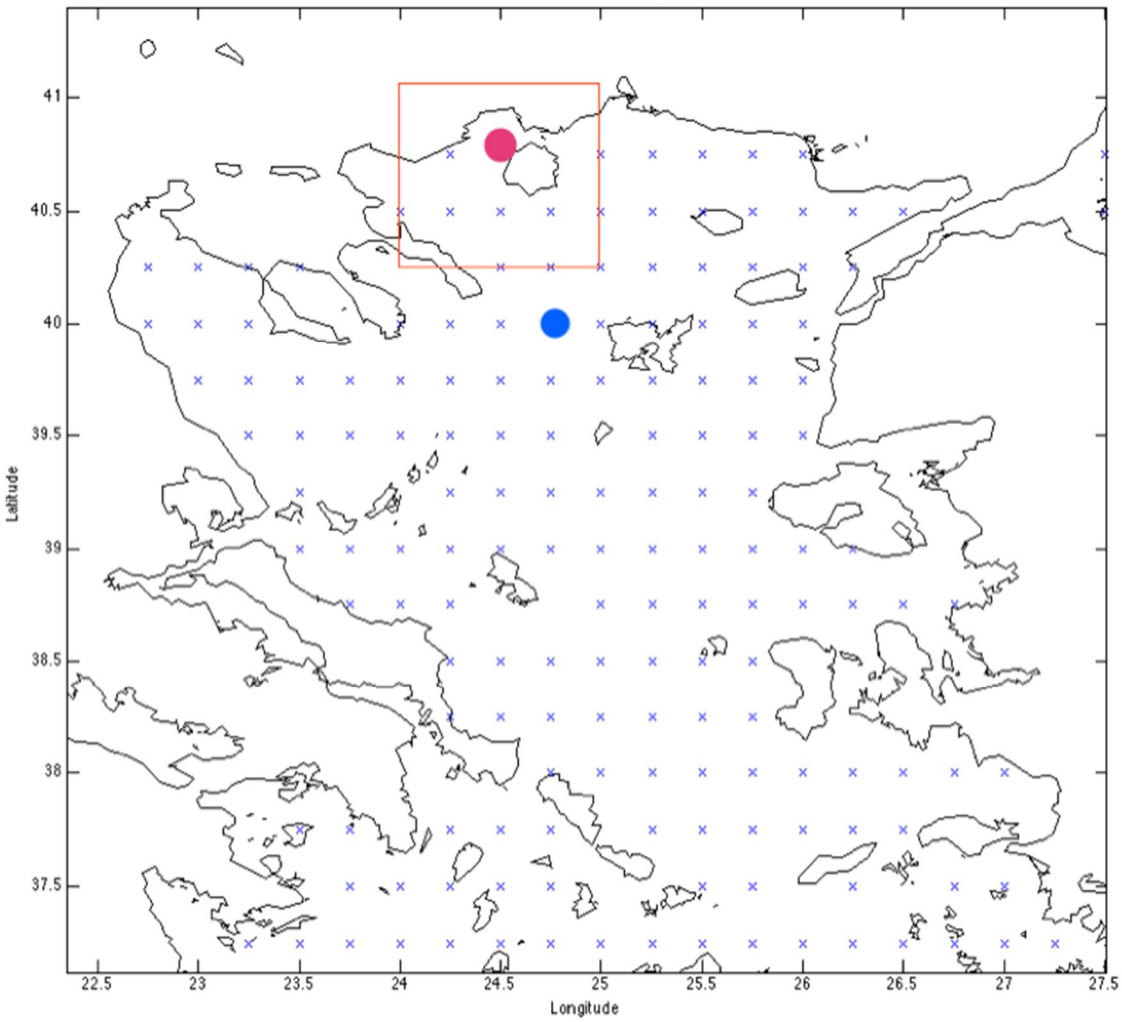
- BMT ARGOSS Hindcat (winds and waves): 3rd generation wave prediction model based on the WaveWatch III (WWIII) code on a global grid and several regional grids, for hindcast and forecast purposes. In this study we have used the Mediterranean grid as a starting point. Data are available between 1992 and 2014.
- BMT ARGOSS Satellite database (winds and waves): satellite database covers a period of about 25 years and all observations are extensively calibrated and validated against wave buoy data; the calibration is re-run each time the database is extended, nominally annually.
- Due to their global coverage and accuracy, the satellite wave/wind data can be used to validate/calibrate hindcast wind/wave data at practically any site in the world, also at sites where no local in-situ wave measurements are available. The systematic quality control applied to the satellite data including their calibration/validation to wave buoy data by BMTA ensures that the satellite data can be used as a reliable source of

reference data worldwide.

- Local weather station data from Thassos Island and KAVALA airport was used to benchmark the satellite wind and wave data.
- BMT ARGOSS Tidal model (tidal currents and levels): BMT tidal model provides the water motions associated with the eight most significant harmonic constituents of tidal oscillation including the principal lunar (M2) and solar (S2) semi-diurnal constituents; another 12 constituents are inferred. The global tidal information is based on the integration of approximately 5000 tidal stations and 15 years of satellite radar altimeter measurements into depth average global and regional tidal models (the 2DH model).
- HYCOM 2.2 model (residual currents, sea temperature and salinity): this is a general circulation model providing wind driven and geostrophic flows with vertical co-ordinates. Residual current data has been extracted from the HYCOM Reanalysis database configured for the global ocean with HYCOM 2.2 as the dynamical model. The bathymetry is derived from the 30-arc second GEBCO dataset. Surface wind forcing is from the NCEP 1-hourly CFSR. Data are available between 1995 and 2012. Besides non-tidal (residual) currents, HYCOM also includes information on sea surface temperature and salinity data through the water column.
- AVHRR Sea surface temperatures: The HYCOM sea surface temperatures have been verified against NOAA's AVHRR's (Advanced Very High Resolution Radiometer) sea surface temperature data. Two high-resolution sea surface temperature (SST) analysis products are available from NOAA's AVHRR satellite sensors.
- NCER CSFR Air temperatures: Air temperatures have been extracted directly from the NCEP CSFR database. Air temperatures correspond to an elevation of 2 m asl

8.1.2.2.1 Waves

Spatial representation of the many small islands in the Aegean Sea is modelled through sub-grid representations within the hindcast model. A wave buoy was identified, to the west of the island of Limnos, at approximately 40.00°N, 24.75°E (blue circle in map below) that provided some verification of the general hindcast performance in the north Aegean Sea. The buoy is part of the Poseidon network of buoys situated around the Greek seas. Basic statistics are available just to the south of the proposed SWRT boundary sites (red square in map below). The satellite calibrated Mediterranean hindcast against these statistics were then compared. Details of the calibrations are contained in the BMT ARGROSS report.



Map 8-4: Aegean Sea and Mediterranean hindcast gridpoints, (Red circle: project areas, blue circle: wave buoy)

The annual frequency of significant wave heights (Hs) at the Lamda platform is given in the table below. The significant wave height is less than 1m. Extreme storms are more frequent in the winter months, dominated by southerly winds.

Table 8-6: annual frequency of significant wave heights (Source: BMT ARGROSS Epsilon field metocean report October 2015)

Wave Height Hs (m)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	All
6,5	7,0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,0	6,5	0,018	0	0	0	0	0	0	0	0	0	0	0	0,002
5,5	6,0	0	0,019	0	0	0	0	0	0	0	0	0	0	0,002
5,0	5,5	0	0	0	0	0	0	0	0	0	0	0	0	0
4,5	5,0	0,018	0,019	0	0	0	0	0	0	0	0	0,018	0,018	0,006
4,0	4,5	0	0,058	0,053	0	0	0	0	0	0	0,018	0,054	0,140	0,027
3,5	4,0	0,088	0,154	0,035	0	0	0	0	0	0	0,070	0,018	0,175	0,045
3,0	3,5	0,105	0,250	0,105	0,036	0,018	0	0	0	0	0,175	0,109	0,158	0,079
2,5	3,0	0,245	0,250	0,123	0,073	0,018	0	0	0	0,018	0,070	0,199	0,351	0,112
2,0	2,5	0,666	0,654	0,473	0,073	0,053	0	0	0	0,054	0,123	0,707	0,473	0,271
1,5	2,0	1,718	1,615	1,455	0,580	0,456	0,018	0,018	0,018	0,145	0,491	2,065	2,016	0,879
1,0	1,5	7,398	7,039	5,891	3,931	2,104	0,453	0,579	0,403	1,359	3,576	5,851	9,607	4,006
0,5	1,0	32,241	30,423	29,383	23,696	18,496	13,533	17,111	17,865	22,246	29,453	27,319	32,837	24,537
0,0	0,5	57,504	59,519	62,483	71,612	78,857	85,996	82,293	81,715	76,178	66,024	63,659	54,225	70,036
		100	100	100	100	100	100	100	100	100	100	100	100	100

Legend
Common occurrences
red - 12 most common
yellow - next 24 most common
orange - next 21 most common
blue - all remaining

The maximum wave heights for the respective extreme return conditions are given in following table. The maximum significant wave height predicted is 6.7m from a southerly direction. The highest waves during the year are from the south despite the predominant wind direction being the north-easterly direction. The waves from the south are swell driven and have time to develop within the Aegean, whereas waves driven by the North easterly winds are smaller as the location is very close to the coastline, and swell development is limited.

It should be noted that Thassos Island provides shelter from the southerly waves, to a greater extent for the existing platform, and this is reflected in the higher wave heights reported for the new platform location.

Table 8-7: Maximum wave heights (in m) for respective extreme return conditions (Source: BMT Hindcast)

Directions from	Return period (years)			
	1	10	50	100
Storm duration (hrs)	4.8	3.3	2.5	2.2
North	1.0	1.6	2.1	2.3
Northeast	1.7	2.4	2.8	3.0
East	1.6	2.2	2.7	2.9
Southeast	1.2	2.0	2.6	2.8
South	3.7	5.3	6.3	6.7
Southwest	1.8	2.4	2.8	3.0
West	0.6	1.3	1.8	2.0
Northwest	0.3	0.8	1.3	1.5

Directions from	Return period (years)			
	1	10	50	100
Omnidirectional	3.7	5.3	6.3	6.7

8.1.2.3 Tidal data

The tidal ranges (based on data extracted between January 1992 and December 2014) at the study site are relatively small.

Table 8-8: Tidal water level components

Tidal definition		Level (rel. MSL)	Level (rel. LAT)
Highest astronomical tide	HAT	0.23	0.46
Mean high water spring (mean of high high-waters only)	MHWS (high)*	0.19	0.42
Mean high water spring (mean of low and high high-waters)	MHWS (mixed)	0.17	0.40
Mean high high-water (mean of all the high high-waters)	MHHW	0.13	0.35
Mean low high water (mean of all the low high-waters)	MLHW	0.09	0.32
Mean high water neap	MHWN***	0.02	0.25
Mean sea level	MSL	0.00	0.23
Mean low water neap	MLWN***	-0.02	0.20
Mean high low-water (mean of all the high low-waters)	MHLW	-0.09	0.14
Mean low water spring (mean of all the low low-waters)	MLLW	-0.13	0.10
Mean low water spring (mean of low and high low-waters)	MLWS (mixed)***	-0.17	0.06
Mean low water spring (mean of low low-waters)	MLWS (low)	-0.19	0.04
Lowest astronomical tide	LAT	-0.23	0.00

** Actual definition of MHWS but in some mixed semi-diurnal tidal regimes this can be lower than MHHW which is not as expected.*

*** Actual definition of MLWS but in some mixed semi-diurnal tidal regimes this can be higher than MLLW which is not as expected.*

**** No need to split Neap Tides, as the constants are very similar.*

8.1.2.4 Currents

Only the residual component of current flow has been subjected to the extreme value analyses. Tidal currents are assumed essentially independent of return period and are usually added subsequently. However, at these study sites the tidal currents are negligible and have been omitted from further analyses. The residual flow extremes may therefore be considered to represent the total current flow.

Traditional methods of deriving extreme current speeds through the water column involve simply treating each depth measurement separately. This method is perfectly adequate in relatively shallow water depths with fixed type structures, where the wave forces may be more important than currents. However, in deep-water situations it cannot take account of the possibility of strong vertical coherence (e.g. the strongest seabed currents may occur at different times to those near the surface; they may even move in opposite directions).

At the locations of interest the water depth is shallow enough and the current flow is orientated in the same directions for the majority of the vertical profile (small changes are observed in the bottom flow but at these depths the current magnitudes are minor) to allow extreme value analyses at each depth interval to be treated independently. The resultant extremes are then combined to form extreme profiles by direction.

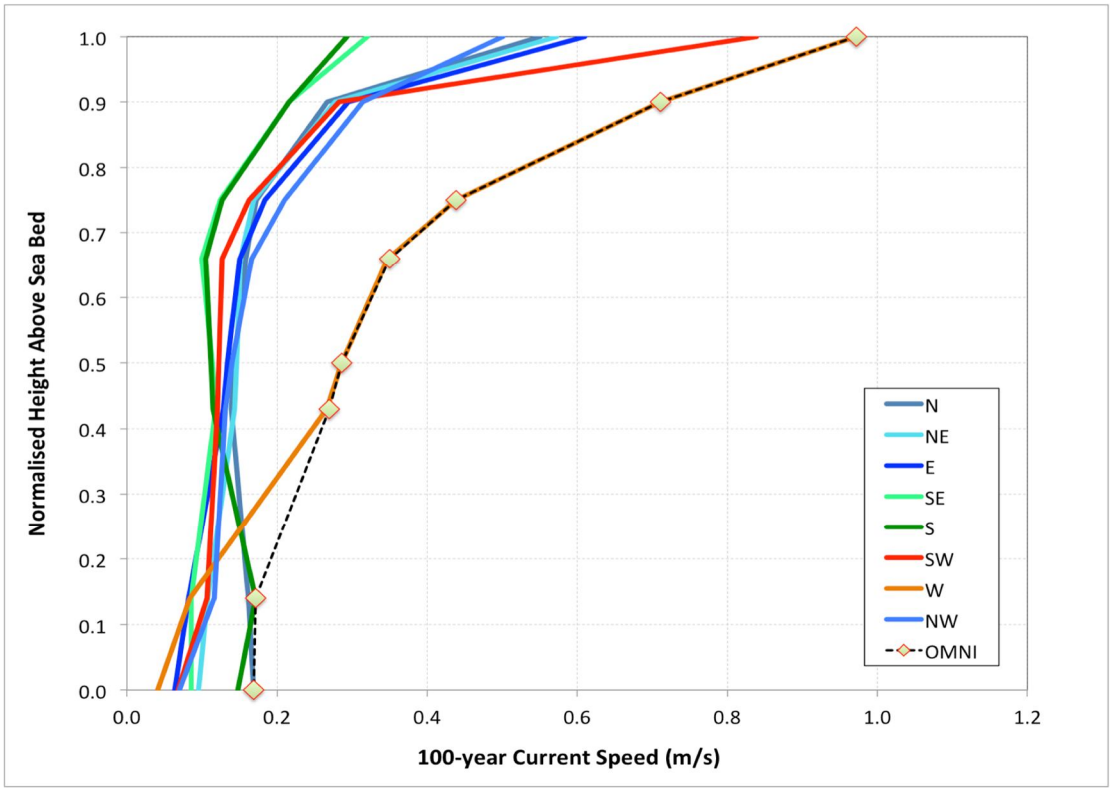


Diagram 8-7: Vertical current profiles by direction

Above Diagram 8-7 emphasises the dominance of the background flow towards the west (at the surface only the south-westerly flow is almost as great). This westerly flow is equal to the omnidirectional flow in all of the upper 75% of the water column. At depth (lower 25% of water column) the current changes to a north/south orientation but by this stage the flow is much reduced.

8.1.2.5 Seawater properties

Sea temperature and salinity data have been extracted directly from the HYCOM hindcast. Sea surface temperatures have been validated against the satellite derived AVHRR data (and found to be in good agreement.

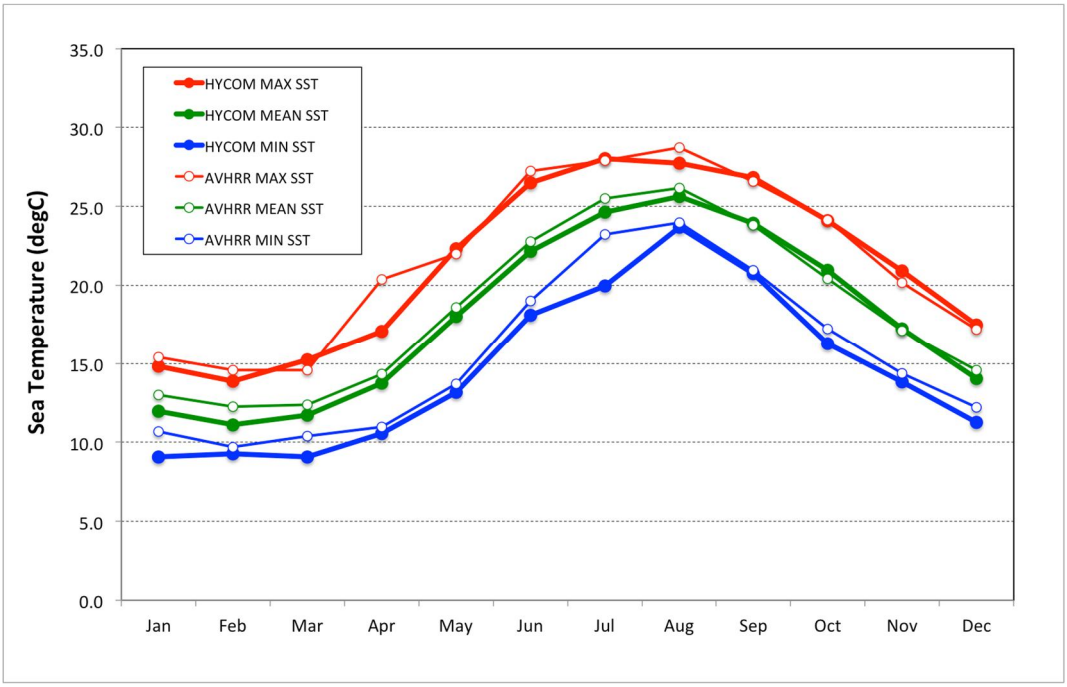


Diagram 8-8: HYCOM vs AVHRR Sea surface temperature check

Seawater density has been calculated using algorithms obtained through the Gibbs Seawater (GSW) Oceanographic Toolbox11. However, one should note that minimum and maximum temperature and salinity values presented may not occur simultaneously and therefore parameter values derived from simply the minima and maxima of each independent variable as presented in the statistical tables may not be representative. Instead we derive seawater density for each timestamp in the HYCOM series (i.e. taking associated values of temperature and salinity together) and calculate density statistics from those. Therefore the temperature, salinity, density tables may appear as inconsistent in the statistical tables.

8.1.3 Bioclimatic characteristics

With regard to climate conditions of Mediterranean areas, usually the Emberger index is used, according to the synthetic formula thereof, the rainfall, the average temperature and the average minimum temperature of the warmest and coldest months of the year are taken into account. Thus, the Mediterranean areas are divided in various bioclimatic levels.

This index is calculated as follows:

$Q = 2.000 \times P / (M^2 - m^2)$, where:

- P = average annual rainfall (mm)

- M = average value of maximum temperatures of the warmest month*
- m = average value of minimum temperatures of the coldest month*

**The figures M and m are expressed in absolute temperature grades, with 273°K corresponding to 0°C*

The quotient Q is used as an ordinate at a coordinates' axis, the abscissa of which is the m index, expressed this time in Celsius grades (°C). The foregoing values are placed on axes of a diagram prepared in advance, which distinguishes between bioclimatic levels.

Based on the Emberger formula, for the period 1984-1999 (based on the data from the Kavala M.S.) the index Q is calculated as follows:

Q = 2,000 x 403.2 / $(273+29.7)^2 - (273+3.0)^2$ **= 52.19**

By placing the value of the index on the Emberger[1] climate diagram, we can observe that the RU of Kavala belongs to the semi-dry bioclimatic level, characterized by cold winters.

More specifically, the climate characteristic of the coastal zone of the area is characterized by warm, dry summers (circulation of subtropical and warm-dry air), cold and wet winters (circulation of relatively cool air from the temperate zone) as well as rainfall of approximately 300-400 mm. The respective continental part of the RU tends to be different and is characterized by cool wet winters, dry summers and rainfall of approximately double values than the coastal zone.

[1]Bioclimatic levels, "The bio climate of Greece, relationship between climate and natural vegetation, bioclimatic maps, forest survey", Volume 1, 1980, Mavromatis G.

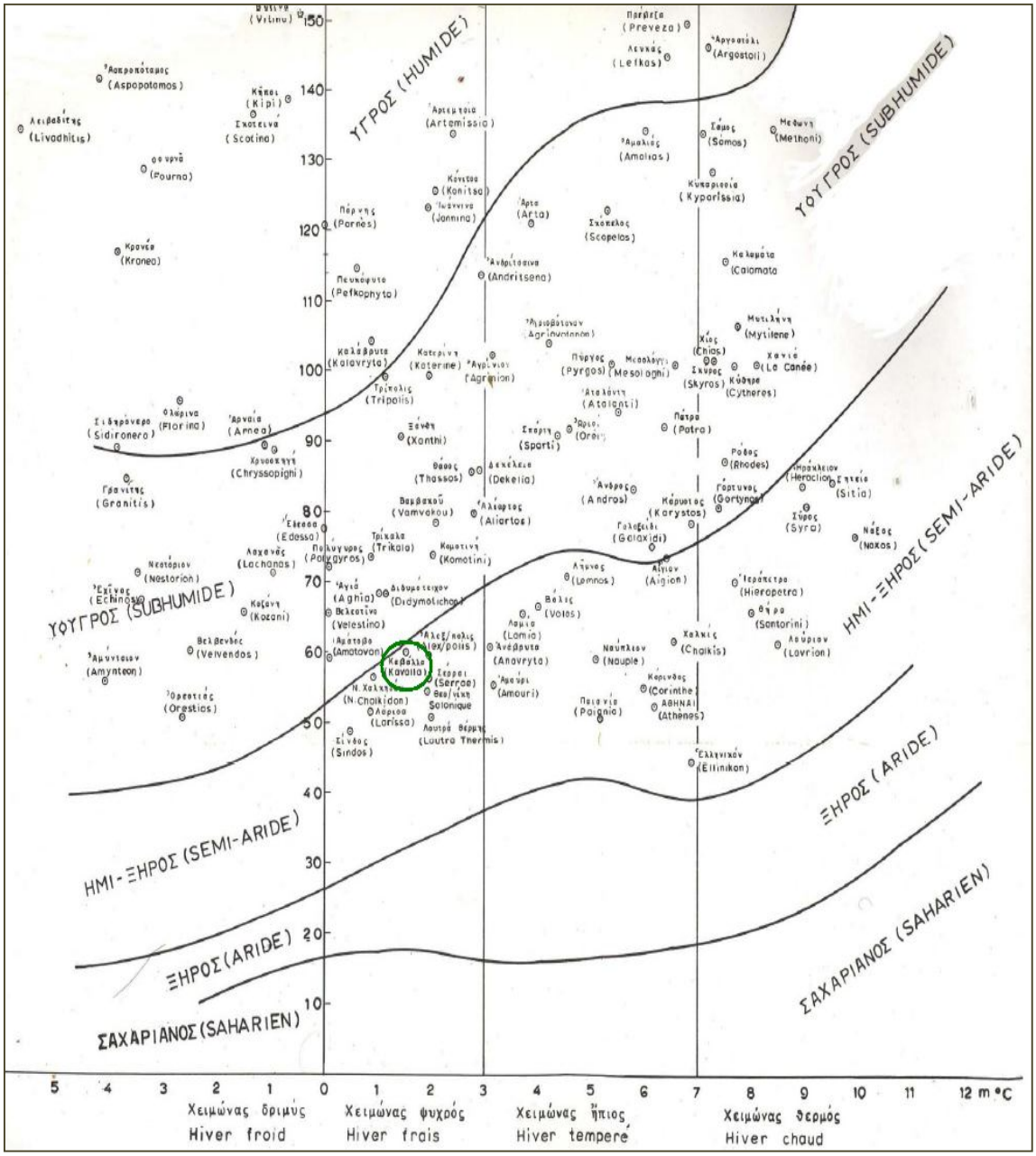


Diagram 8-9: Abstract from bioclimatic levels of Emberger diagram

It is noted that changes to climate and bioclimatic characteristics of the wider area have not been observed and so it can be concluded that the existing offshore and onshore project has no effect on these environmental parameters, which is also expected given the nature and the size of the installations.

8.2 MORPHOLOGICAL AND TOPOLOGICAL CHARACTERISTICS

The topological and morphological characteristics of the area under assessment are divided (for the purposes of better description thereof) in:

- Land morphological and landscape characteristics;
- Marine morphological and landscape characteristics.

It is noted that the concept of morphological characteristics in the sea and at a large distance from the shore, can only be understood as seabed morphology (described in the following paragraph), whereas any topological elations are due to floating fixed installations, such as the existing platforms/platforms for the extraction and processing of the extracted hydrocarbons.

8.2.1 Morphological and topological characteristics in the land environment

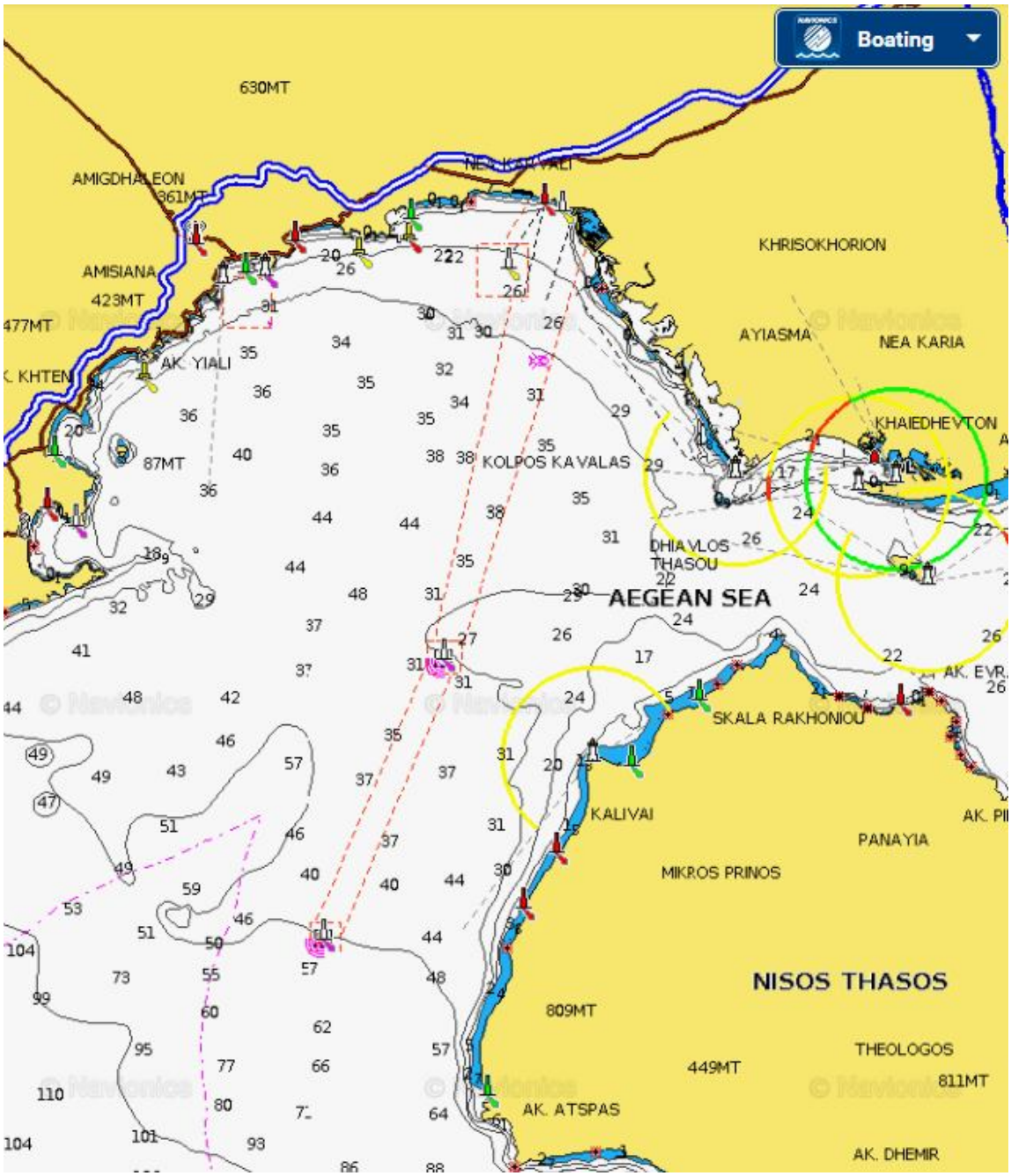
The morphology of the coastal zone can be characterised by extensive sand beaches with lakes, lagoons and land strips. The river Nestos delta is dominant in terms of morphology and topology. The lagoons closest to the project under assessment are Erateino and Vassova. Rainwater forms numerous torrents towards the plain. The water from these torrents, which in the past used to form marshes at the low locations of the plain, now reaches the sea through drainage channels. The plain, to a large part, consists of light, sandy soil with low water retention capability. As regards human intervention in the topological and morphological characteristics of the wider area, it must be noted that the projects with the most significant impact is the Kavala airport, to the east of the land facilities, and the road projects (Egnatia Odos and the highway N.R. Kavala – Xanthi), the routing of which is located to the north of the facilities.

The offshore platforms are installed at a distance more than 10km from residential areas and historical monuments and at a maximum height of 25 m above sea level, and for that reason there is not significant visual disturbance to the receptors (residents, tourists etc). The platforms are clearly visible only by vessels sailing in the area.

8.2.2 Morphological and topological characteristics in the marine environment

8.2.2.1 Bathymetry in the Kavala Gulf

The bathymetry in the Kavala Gulf and in the project area is given in the following map.



Map 8-5: Bathymetry in the Kavala Gulf
Source: https://webapp.navionics.com/#@11&key=fxvvEmabyC

8.2.2.2 Geophysical characteristics in the project area

According to the JMD 170225/2014 on the environmental permitting procedure, the preparation of Geophysical and Geotechnical surveys is obligatory for such projects. The geophysical survey provides the overall mapping of the seabed surface and subsurface (up to 100 m).

The Preliminary study of the seabed of Kavala Gulf has been assigned to the Laboratory of Marine Geology and Physical Oceanography of the Geology Department of the University of Patras, in collaboration with GEODOMIKI. The main objective of the work is the seafloor

mapping and shallow seabed stratigraphy analysis through processing and interpretation of multi-platform geophysical datasets collected from the Delta-Epsilon/Lamda-Omikron complex in the PRINOS Field at the Kavala Gulf.

This chapter briefly presents the results of the Geophysical and Geotechnical Survey related to the morphology of the seabed. The full report is given in Annex 03.

The content of the survey related to the seabed morphology include:

- A detailed bathymetric survey;
- A detailed mapping of the seabed morphological features;
- A detailed study of the shallow seabed seismic stratigraphy;
- The detection of magnetic field anomalies indicating major metallic objects lying or being buried on the seafloor;
- The detection and mapping of existing pipelines and cables within the Base Case area; and
- The detection and the identification of ancient, historical and modern wrecks lying on the seabed.

The major field activities related to the seabed morphology are:

- Detailed Bathymetry Survey (Multibeam and Single beam echo sounders) to establish water depth and seabed contours
- Side scan sonar survey (detailed seabed surface imagery for the detection of objects/obstacles/gas pock marks in the platform and pipeline locations)

The area of geophysical survey (base case area) is shown in the following figure.

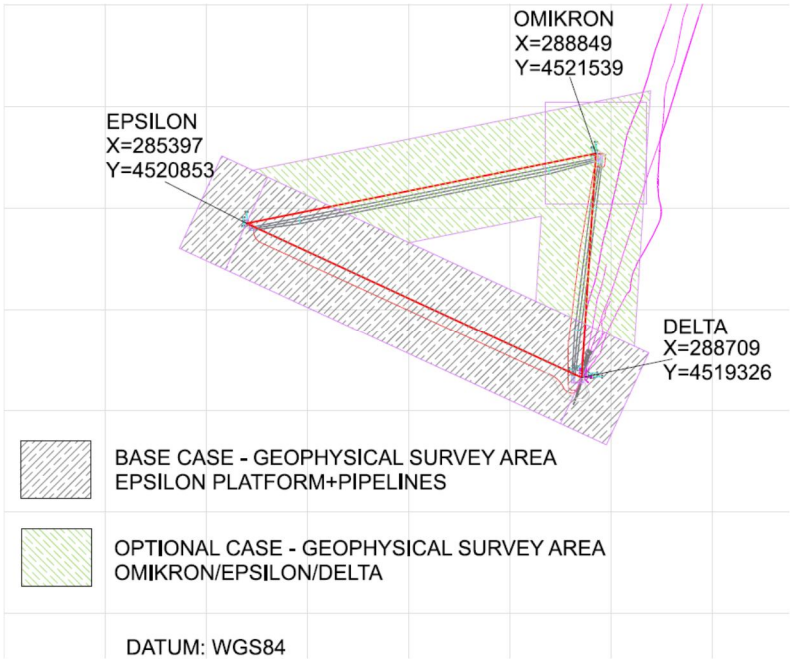


Figure 8-1: Area of Geophysical Survey

Detailed Bathymetry Survey

The depth of water in the area of the geophysical survey (see figure above) ranges between 30 m and 52 m. The area can be separated in three parts based on the bathymetry. The eastern part (-the area between Delta complex and the central part of Base Case area-) constitutes a bathymetric high plateau and is characterized by a smooth seafloor, deepening gently from 30m water depth at Delta complex to 34m water depth at the central part of the Base case (slope <1º). The western part (including Epsilon/Lamda platform area) also constitutes a bathymetric high plateau (37-41m water depth), which is deepening gently to the east and north (slope ≈1º). The two bathymetric high plateaus are separated by a deep part (50-52m water depth), which forms a channel, running almost north-south. In the area between the channel and the western plateau, the seafloor is deepening with a low slope to the west (2 º - 4 º) and a medium slope to the north (3º - 9º). The seafloor between the eastern part and the channel is characterized by low slopes towards the south and by medium to high slopes (up to 13º) towards north.

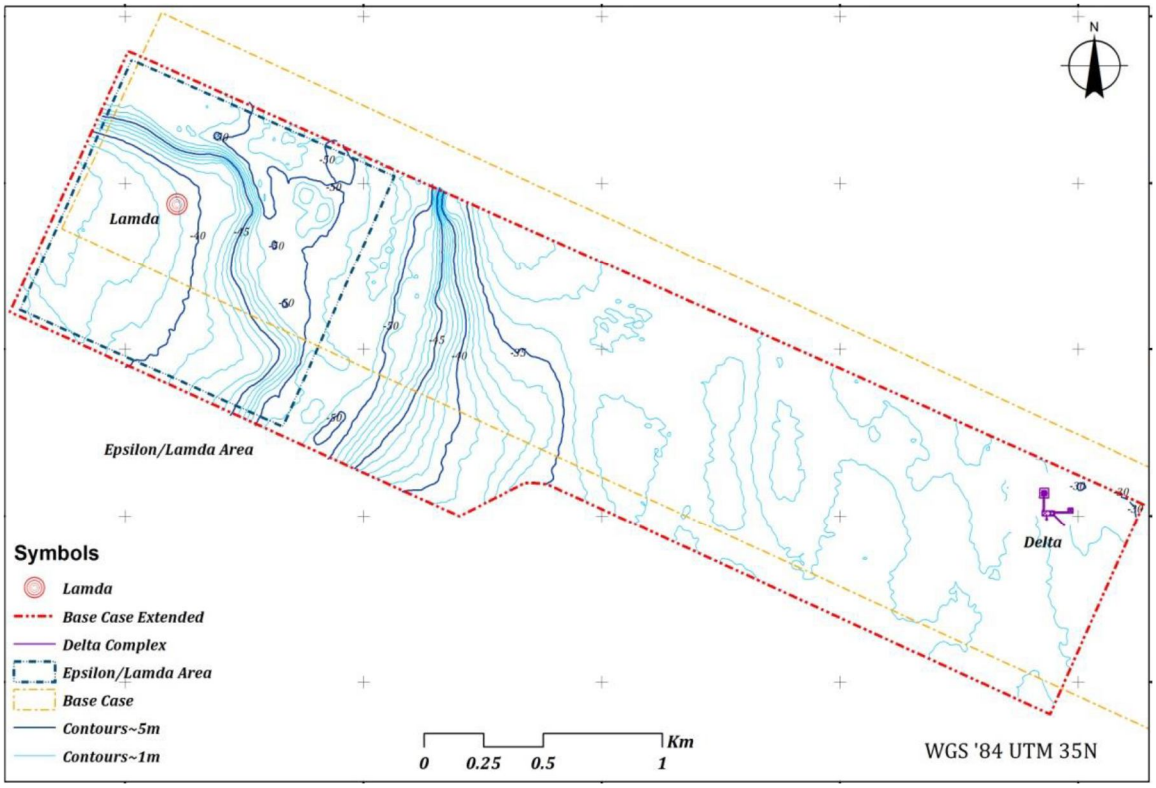


Figure 8-2: Bathymetric Map of the Base Case Area

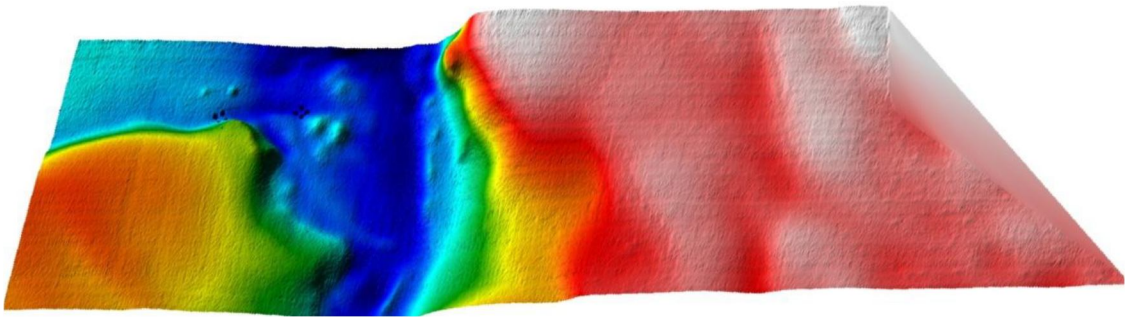


Figure 8-3: 3D Representation of the Base Case Area (Delta Complex area has been excluded)

The bathymetry of the Epsilon/Lamda platform area is characterized by a plateau at the western part, as described above, with water depth ranging from 37 to 41m and a channel (deeper part) at the eastern and northern part of the area. The slope between these two morphological units is low to medium at the southern part and medium at the northern part. At the northern part of the area, within the deeper part, eight small scale, circular deepening's about 25 m in diameter and 1.5 m deep were recorded. The location of the deepening's form two rectangles. Most probably these deepening's have been formed by the weight of the legs of two old well platforms. The identification of the drill rig footprints, gives a good indication that seabed movement is minimal in the area.

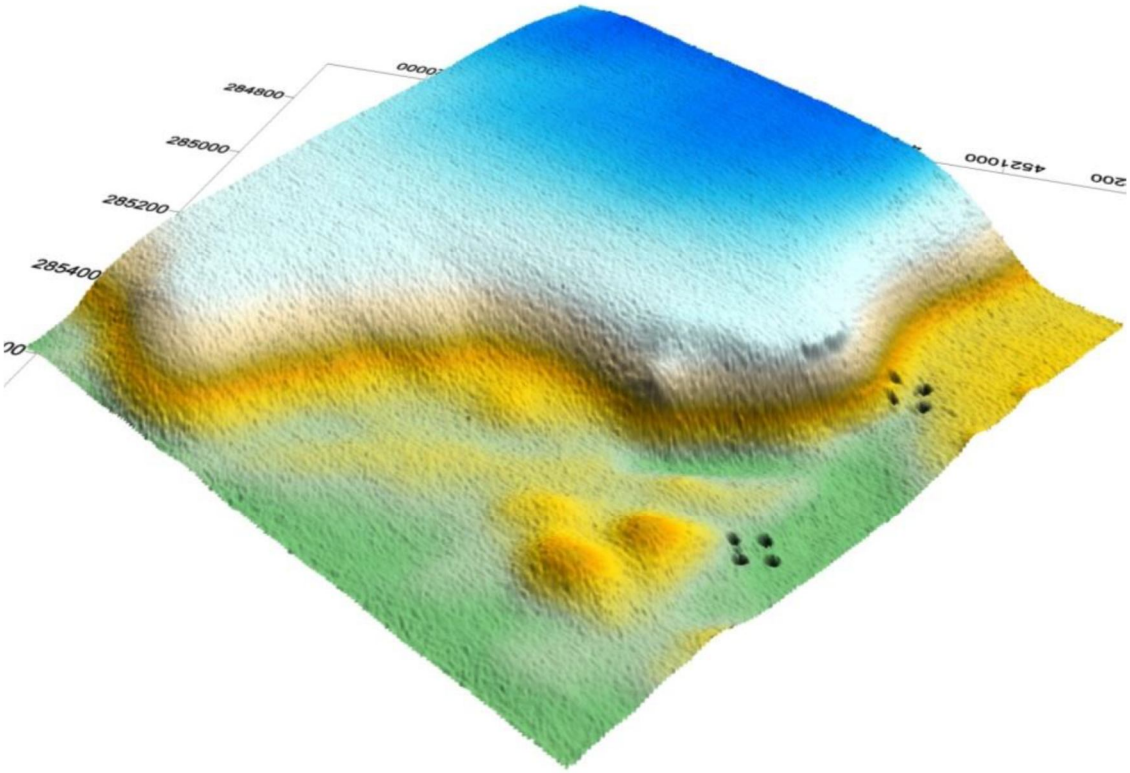


Figure 8-4: 3-D representation of Epsilon/Lamda platform Area. The deepening's that have been formed by the weight of two old well platforms are also shown.

Side Scan Sonar Survey

Side scan sonar imagery indicates no major seabed features or anomalies along the pipeline route and new platform location. There is also no evidence of gas pock marks or craters on the seabed. As expected, a narrow man made rock berm covering the existing pipeline from Delta to Kappa was identified running North/South from the south side of the DELTA platform, see below.

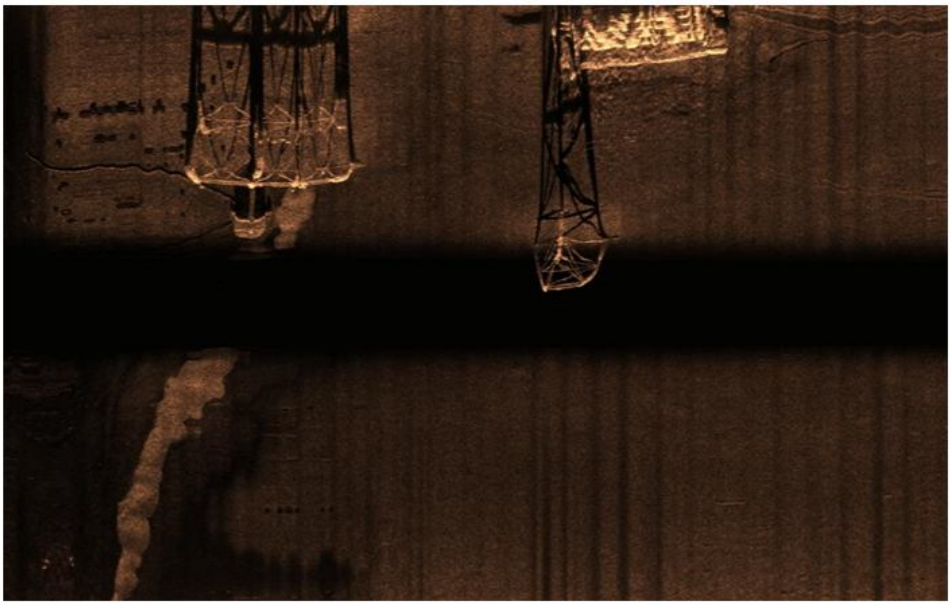


Photo 8-1: Seabed soils in Kavala Gulf

The side scan sonar identified the location of the previous drill rig footprints (E1 and E2) described in section above. This gives a good indication that seabed movement is minimal in the area; given that the drill rig was present in this location nearly 15 years ago, see photo below.

Photo 8-2: Seabed in Kavala Gulf

8.3 GEOLOGICAL AND TECTONIC CHARACTERISTICS

The geological and tectonic characteristics are divided into:

- Land geological characteristics;
- Marine geological characteristics;

- Tectonic characteristics

8.3.1 Geological characteristics in the land environment

Geological characteristics in the land environment are examined in brief for completeness reasons. The RU of Kavala is located on the geotectonic zone of Rodopi and constitutes part of the tertiary tectonic depressions of Nestos and Visthonidas.

Concerning the sedimentary rocks – meaning the series of sediments, it must be noted that the stratigraphic classification thereof (which composes the whole wider area to the south of the mountainous zone, at a great depth) from the surface of the background of the basins until the current surface, is as follows:

Paleogene Sediments: They constitute the majority of the west and southwest hill ranges of the Visthonida basin, constituting also the watershed of the adjacent basin of Nestos. At the same time, they can also be found in the surface of this eastern area, to the southwest of the city of Komotini. At the base of this system breccia and gravel can be found, while, subsequently sits a discontinuous (in the form of lenticular intercalations) nummulitid limestone. The series of Palaeogene sediments follows, which, usually appears as layers of conglomerates, sandstone, marlstone and clay slate. These formations, in terms of spring waters, are of very limited interest.

Neogene sediments: This system is the first series of sediments for the largest part of the Nestos basin. In many locations these Neogene sediments cannot be distinguished from the paleoquaternary ones, due to same origin (fluviotorrential) and the same characters. A characteristic of the sediments of Neogene is the lack of development of clear and normal horizons, but the existence of one characteristic primary heterogeneity with lateral transitions and slippings.

Quaternary sediments (recent and modern silting): The quaternary sediments and the paleoquaternary surface ones occupy a small area, while they are located at a depth below the newer quaternary silting. They originate from the lateral scree and the materials deposited by the small torrents with a mouth exactly at the fringes. They consist of coarse material, breccia, gravel, pebbles of various sizes – the composition of which are mainly gneiss, amphibolite's and marbles, as well as fine materials, mainly from clay silt and/or sand materials.

Specifically, Nestos plain may be considered as consisting of soils that show common characteristics, such as:

- Common bedrock, in the sense of quaternary deposits - alluvial from small torrents that result from the various rocks of the basin and comprise a complex material, however mainly a coarse one, and rarely medium grain or fine grain;
- Low soil development and lack of horizons, due to the short-term impact of soil generation factors (namely, young age);
- Common bedrock from water-bearing sand, with a depth of 0 to 4 m and a thickness up to 5m, most of the time;

- Small relevant thicknesses, with a surface layer from 0 to 2 m, many times less than 0.7 m;
- Rare occurrence of calcium carbonate;
- Excellent pH reaction from 6.3 to 7.6
- Relief with moderate to gentle slope;
- Low content of Ca, N, P and organic substances and sufficient K content;
- Moderate to rapid initial invasiveness and very slow to rapid final one.

8.3.2 Geological characteristics in the marine environment

8.3.2.1 Geological characteristic on Kavala Gulf

On a general level, the Aegean Sea is characterized from a multitude of sedimentary basins of the Tertiary, some of which were developed due to volcanic activities. At the beginning of the Eocene, faults were formed, which resulted in the fragmentation of the area. Pieces were lifted, whereas other sunk. Consequently the sea entered the lower areas. Moreover, the development of Miocene molasse sediments in closed tectonic basins resulted in evaporites, under which hydrocarbon deposits were located inside Messinian sandstone formations. At the same time, around the end of the Oligocene and at the beginning of the Miocene the last alpine folds are formed, resulting in the folding of the formations of the Eocene - Oligocene. The breaking of old faults, rising and sinking of pieces, creation of seas and lakes follow, while in the Thracian Sea a closed sea was formed, which created all the prospects for trapping hydrocarbons.

The granulometric analysis of the sediments of the gulf (Lykousis 1984) shows that the largest part thereof is covered by fine sediments with mud-clay percentages between 85 and 95%. Increased sand and mud percentages, with high content of mica and silica are found in the south-eastern part and along the north-eastern and eastern shores of the gulf. It is considered that the major source of fine materials is the river Nestos. The distribution of these fine materials is basically attributed to the general cyclonic-anticyclonic movement of waters (tide, wind-currents), the relatively small speeds of bottom currents and the slope of the bed. Finally, biogenic sand (pieces of echinoderms, molluscs) can be found in the central and southwestern part of the gulf.

8.3.2.2 Geological characteristics in the project area

As already mentioned in the chapter 8.2.2, the preparation of Geophysical and Geotechnical surveys is obligatory for such projects. The geotechnical survey provides the physical soil parameters for the pipeline and platform foundation design based on actual borehole data. The Preliminary study of the seabed of Kavala Gulf has been assigned to the Laboratory of Marine Geology and Physical Oceanography of the Geology Department of the University of Patras, in collaboration with GEODOMIKI. The main objective of the work is the seafloor mapping and shallow seabed stratigraphy analysis through processing and interpretation of multi-platform geophysical datasets collected from the Delta-Epsilon/Lamda-Omikron complex in the PRINOS

Field at the Kavala Gulf.

This chapter briefly presents the results of the Geophysical and Geotechnical Survey related to the seabed geology of the seabed. The full report is given in Annex 03. The content of the survey related to the seabed geology include a ground-truthing survey consisting of visual inspection and sediment sampling based on the geophysical seabed mapping results.

The major field activities related to the seabed geology are consist of

- Magnetometer Survey;
- Sub bottom profile Survey (Chirp and Sparker to determine soil profiles below seabed and indications of shallow gas);
- Seabed surface grab sample acquisition at strategic points along the survey route.

The area of geophysical survey (base case area) is shown in the following figure.

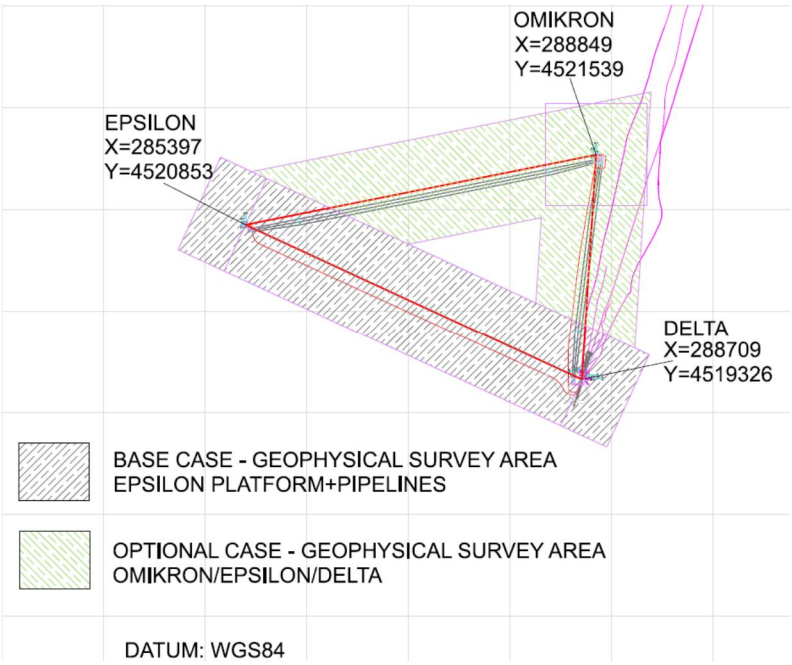


Figure 8-5: Area of Geophysical Survey

Magnetometer Survey

The map of the magnetic field deviation exhibits correlations both to geologic components of the seafloor as well as to metallic objects lying on it. The geologic components are expressed as low range (-5 - 5nT) deviations, while metallic objects as major magnetic anomalies (12 - 180nT). All major magnetic anomalies match very well to known man-made objects, which are four wells and a pipeline, having magnetic signatures of about 180 and 12nT, respectively.

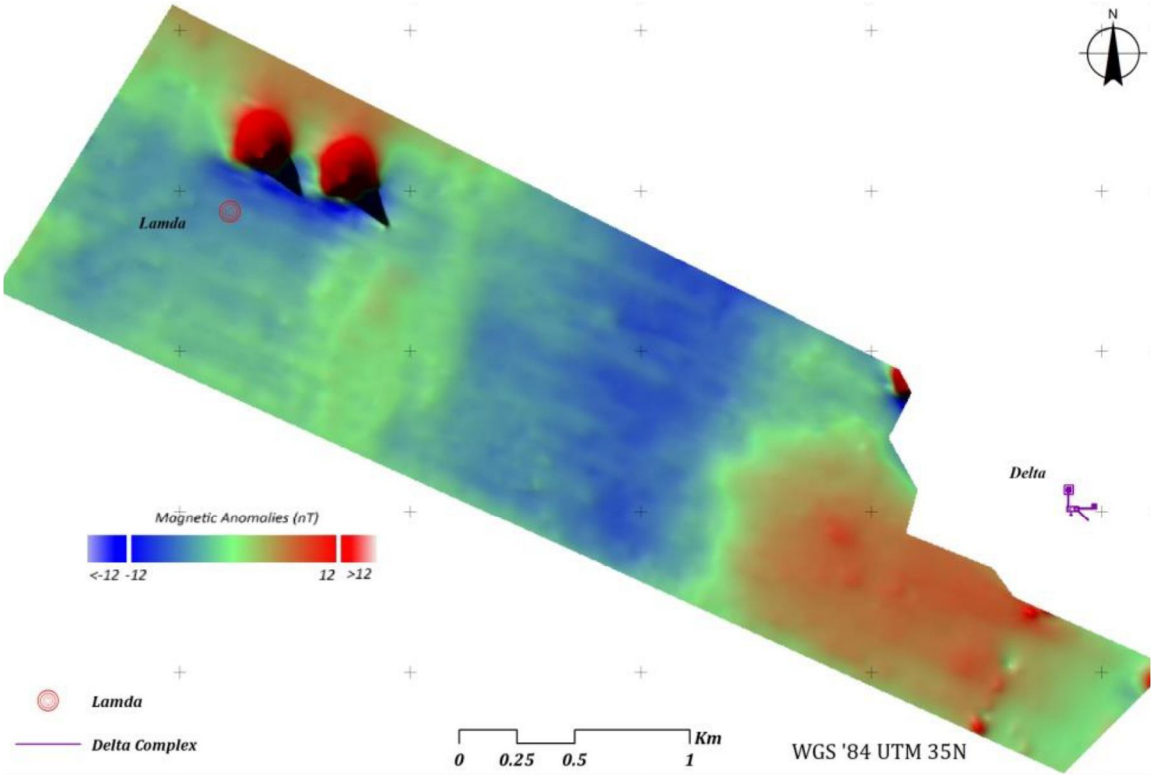


Figure 8-6: Magnetic Map showing the magnetic field deviation

Sub Bottom Profile Survey

Sub bottom profiles were generated on all lines, by a chirp and sparker, with results up to 100m below the seabed. In general the sediment profiles are consistent with very little sub layering up to depths of 30m. In general the material encountered from the reflectivity was shown to be silty sand, which is also consistent with the side scan sonar data and the ground trothing soil samples taken.

Seabed Sampling – Ground Truthing

Surface soil samples were recovered by a simple grab bucket at strategic locations within the survey area. The summary of the locations and representative samples are depicted in Figure 8-7. It is clear that the sediments recovered are mostly coarse grained silty sands, which is substantiated by core samples taken by previous surveys and the reflection indications from the side scan sonar and sub bottom profile data.

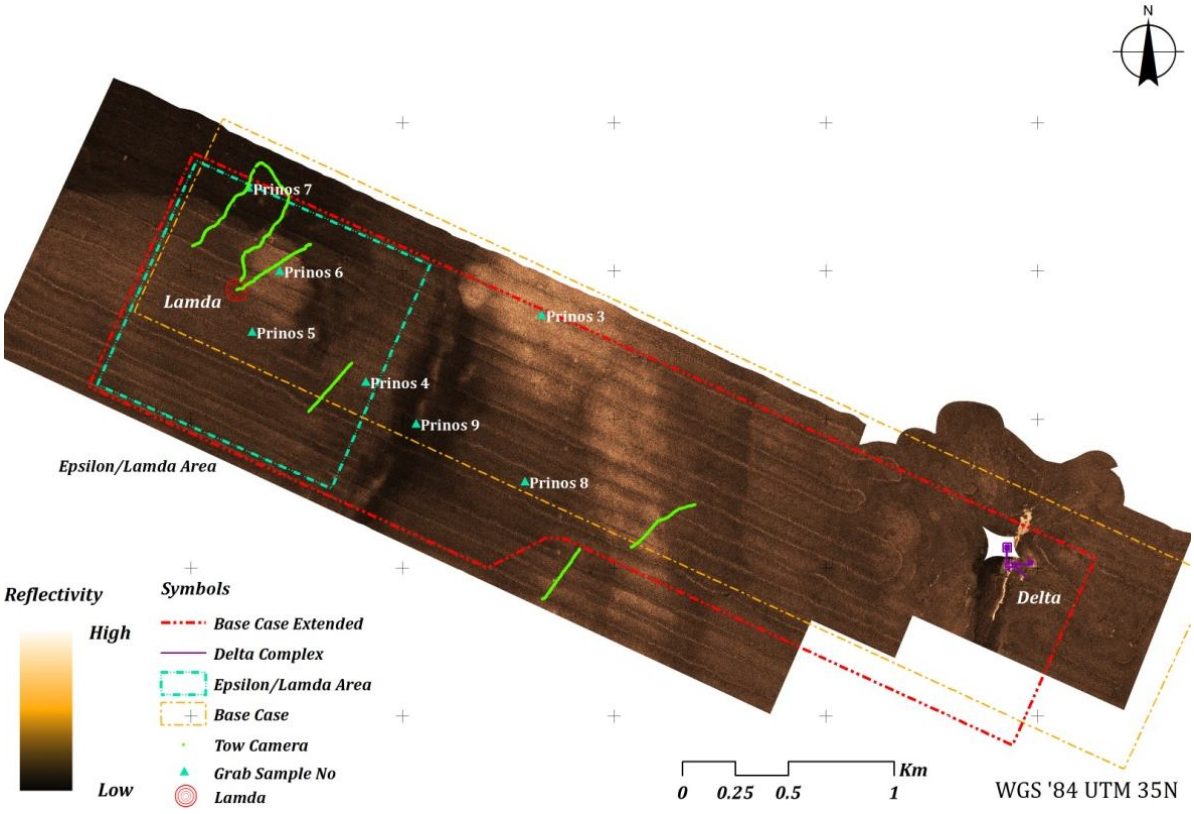


Figure 8-7: Sample locations and tow camera tracklines carried out at the Base Case Area, Lamda Platform.

In the following table, it is presented the information about the collected sediment samples, concerning: (1) location, (2) depth, (3) sample code, (4) indicative photos and (5) macroscopic/qualitative description.

Table 8-9: Information about the sediment samples collected during the ground-truth survey. Colour coding was held according to the "Munsell Soil Colour Chart"

Location (1)		Depth (m) (2)	Sample code (3)	Indicative Photo (4)	Macroscopic description (5)
X	Y				
286657	4520588	28.3	PRINOS_3		Top Layer: Maerl (thickness >5 cm) Base Layer: Light brownish grey (2.5Y 6/2) silty sand with high presence of biogenic fragments
285826	4520273	50.3	PRINOS_4		Greyish brown (2.5Y 5/2) silty sand with high presence of biogenic fragments, gastropods and bivalve shells

Location (1)		Depth (m) (2)	Sample code (3)	Indicative Photo (4)	Macroscopic description (5)
X	Y				
285289	4520508	39.6	PRINOS_5		Dark greyish brown (2.5Y 4/2) silty sand with presence of biogenic fragments and plant residues
285419	4520795	40.6	PRINOS_6		Top Layer: Maerl (thickness >5 cm) and bivalve shells Base Layer: Greyish brown (2.5Y 5/2) sandy silt
285272	4521187	47.7	PRINOS_7		Gray (2.5Y 5/1) silt with low presence of biogenic fragments and gastropods. It is covered by a thin veneer of brown (10YR 4/3) watery, clayey layer
286577	4519802	37.7	PRINOS_8		Greyish brown (2.5Y 5/2) silty sand with presence of biogenic fragments and gastropods
286064	4520076	50.4	PRINOS_9		Greyish brown (2.5Y 5/2) sandy silt with presence of biogenic fragments

Sediment Quality

With regards to the sediment quality in the area of existing and proposed platforms, a survey of "Trace Metal determination and pollution assessment" and a survey of "Polycyclic Aromatic Hydrocarbons" have been carried out by the National Technical University of Athens. The main findings related to the sediment quality are presented below in brief while the full reports are included in Annex 06. Surface sediments were collected from thirteen (13) stations and were analyzed for metal and PAHs concentrations.

Map 8-6: Sampling points of sediments

The metal concentration in sediment is given in the following table. All values are expressed in mg/kg of dry sample with the exception of iron Fe in sediments, which is expressed in % w/w. Minimum, maximum and median values determined in the sediments are also reported.

Table 8-10: Metal concentration in sediments

Sampling point	% w/w	µg/g									
	Fe	As	Pb	Cr	Cu	Mn	Ni	Co	Zn	Cd	Mo
Sampling point 1	1.22	5.1	12.1	8.7	3.8	154.9	5.0	4.7	24.5	0.6	<0.5
Sampling point 3	4.69	12.2	41.6	59.8	24.6	310.3	34.5	11.2	106.4	1.8	<0.5
Sampling point 4	1.82	6.1	22.1	24.9	9.1	226.5	14.8	7.0	51.2	1.1	<0.5
Sampling point 5	1.16	7.1	23.1	17.8	8.1	190.1	9.8	4.4	39.3	0.7	<0.5
Sampling point 6	1.40	6.9	19.7	13.5	4.6	156.5	7.0	4.3	37.2	0.7	<0.5
Sampling point 7	2.85	9.7	34.9	52.5	21.1	283.6	30.3	9.3	89.0	1.4	<0.5
Sampling point 8	1.06	4.3	24.4	16.7	8.0	146.7	9.9	4.0	48.4	0.7	<0.5

Sampling point 10	0.92	7.5	25.7	14.0	6.5	127.1	7.6	3.6	35.4	0.6	<0.5
Sampling point 11	0.61	4.4	31.2	13.6	6.8	97.0	5.8	2.8	33.7	0.4	<0.5
Sampling point 12	0.60	5.8	16.3	9.6	3.7	80.4	5.5	2.6	22.8	0.4	<0.5
Sampling point 13	0.90	3.3	18.8	12.7	5.6	166.4	7.8	3.8	31.6	0.6	<0.5
Sampling point 1E	0.61	7.85	16.13	9.97	25.9	222.2	5.7	4.6	23.5	1.81	<0.5
Sampling point 2E	0.77	6.10	11.46	7.41	30.8	238.3	4.6	2.7	26.8	1.71	<0.5
maximum	4.69	12.2	41.6	59.8	24.6	310.3	34.5	11.2	106.4	1.8	n/a
minimum	0.60	3.3	12.1	8.7	3.7	80.4	5.0	2.6	22.8	0.4	n/a
median	1.16	6.1	23.1	14.0	6.8	156.5	7.8	4.3	37.2	0.7	n/a
STDEV	1.21	2.6	8.5	17.4	7.0	72.1	10.2	2.8	26.7	0.4	n/a

The strong correlation (Pearson correlation coefficient) of most elements reveals a common origin of the examined samples. All elements except copper (Cu) and cadmium (Cd) show strong correlation with iron (Fe), suggesting common lithogenic origin. Cd and Cu on the other hand, show strong correlation between them but not with the rest of the elements thus suggesting a common, most probably, anthropogenic origin. Estimation of the element distribution among the sampling sites is depicted in the following figures revealing peak values for all the examined elements at the sampling sites 3 and 7, although As, Pb and Mn show a broader distribution.

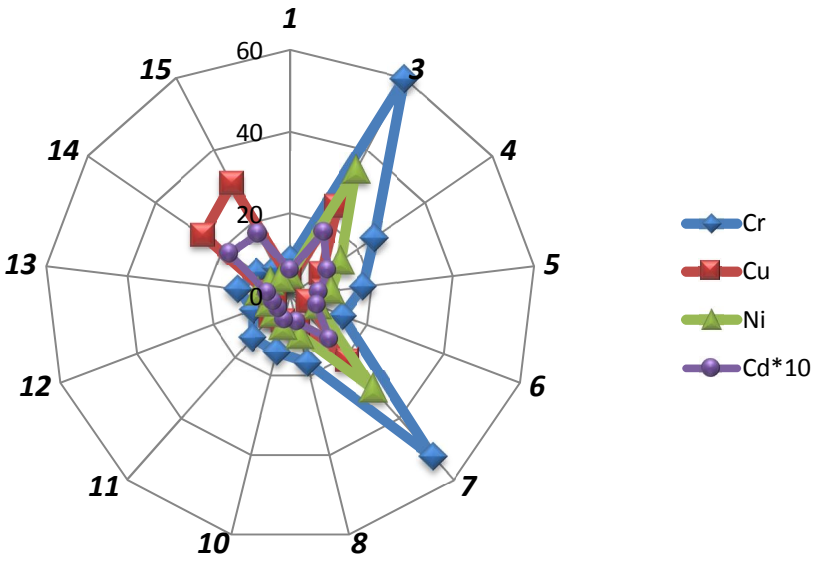


Figure 8-8: Distribution of Cr, Cu, Ni and Cd in the sampling sites (Cd is plotted as ten times the actual concentration for scale reasons)

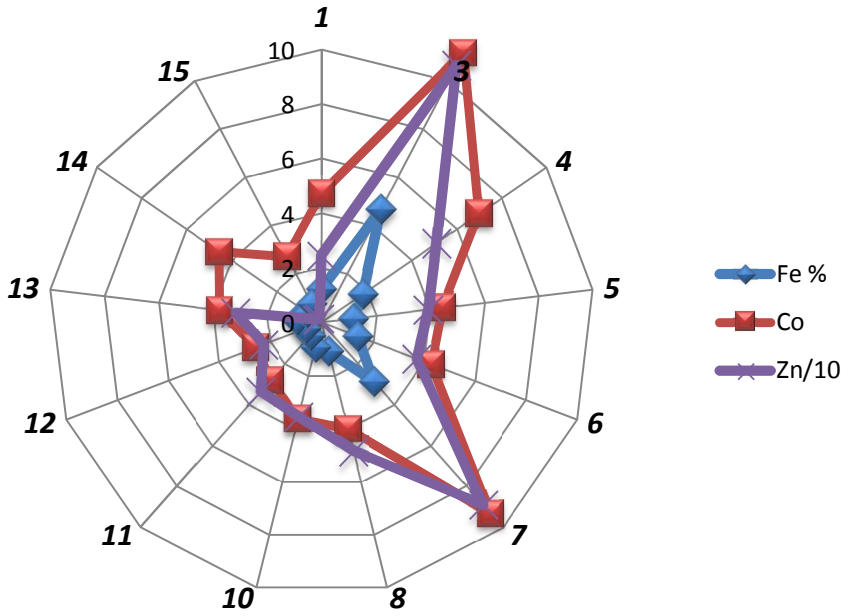


Figure 8-9: Distribution of Co, Zn and Fe in the sampling sites (Zinc is plotted as 1/10 of the actual concentration for scale reasons)

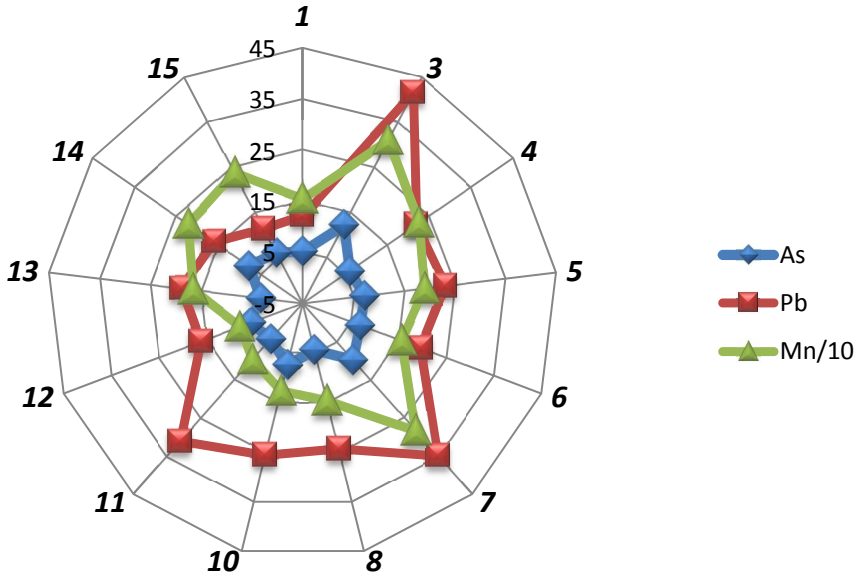


Figure 8-10: Distribution of Pb, As and Mn in the sampling sites (Manganese is plotted as 1/10 of the actual concentration for scale reasons)

The results of PAHs analysis are presented in the following table.

Table 8-11: PAHs in sediments (μg/L)

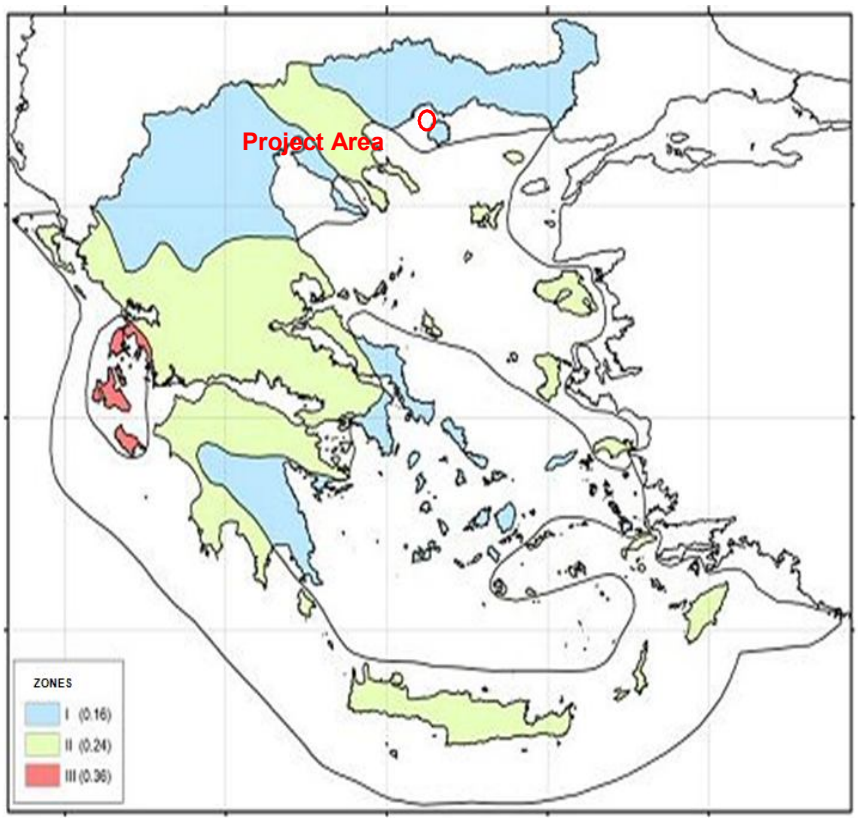
Sampling point	NAPH	ANTH	FLUO	B[b]F	B[k]F	B[a]P	B[ghi]P	IP
Sampling point 1	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
Sampling point 3	N.D	<LOQ	N.D	0.005	<LOQ	<LOQ	<LOQ	N.D
Sampling point 4	N.D	N.D	N.D	<LOQ	N.D	N.D	N.D	N.D
Sampling point 6	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
Sampling point 7	N.D	<LOQ	N.D	0.004	<LOQ	<LOQ	<LOQ	N.D
Sampling point 8	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
Sampling point 10	N.D	N.D	N.D	<LOQ	N.D	N.D	<LOQ	N.D
Sampling point 11	N.D	<LOQ	<LOQ	0.008	0.004	0.006	0.005	<LOQ
Sampling point 12	N.D	N.D	N.D	<LOQ	N.D	N.D	<LOQ	N.D
Sampling point 13	N.D	N.D	N.D	<LOQ	N.D	N.D	N.D	N.D
Sampling point 1E	N.D	N.D	N.D	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
Sampling point 2E	N.D	N.D	N.D	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ

N.D.: Not detected
LOQ: Level Of Quantification

Conclusively and according to the outcomes presented above, the study area shows minor metal enrichment except cadmium (Cd). Despite this observed anomaly, the quality of the sediments is below baseline metal pollution with the exception of sites 3 and 7 which show increasing pollution levels The conclusion is drawn based on the average earth crust as reference environment and is considered to be representative of the present situation. The results of the determination of the main PAHs in sediments indicate the non-existence of pollution problems concerning this type of pollutant neither in the area of the existing facilities, nor in the area of the planned installations. The concentrations are below the EU thresholds for Good Environmental Status of marine environment.

8.3.3 Tectonic characteristics

With regards to the seismicity of the area, the onshore and offshore project area is classified in the seismic risk zone I, namely in the lower category (see map below) in accordance with the "Amendment to the Provisions of the Greek Seismic Code GSC 2000 due to Revision to the Seismic Risk Map GG 1154/B/12.08.2003".



Map 8-7: Seismic risk zone map of Greece2

8.4 WATER ENVIRONMENT

This chapter presents the quantity and quality status of surface and groundwater bodies in the study area according to the National River Basin Management Plans (RBMPs) which were prepared in accordance with the Water Framework Directive 2000/60 and carried out under the responsibility of Special Secretariat for Water of the Ministry of Environment. Moreover, it presents in brief the main findings of the "Polycyclic Aromatic Hydrocarbons" survey and "Trace Metal determination and pollution assessment" survey (carried out by the National Technical University of Athens) related to the seawater quality in the area of existing and proposed platforms. The full report is included in Annex 06.

This chapter also presents the quality of bathing waters according to the "Monitoring Program of bathing water quality on the coast Greece in accordance to the specification set out in the Directive 2006/7/EC", carried out under the responsibility of Special Secretariat for Water of the Ministry of Environment.

[2] *Seismic risk zones of Greek territory, Earthquake Planning and Protection Organization (EPPO), available at the link: http://www.oasp.gr/ (last visited on 5/05/2015).*

8.4.1 Surface Water

The project area belongs to the 11th and 12th Water Districts. More specifically, the onshore facilities belong to the river basin of Nestos. Moreover, close to the offshore facilities (SIGMA), at the west, there is a stream named Kotsas stream. The ecological and chemical status of Kotsas stream is characterized as unknown.

With regards to the Coastal Water Bodies (CWB,) the project area belongs to GR1106C0004N "Gulf of Kavala West" and GR1207C0001N "Gulf of Kavala East" and is close to the CWB GR242C0012N "Thasos coast". The ecological status of the CWB GR1106C0004N is characterized as "medium" and the chemical status as "unknown". The ecological status of the CWB GR1207C0001N is characterized as medium and the chemical status as "failing to achieve good". Finally, the ecological status of the CWB GR242C0012N is characterized as "high" and the chemical status as "good".

As already mentioned, a survey of "Trace Metal determination and pollution assessment" and a survey of "Polycyclic Aromatic Hydrocarbons" have been carried out by the National Technical University of Athens (see Annex 06). The seawater samples were collected from four sampling points and analyzed for metal and PAHs concentrations. The results of metal (Fe, As, Pb, Cr, Cu, Mn, Ni, Co, Zn, Cd) concentrations were below the quantification limits. The results of PAHs analysis are presented in the following table.

Map 8-8: Seawater sampling points

Table 8-12: PAHs in seawater (μg/L)

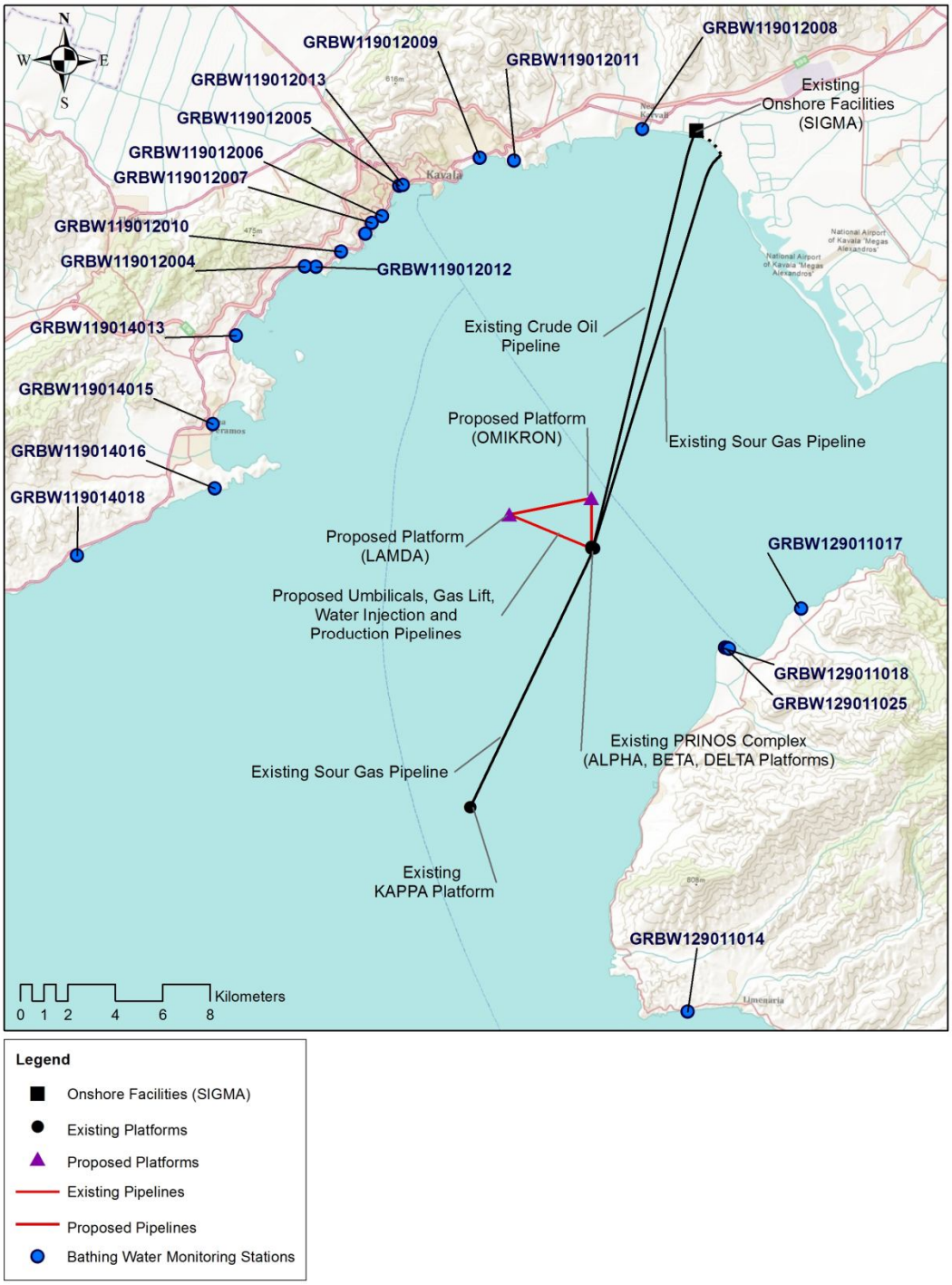
Sampling point	NAPH	ANTH	FLUO	B[b]F	B[k]F	B[a]P	B[ghi]P	IP
Sampling point 11	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
Sampling point 13	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
Sampling point 1E	<LOQ	N.D	N.D	N.D	N.D	N.D	N.D	N.D
Sampling point 2E	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D

N.D.: Not detected
LOQ: Level Of Quantification

The results of the determination of the main PAHs in seawater indicate the non-existence of pollution problems concerning this type of pollution. All metal and PAHs values were below detection or quantification limit and below the EU thresholds for Good Environmental Status of marine environment.

8.4.2 Bathing waters

The quality of bathing water is monitored under "Monitoring Program of bathing water quality on the coast Greece in accordance to the specification set out in the Directive 2006/7/EC", carried out under the responsibility of Special Secretariat for Water of the Ministry of Environment. The monitoring stations of the wider project area are shown in the following map. The quality of the bathing water per each station are given in the below tables.



Map 8-9: Bathing Water Monitoring Stations in the wider study area

Table 8-13: Quality of bathing waters from 2011 till 2014 in the wider study area

Code of Monitoring Station	Name of Monitoring Station	Results 2011	Results 2012	Results 2013	Results 2014
GRBW129011017	Rachoniou Lake	High	High	High	High
GRBW129011018	Thasos Dasyllio 1	High	High	High	High

Code of Monitoring Station	Name of Monitoring Station	Results 2011	Results 2012	Results 2013	Results 2014
GRBW129011025	Thasos Dasyllio 1	High	High	High	High
GRBW129011014	Limenaria	High	High	High	High
GRBW119012008	Nea Karvali	High	High	High	High
GRBW119012011	Aspri Ammos	High	High	High	High
GRBW119012009	Perigiali	High	High	High	High
GRBW119012013	Rapsani 2	High	Good	Sufficient	Good
GRBW119012005	Rapsani 1	High	Good	Good	Good
GRBW119012006	Kalamitsa	High	High	High	High
GRBW119012007	Mpatis	High	High	High	High
GRBW119012010	Toska	High	High	High	High
GRBW119012004	Palio	High	High	High	High
GRBW119014013	Nea Iraklitsa	High	High	High	High
GRBW119014015	Nea Peramos	High	High	High	High
GRBW119014016	Ammolofoi	High	High	High	High
GRBW119014018	Ocean View	High	High	High	High

8.4.3 Terrestrial Groundwater Bodies

The onshore facilities (SIGMA) belong to the Groundwater Body (GWB) GR1100130 “System of Symvolou – Kavala” which is a fractured aquifer system. With regards to the qualitative status of this GWB, small point pollution sources from livestock activities are observed. However, overruns of water quality have not been detected and also pollution trend in the concentrations of qualitative parameters of the system have not been not diagnosed. The qualitative (chemical) status is characterized as “good”. With regards to the quantitative status of this GWB, there is no available information concerning the piezometer of the aquifer. In this GWB system, 36 wells and 20 springs have been identified. The wells’ supply is ranging from 10 to 50 m^3/h and is utilized to cover water supply and irrigation needs. According to the hydrogeological conditions and the registration of the wells, no indication of overpumping is observed and the quantitative status is characterized “good”.

The onshore facilities borders with the GWB GR1200060 “Nestos Delta System” which is an alluvial aquifer system. The system has hydraulic communication with the river Nestos from which it receives strong water supply. In this GWB, it has been observed seawater intrusion in the eastern part and high concentration of EC and Cl due to the overpumping of the aquifer for irrigation needs. The number of wells in this aquifer is 510. The quality status of this GWB is degraded due to industrial pollution from food, agricultural and ceramics industries, urban pollution from wastewater discharges and presence of underground geothermal fluids. The qualitative (chemical) status is characterized as “bad”. The quantitative status of this GWB is characterized as “good” because the estimated amount of total abstractions are less than the

annual renewable water reserves. However and as mentioned above, overpumping is observed in the waster eastern part during the irrigation period and the water balance is deficit.

8.5 AIR ENVIRONMENT - AIR QUALITY

The probable degradation of air quality may occur from the various industries in the wider project area:

- Industrial activity of Energean (Sigma onshore and offshore facilities)
- Greek Fertilizers and Chemical ELFE SA
- Activity in port Philippos B' as well as Kavala and Keramoti ports
- Road Traffic (Egnatia motorway, side roads connections and urban Kavala network)

Energean (previously Kavala Oil) operates continuously since 1979 an air quality monitoring station located within 500 meters of shore-based installations "Sigma" fully equipped with all necessary equipment for continuous monitoring of air quality:

- Concentration of hydrogen sulphide (H_2S).
- Concentration of sulphur dioxide (SO_2).
- Concentration of total hydrocarbons (HCT).
- Concentration of methane (CH_4)
- Concentration of non-methane hydrocarbons (NMHC).
- Measurements of meteorological parameters (wind direction and speed, ambient temperature, relative humidity).

In the region of Thasos and Kavala are established 12 monitoring stations of total sulphation of the atmosphere on a monthly basis.

According to the recent annual report 2014 of the onshore and offshore facilities of Energean for 2014, the measurements of the sulphur dioxide (SO_2) and hydrogen sulphide (H_2S) analysers of the Environmental Stations and the results from the 12 air sulfation monitoring stations in the surrounding of area of Kavala and Thasos were all within the permissible limits as shown in the following diagrams.

The annual GHG emission of onshore & offshore facilities according to the TUV Austria Hellas verification statement of 2014 is 34,100 tn CO2. The verification statement is sufficient and has been conducted according to the 600/2012/EU and 601/2012/EU Regulations and there are no important inaccuracies.

The annual inventory of European Pollutant Release and Transfer Register has been submitted until the year 2014 to the Division EARTH of the Ministry of Environment, Energy and Climate Change (YPEKA, currently YPEN).

The sulphur oxides (SO_x/SO_2) and nitrous oxide (NOx) emission of the offshore facilities during 2014 is 1,517 tn and 1.075 tn respectively.

The GHG emissions of the offshore facilities during 2014 were 1,684 tn CO_2.

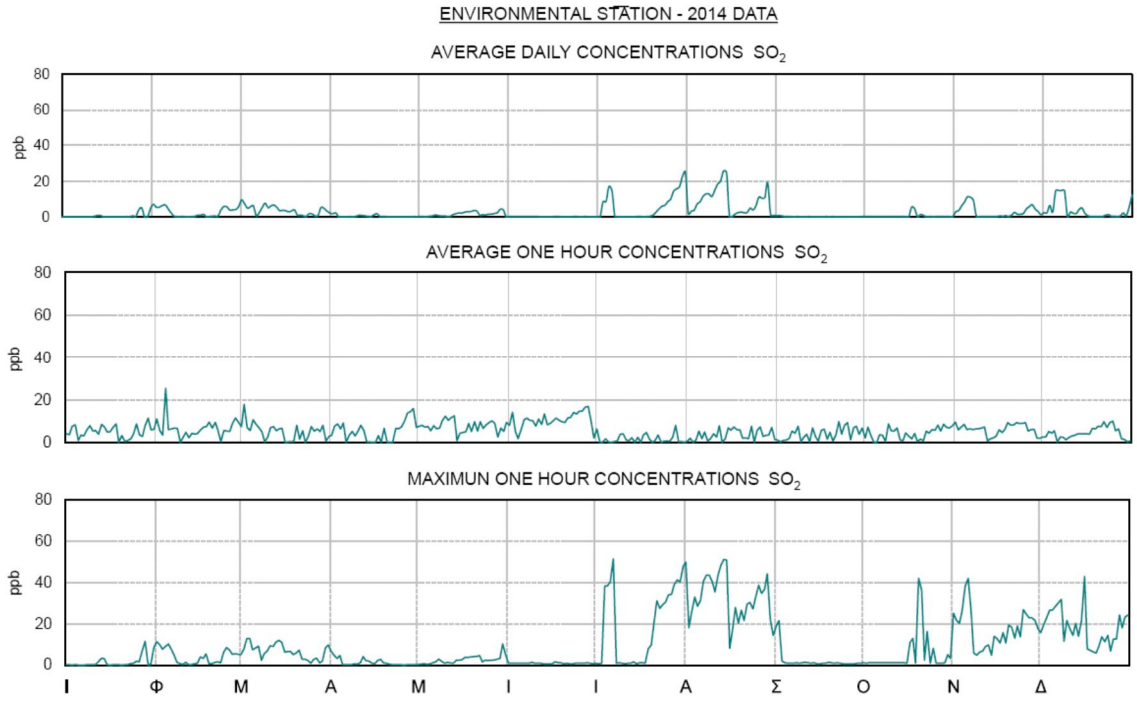


Diagram 8-10: Average SO2 concentrations in ppb.

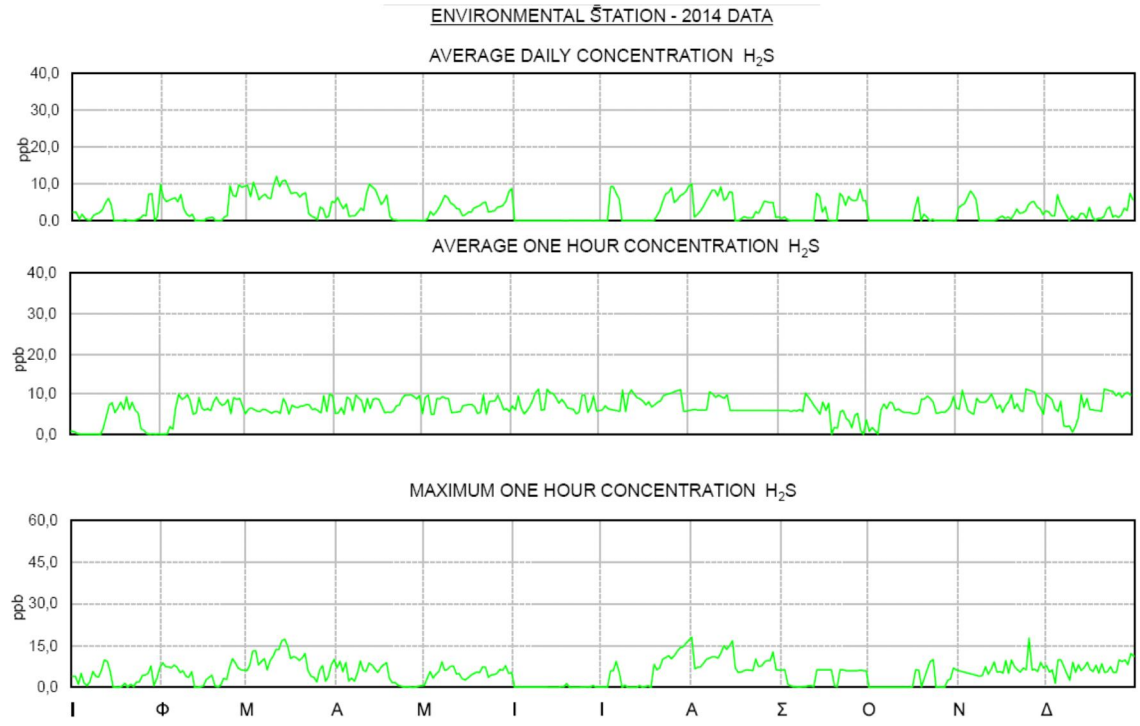


Diagram 8-11: Average H2S concentrations in ppb

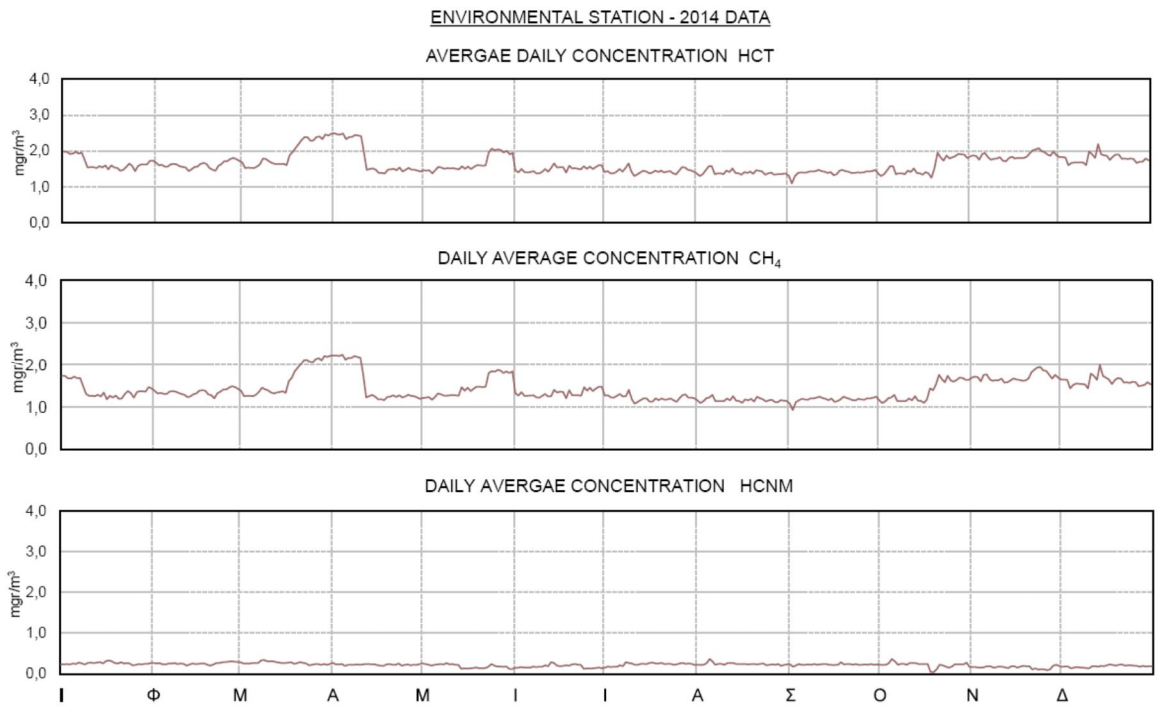


Diagram 8-12: Average Total Hydrocarbon- HCT concentrations in mg/m3

The air pollution waste of offshore facilities originates from the use of natural gas fuel and diesel. The points where natural gas fuel gas is consumed are:

- Torch chimney, FS-165 of Delta Rig
- Pilots and purge of the complex flare
- The glycol reboiler for the dehydration of sour natural gas, E-102, on Delta Rig.

In addition, the atmospheric flash gases of the produced water are sent continuously to flare. These are calculated at 420 Nm^3/h, with a hydrogen sulphide content of 40% by volume.

Smoke from the glycol furnace does not exceed level 1 of the Ringelman scale. Moreover, neither burning chamber nor any point of the production process releases dust to the ambient environment of the installation.

Diesel is consumed by the motors of the platforms cranes, the backup firefighting pump, the emergency generator on Delta and the generators on Kappa. Any impact from their operation is minimal because the measured pollutants are within the accepted limits/thresholds. The overall processes are fully monitored by the existing Environmental Monitoring Plan, currently providing annual Environmental Reports to the Ministry's agencies.

8.6 ACOUSTIC ENVIRONMENT

The major sources of impacts on acoustic environment in the wider area are:

- Industrial noise from facilities operating in the region (Energean Oil and Gas, Greek Fertilizers and Chemical ELFE SA , quarries);

- Noise from the activity in the commercial port of Philippos II;
- The movement of vehicles on roads in the region, including heavy vehicles, due to industrial activity;
- Noise from the marine traffic;
- Typical urban activities in settlements of the region.

The operation of the offshore facilities is continuous and, therefore, there are not significant fluctuations in the level of noise. It must also be noted that, there is a 500m exclusion zone around the offshore facilities, thus there is not an effect of noise to the passing fishing vessels and ships. The offshore facilities do not constitute a source of noise for the surrounding area due to the limitation of 65db that is enforced at the border of the facility.

8.7 BIOTIC ENVIRONMENT

8.7.1 Plankton

According to the available desk based information, the Aegean Sea, like the rest of the eastern Mediterranean Sea, is an area of low nutrient concentration, plankton biomass and production. The water-column structure of the N. Aegean is influenced by the input of brackish waters from the Black Sea through the Dardanelles generating strong salinity stratification in the upper layers during both seasons. Furthermore, the Black Sea waters being significantly colder in spring produced in the N. Aegean a 20 m thick surface layer cooler than the subsurface waters at that season. The North Aegean, which is influenced by Black Sea waters (BSW), is relatively more productive than the highly oligotrophic southern part. The main zooplanktophagus fish in the area is the European anchovy (*Engraulis encrasicolus*). The main zooplankton groups are Holoplankton (Chaetognaths, Cladocerans, Appendicularians, Copepods, Doliolids, Euphausiids, Medusae, Ostracods, Pteropods, Siphonophores) and Meroplankton (Gastropod larvae, Lamellibranchia larvae). In the surface level (0-50 m), copepods, cladocerans and appendicularians showed highest abundance in coastal areas, whereas chaetognaths and doliolids in pelagic areas. Below the surface layer, copepods constituted the bulk of zooplankton and chaetognaths became more important than in the surface. The abundance of the main groups showed a strong decrease with depth with the exception of ostracods, which showed an increasing trend. The larval fishes that were identified in the North Aegean area are: *Sardinia aurita, Engraulis encrasicolus, Cyclothone braueri, Vinciguerria soo., Ceratoscopelus maderensis, Hygophum benoti, Lampanyctus crocodiles, Lobianchia dofleini, Myctophum punctatum, Lestidiops jayakari, Callanthias ruber, Serranus hepatus, Serranus cabrilla, Capola rubescens, Trachurus mediterraneus, Mullus spp., Chromis chromis, Coris julis, Labridae I, Labridae II, Auxis rochei, Scomber japonicas, Callionymus maculatus, Callionymus risso, Arnoglossus laterna, Arnoglossus thori, Buglossidium luteum, Maurolicus muelleri, Bentosema glaciale, Lampanyctus crocodiles*.

According to the available desk based information and with regards to the phytoplankton, picoplankton dominates and contributes more in total chlorophyll a (chla) and total primary production in the North and South Aegean Sea. Microplankton is next in abundance proportions of total chla and total primary production and ultraplankton has the lowest contribution. It is noted that no specific surveys have been carried out in the project area and so no location specific information is available.

Source: Laboratory of Zoology, Department of Biology, University of Patra, 2005, Mesozooplankton distribution in relation to hydrology of the Northeastern Aegean Sea, Eastern Mediterranean

Institute of Biology of the National Research Centre Democritos, Institute of Marine Biology of Crete, Institute of Oceanography, National Centre for Marine Research, 2001, Phytoplankton size-based dynamics in the Aegean Sea (Eastern Mediterranean)

Institute of Marine Biology of Crete, 1996, Distribution and abundance of larval fish in the northern Aegean Sea – Eastern Mediterranean – in relation to early summer oceanographic conditions

8.7.2 Benthic Communities and Habitats

In order to assess the marine ecology of the area, a field survey was undertaken in order to collect benthic samples, which were processed for lab analysis and identification. The "Study of the benthic communities in Prinos area, Kavala Bay" as well as the analytic laboratory methods and conclusions are found in Annex 05. The legislation that has been enforced for the assessment of the Environmental Status of the marine waters of Kavala gulf is the "Marine Strategy Framework Directive (MSFD)" (EC, 2013). The MSFD directive has set the criteria to achieve good environment status of marine waters. It is noted that the statistical package PRIMER was used for the statistical treatment of data, while the Ecological Quality was assessed using the index BENTIX (Simboura & Zenetos, 2002) recommended for the Eastern Mediterranean.

The report of the Marine ecology of the area in scope examines a number of environmental parameters. The parameters that have been examined in the study are:

- The ecological indicators (number of species and number of individuals) per platform and per station,
- The diversity of community characteristics (number of species and individuals and diversity per station and platform),
- The Good Environmental Status according to Marine Directive.

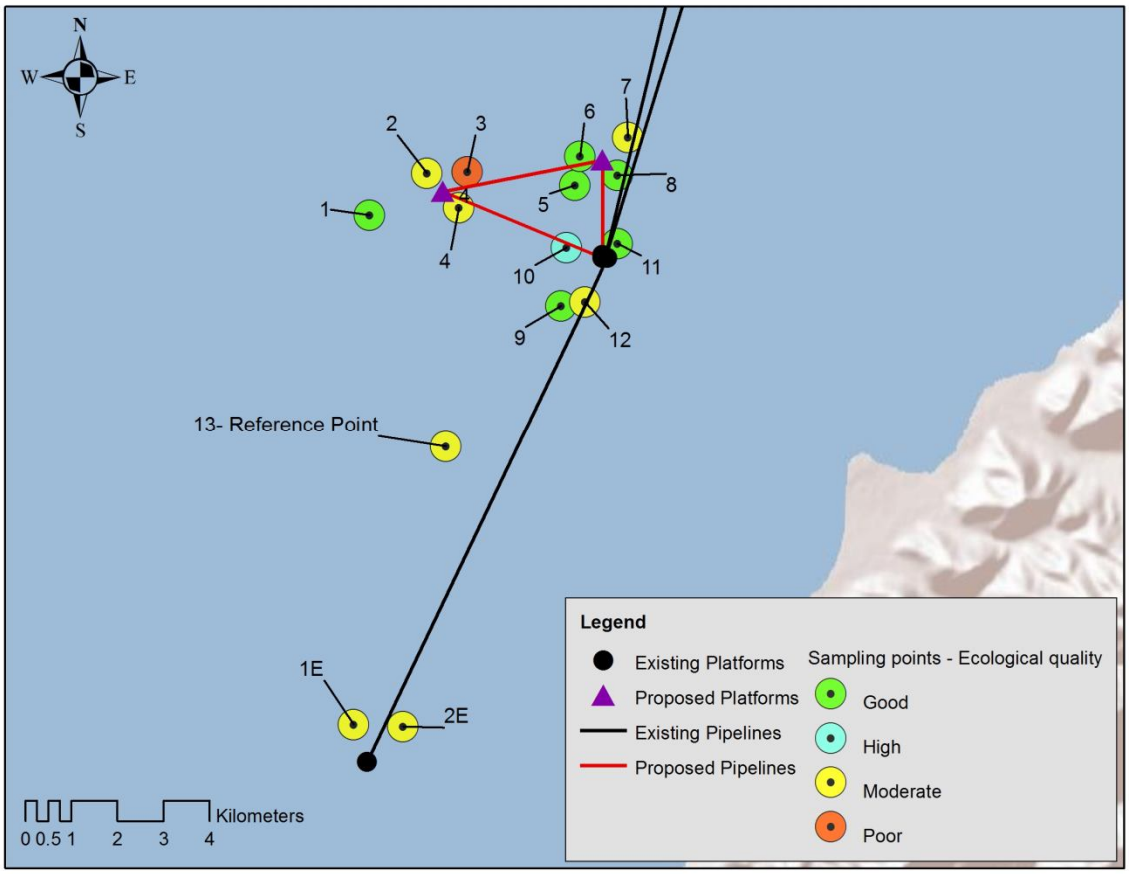
The quantitative results of the Marine ecology study are shown in the following table and while the study is given in Annex 05.

Table 8-14: Values of BENTIX and ecological quality of sampling stations

St.	PL[3]	Diversity H'	Classif. H'	Richness S	Classif. S	Bentix	Classif. MSFD	Class. WFD
1	L	3.22		31	GEnS	3.53	GEnS	GOOD

[3] *PL: Platform; L: Lamda; O: Omicron; D: Delta; R: Reference point; K: Kappa*

St.	PL[3]	Diversity H'	Classif. H'	Richness S	Classif. S	Bentix	Classif. MSFD	Class. WFD
2	L	1.42		5		2.8		MODERATE
3	L	1.78		10		2.2		POOR
4	L	3.02		27	GEnS	3.22		MODERATE
5	O	3.35		38	GEnS	4.24	GEnS	GOOD
6	O	3.16		31	GEnS	3.63	GEnS	GOOD
7	O	2.43		13		3		MODERATE
8	O	3.29		34	GEnS	3.56	GEnS	GOOD
9	D	3.03		34	GEnS	4.09	GEnS	GOOD
10	D	3.04		36	GEnS	4.87	GEnS	HIGH
11	D	2.97		31	GEnS	4.45	GEnS	GOOD
12	D	3.22		49	GEnS	3.46		MODERATE
13	R	2.24		13		2.89		MODERATE
1E	K	3.18		36	GEnS	3.1		MODERATE
2E	K	3.62		55	GEnS	3.34		MODERATE



Map 8-10: Graphical representation of the ecological quality of the sampling stations. Colour symbolism as in the Water Framework Directive

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Concerning community structure, the species found in the “Study of the benthic communities in

Prinos area, Kavala Bay (Annex 05)" are either characteristic or abundant in benthic communities of the Circalittoral Zone of the Mediterranean, as described by the classic work of Peres and Picard (Peres 1967). Thus, there were species belonging to the Coastal Terrigenous Mud (VTC), such as the polychaetes Sternaspis scutata Laonice cirrata and Goniada sp., the bivalve Abra alba and the crab Goneplax rhomboides. There were also species belonging to the Coastal Detritic (DC) community, such as the polychaetes Glycera rouxi and Terebellides stroemi the bivalves Corbula gibba and Tellina serrata, the crab Ebalia and the echinoderms Amphipholis squamata and Amphiura chiajei. The biogenic detritus originate from inorganic parts of benthic organisms and they are often covered by layers of calcareous algae. Such detritus were quite abundant in the study area. It is worth noticing that a lot of the common or abundant species found in this study have also been mentioned by previous studies in the Bay of Kavala at similar depths by Zarkanellas (1977) and Papazaharias et al (1998). The benthic communities in the study area are typical of the Mediterranean in the given depthsand similar to those described for the area in the past. Moreover, there is an increased number of species and individuals in the area of the installations, which is due to the exclusion of the area of other activities and the resulting protection of the sea bottom. With regards to the marine habitats and according to the field survey of marine ecology, the habitat in the area of proposed and new platforms can be characterized as "Mediterranean communities of muddy detritic bottoms" in accordance to the EUNIS Habitat classification. The description of this habitat is "This biocenosis develops in areas where a detritus bottom is covered with mud formed by terrigenous deposits from rivers. The sediment is a very muddy sand or sandy mud, or even a rather compacted mud, rich in shell debris or volcanic fragments (scoriae); sedimentation is slow enough to allow the development of sessile epifauna. Gravel, sand and mud are mixed in varying quantities, but mud always predominates". This habitat type is not characterized as "priority" habitat and is not included in the Annex I of the Habitats Directive 92/43/EEC. Annex I contains the types of habitats whose conservation requires the designation of special areas of conservation and some of them are defined as "priority" habitats (in danger of disappearing).

8.7.3 Fish Species

According to the available desk based information, the Aegean Sea is separated into two sub-areas in respect of the distribution of fish fauna: (i) the northern Aegean Sea, roughly a rectangular basin, separated from the South Aegean by the archipelago of the Kyklades islands, characterized by cold water fauna, and (ii) the southern Aegean Sea characterized by more thermophilic species, as well as Lessepsian immigrants from the Red Sea. The dominant fish species in the Thracian Sea based on abundance rank for different depth groups identified by cluster analysis are shown in the following table.

Table 8-15: Dominant fish species and protection status in the Thracian Sea based on abundance rank for various depth groups identified by cluster analysis.

Fish species in depth 16-28 m average similarity: 67.8 SD: 4.9	Protection status Bern Convention	Protection status 2009/147/EC Habitat Directive
Arnoglossus laterna	Not included	Not included
Serranus hepatus	Not included	Not included
Diplodus annularis	Not included	Not included
Gobius niger	Not included	Not included
Mullus barbatus	Not included	Not included
Trisopterus minutus capelanus	Not included	Not included
Spicara flexuosa	Not included	Not included
Trigla lucerna	Not included	Not included
Merlangius merlangus euxinus	Not included	Not included
Scorpaena notata	Not included	Not included
Merluccius merluccius	Not included	Not included
Gobius paganellus	Not included	Not included
Solea vulgaris	Not included	Not included
Cepola rubescens	Not included	Not included

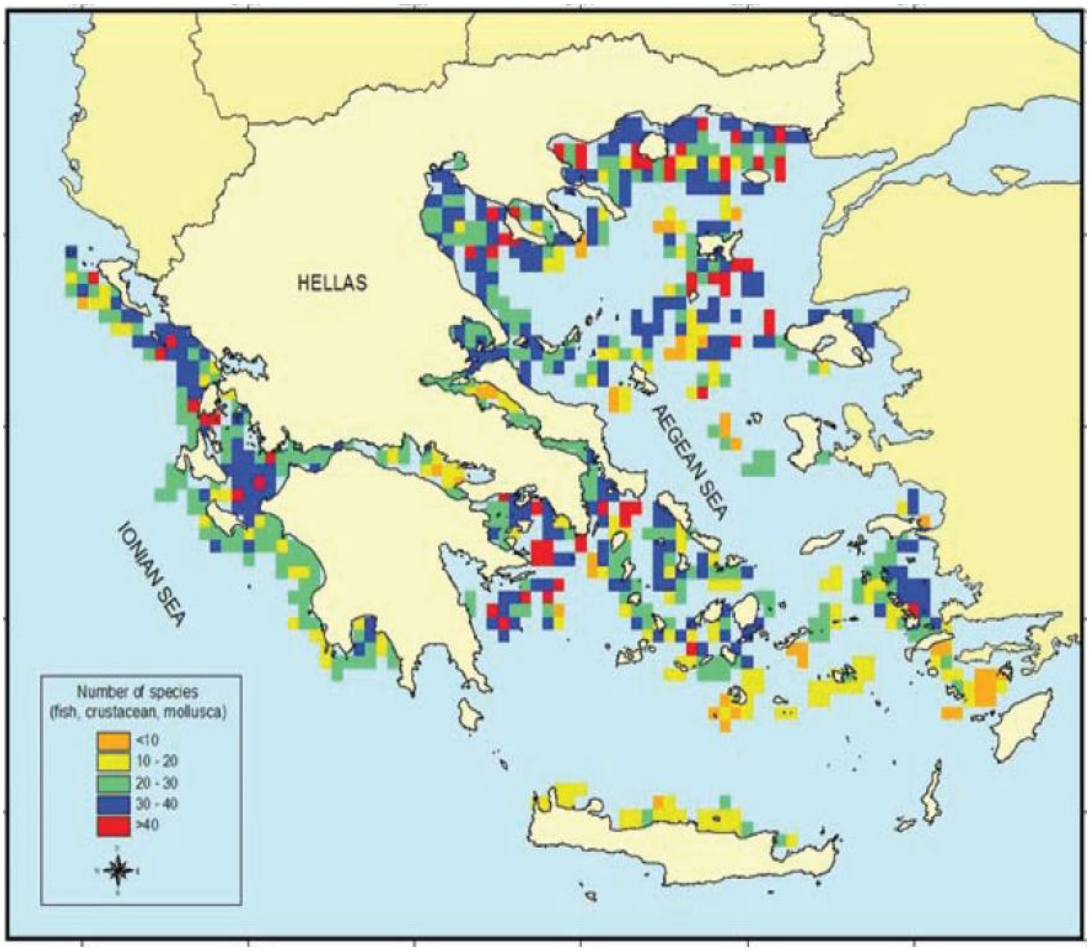
Fish species in depth30-90 m average similarity: 73.8 SD: 7.1	Protection status Bern Convention	Protection status 2009/147/EC Habitat Directive
Serranus hepatus	Not included	Not included
Trisopterus minutus capelanus	Not included	Not included
Mullus barbatus	Not included	Not included
Arnoglossus laterna	Not included	Not included
Merluccius merluccius	Not included	Not included
Spicara flexuosa	Not included	Not included
Lepidotrigla cavillone	Not included	Not included
Cepola rubescens	Not included	Not included
Deltentosteus quadrimaculatus	Not included	Not included
Callionymus maculatus	Not included	Not included
Scyliorhinus canicula	Not included	Not included
Citharus linguatula	Not included	Not included
Lophius budegassa	Not included	Not included
Serranus cabrilla	Not included	Not included
Symphurus ligulatus	Not included	Not included
Gaidropsarus sp.	Not included	Not included
Raja clavata	Not included	Not included
Arnoglossus thori	Not included	Not included

Fish species in depth 100-190 m average similarity: 73.6 SD=4.4	Protection status Bern Convention	Protection status 2009/147/EC Habitat Directive
Trisopterus minutus capelanus	Not included	Not included
Merluccius merluccius	Not included	Not included
Argentina sphyraena	Not included	Not included
Lophius budegassa	Not included	Not included
Lepidorhombus boscii	Not included	Not included
Arnoglossus laterna	Not included	Not included
Scyliorhinus canicula	Not included	Not included

Fish species in depth 100-190 m average similarity: 73.6 SD=4.4	Protection status Bern Convention	Protection status 2009/147/EC Habitat Directive
Lepidotrigla cavillone	Not included	Not included
Callionymus maculatus	Not included	Not included
Cepola rubescens	Not included	Not included
Serranus hepatus	Not included	Not included
Capros aper	Not included	Not included
Phycis blennoides	Not included	Not included
Aspitrigla cuculus	Not included	Not included
Trigla lyra	Not included	Not included
Mullus barbatus	Not included	Not included

Fish species in depth 200-500 m average similarity: 72.3 SD: 7.8	Protection status Bern Convention	Protection status 2009/147/EC Habitat Directive
Hymenocephalus italicus	Not included	Not included
Gadiculus argenteus argenteus	Not included	Not included
Lepidorhombus boscii	Not included	Not included
Micromesistius poutassou	Not included	Not included
Coelorhynchus coelorhynchus	Not included	Not included
Phycis blennoides	Not included	Not included
Lophius budegassa	Not included	Not included
Argentina sphyraena	Not included	Not included
Merluccius merluccius	Not included	Not included
Galeus melastomus	Not included	Not included
Trigla lyra	Not included	Not included
Capros aper	Not included	Not included

According to the information presented in the above table, protected fish species are not expected in the wider project area. The distribution of selected species of interest to commercial and recreational fisheries (crustacean, shell fish, squid and octopuses, sharks, rays and bony fish) based on various survey data is shown in the following map.



Map 8-11: Distribution of selected species of interest to fisheries (crustacean, shell fish, squid and octopuses, sharks, rays and bony fish) based on various survey data. The number of species refers to the estimated mean per sampling operation.

As already mentioned, a survey of “Trace Metal determination and pollution assessment” and a survey of “Polycyclic Aromatic Hydrocarbons” have been carried out by the National Technical University of Athens (see Annex 06).

In total 4 bottom fish samples were obtained, weighting approximately 400 grams each. Two of the fishes were acquired in the waters of Delta platform, while the other two were fished in the area of Lamda platform. An approximate total of 19 bivalve molluscs were obtained, solely found in Delta platform. The encountered species regarded mussels, attached in the metallic “legs” of the platform. Direct retrieval of the mussels from the metallic structures can theoretically result in elevated traces of Fe and other metals within the bivalve tissues, however, the existing intermediate layer of marine growth (biofouling) between the metal and the mussels can also act as an isolating barrier.

The metal concentration in fishes and mussel samples is given in the following table.

Table 8-16: Metal concentration in sediments, fish and mussels sampled in Kavala Gulf

Organisms	µg/g										
Sample name	**Fe**	**As**	**Pb**	**Cr**	**Cu**	**Mn**	**Ni**	**Co**	**Zn**	**Cd**	**Mo**
Mussels MNTUA	69.1	5.8	1.7	<0.5	2.3	4.7	1.4	1.1	52.7	0.5	<0.5
Mussels MUOA	81.1	7.1	2.1	<0.5	3.3	3.8	1.7	1.1	74.7	0.6	<0.5
Fish F3+F4	26.5	<0.5	1.2	<0.5	1.4	2.1	0.9	0.7	32.8	0.2	<0.5
Fish F2	35.0	0.3	1.6	<0.5	2.3	1.7	0.9	0.7	26.8	0.1	<0.5

The correlation (Pearson correlation coefficient) of most elements is strong, verifying the common origin of the trace elements but it must be underlined that the results should be considered with caution due to the limited number of samples.

The results of PAHs analysis are shown in the following table.

Table 8-17: PAHs in fishes and mussels (mg/L)

		NAPH	ANTH	FLUO	B[b]F	B[k]F	B[a]P	B[ghi]P	IP
1	FISH1/EPA 368	18.32	0.69	<LOQ	N.D	N.D	N.D	N.D	N.D
2	FISH2/EPA 369	27.45	1.03	0.98	N.D	N.D	N.D	2.04	N.D
3	FISHES 3+4/EPA 370	17.66	0.65	1.13	N.D	<LOQ	N.D	0.93	N.D
4	MUSSELS/EPA 371	4.17	<LOQ	<LOQ	N.D	N.D	N.D	0.35	N.D

ND: not detected, LOQ: level of quantification

The PAHs values on fishes presented in the above table are lower from the upper limits both for human consumption and for Good Environmental Status.

8.7.4 Marine Mammals

8.7.4.1 International, EU and National Protection Regime of Marine Mammals

Marine mammals are protected by a series of international, EU and national legislative acts. The legislative acts concerning directly the protection of marine mammals are:

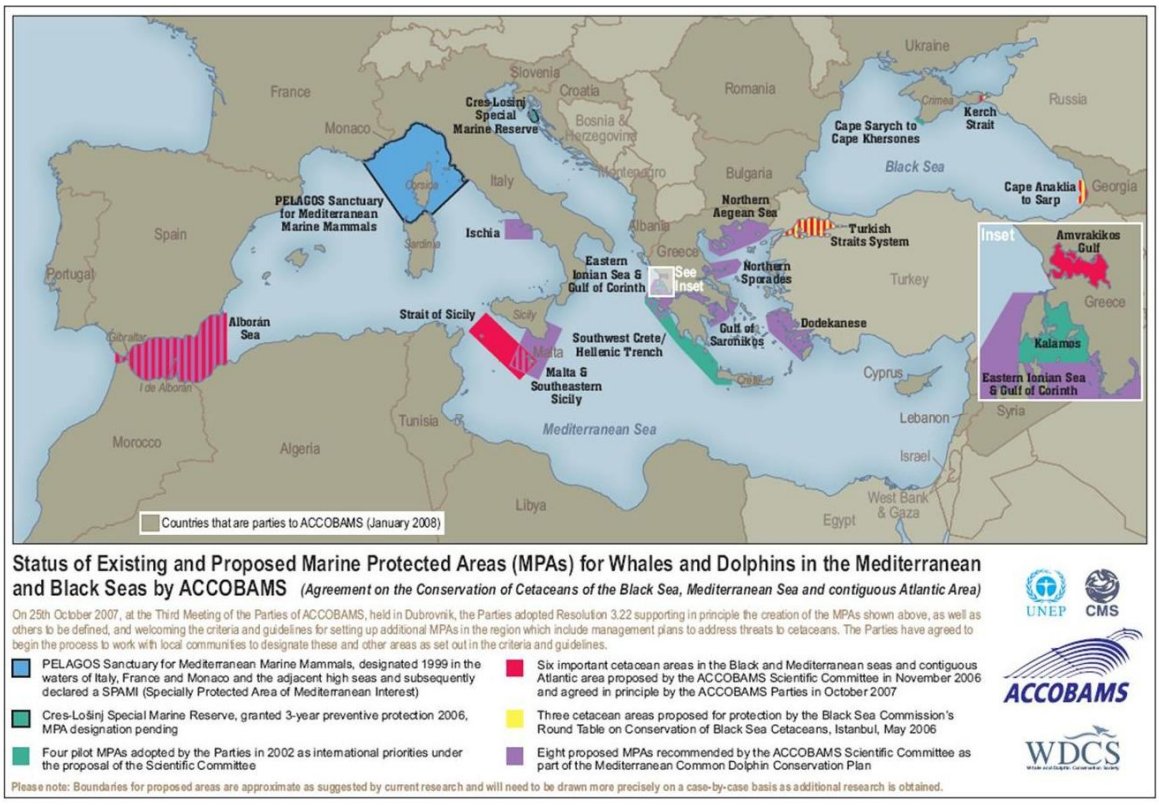
International legislation

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, Washington Convention), (1973)
- The Convention for Protection of the Mediterranean Sea against Pollution (Barcelona Convention) (1976)
- The Convention on the Conservation of Migratory Species of Wild Animal Is (CMS or

Bonn Convention) (1979)

- The Bern Convention on the Conservation of European Wildlife and Natural Habitats (Berne Convention or Bern Convention) (1979)
- The Rio Convention on Biodiversity (1992).
- Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) (1996)

ACCOBAMS has proposed to declare the entire Thracian Sea, Greece, which includes the Project area, as a Marine Protected Area MPA already back in 2007, aiming at the protection of various cetacean populations, but more importantly for the protection of the short-beaked common dolphin population (see map below). Furthermore, the presence of the recently identified sub-species of the harbour porpoise (Phocaea phocoena relicta) in the Thracian Sea is unique for the Mediterranean Sea with additional populations in the Sea of Marmara, and in the Black Sea.



Map 8-12: Status of existing and proposed Marine Protected Areas (MPAs) for Whales and Dolphins in the Mediterranean and Black Seas by ACCOBAMS.
ACCOBAMS (2007): already existing and proposed future Marine Protection Areas for cetaceans in the Mediterranean and the Black Seas. The 8 proposed future MPAs, aiming at the protection of the short-beaked common dolphin are highlighted in purple colour. One of those 8 future MPA's is the Thracian Sea, with its south-most boundary being the island of Limnos, Aegean Sea, and including the marine area adjacent to the peninsula of Chalkidiki, Region of Central Macedonia.

It is noted that up today there is no time schedule from the Greek State for establishment of the abovementioned MAP. Certain obligations, such as specific management measures, monitoring,

zoning, research activities etc. will arise from the future establishment of the MPA. The potential future implications, to the Project and to future activities, by this fact will be faced by:

- Defining the mitigation measures for cetaceans – in this ESIA - according to ACCOBAMS Guidelines.
- Taking into account ACCOBAMS Guidelines in the design of all future activities.
- The participation of Energean, as a stakeholder, in the consultation for the MPA establishment - when put in place sometime in the future.

EU Legislation

The main legal tools of the EU with respect to the protection of marine mammals are the following:

- Council Directive 92/43/EEC of 21 May 1992 “On the conservation of natural habitats and of wild fauna and flora”, or "Habitats Directive", and its Annexes (Official Journal L 206, 22.07.1992).
- Marine Strategy Framework Directive 2008/56/EC (MSFD) of the European Parliament and of the Council, adopted on 17-06-2008
- Directive 2014/89/EE of the European Parliament and the Council of 23 July 2014 “establishing a framework for maritime spatial planning

Additional to the above-mentioned legislation, there are also a number of other EU legislation acts indirectly involving the conservation of cetaceans, primarily through the conservation of their habitats and the populations of their prey species. Two examples are mentioned here:

- Council Regulation (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea amending Regulation (EEC) No 2847/93 and repealing Regulation (EC) No 1626/94 (Mediterranean Fisheries Regulation), aiming at sustainable practices in fisheries, the conservation of the fragile marine environment and the restoration of the fishery resources. The Regulation also sets a series of legislative and policy measures to help eliminate overfishing and illegal fishing.
- Directive 2013/30/EU of the European Parliament and of the Council of 12.06.2013 on safety of offshore oil and gas operations and amending Directive 2004/35/EC which makes a reference to the safety levels and to the required safety measures for offshore oil and gas operations facilities and works.

National legislation

The national legislation, in addition to international conventions and EU regulations and Directives ratified by Greece, also provides the following legal tools that clearly and directly protect the marine mammals in general:

- Presidential Decree (P.D.) 67/1981 "For the Protection of the Wildlife and Native Flora": It lists the species threatened with extinction for the first time.
- Framework Law 1650/1986 constitutes the main legal tool and, since its issue, it has

been supplemented with additional Joint Ministerial Decisions and Presidential Decrees. It lays down the fundamental rules and establishes and provides the necessary legal mechanisms required for the conservation of the environment (the establishment of protection zones, for instance, etc.).

- Biodiversity Law 3937/2011: in accordance with the provisions of the specific Law, the state is obliged to develop and implement action plans for all marine mammals that are part of international conventions and in the EU legislation.
- Joint Ministerial Decision 69269/5387/1990 sets the criteria for the classification of various works and activities into categories and defining the contents of Environmental Impact Assessments (EIA).

8.7.4.2 Protection Regime for the Mediterranean monk seal

The Mediterranean monk seal is a species protected under the Greek legislation by Presidential Decree 67/1981, as well as by the Habitats Directive 92/43/EEC, Annex II (priority species), and Annex IV. In addition, Regulation 1626/94/EU has listed the Mediterranean monk seal under Annex I. The Mediterranean monk seal is also included in the following international Conventions: the Washington Convention; the Barcelona Convention; the Bonn Convention, Annexes I and II; the Bern Convention, Annex II; Protocol on Special Protected Areas and Biodiversity.

Finally, the Mediterranean monk seal was classified as a critically endangered species in the relevant IUCN lists between 1966 and 2015. In 2015 the monk seal was re-classified as endangered (criterion - C2a(i)). According to IUCN (www.iucnredlist.org) it is now thought that the previous assessment (critically endangered A2abc) was an overestimate of the scale of decline in the global population over the previous 33 years. However, in Greece, the Mediterranean monk seal is still considered as critically endangered in the “Red Data Book of the threatened vertebrates of Greece” (Hellenic Zoological Society 2009) and is protected by law, according to the Presidential Decree 67/1981.

8.7.4.3 Protection Regime for Cetaceans

Cetaceans also benefit from a series of international, EU and national legislation acts currently in power. The Red Data Book of Endangered Animals of Greece (Legakis & Marangou 2009) lists a total of 8 cetacean species regularly recorded in the Greek seas, out of which 5 have been classified in one of the three IUCN categories under threat (Critically Endangered, Endangered, Vulnerable). The remaining 3 species, the populations of which are not known at a satisfactory level, are listed in the category “Data Deficient”. None of the cetacean species of Greece has been filed under the categories “Near Threatened”, “Least Concern” or “Not Evaluated”, neither any of them has been filed under the categories “Extinct”, “Regionally Extinct”, and “Extinct in the Wild.

Cetacean species with no regular presence in Greek waters, as is the case with the false killer

whale and the humpback whale, which are visitor species in the entire Mediterranean Basin, are not included in the Red Data Book of Endangered Animals of Greece (Frantzis 2009).

At the international level, the situation is sometimes different with respect to the classification of the 8 cetacean species with regular presence in Greek waters. Certain populations might count satisfactory numbers of individuals on a global scale, as is the case of some species of dolphins. Therefore, they are classified under the "Least Concern" category at the global level. However, their Mediterranean populations are isolated from those in the Atlantic and they constitute genetically different and evolutionary important sub-populations that are highly vulnerable with respect to epidemics or to human-induced pressure, etc.

8.7.4.4 Noise and Marine Mammals

Noise and Marine Mammals

Many marine organisms, including most marine mammals (whales, dolphins, porpoises and pinnipeds) use sound for a variety of purposes, for example in communication, to locate mates, to search for prey, to avoid predators and hazards, and for short / long-range navigation. Depending on the intensity (sound pressure level) at the source, the pitch (frequency) and the distance between source and receiver, sound can potentially affect marine organisms in various ways. The auditory bandwidth of cetaceans can be roughly divided into three functional groups, low, medium and high as outlined in the table below.

Table 8-18: Functional hearing groups for cetaneans

Functional Hearing Group	Estimated Auditory Bandwidth
Low-frequency cetaceans	7 Hz to 22kHz
Mid-frequency cetaceans	150Hz to 160Hz
High-frequency cetaceans	200Hz to 180kHz
Pinniped in water	75Hz to 75kHz
Pinniped in air	75 Hz to 30kHz
Low-frequency cetaceans	7 Hz to 22kHz

Categories after Southall et al 2007

8.7.4.5 Marine Mammals in the study and wider project area

Seismic survey

The section below provides an overview of the key species identified during a 1 month seismic survey in the project area in 2015. Two ships, *MV Polar Marquis* and *MV Artemis Arctic*, with 3 chase boats for support (*MV Moonrise*, *MV EDT Niovi* and *MV Aegean*) were in charge of the seismic surveys. The project covered an area of approximately 385 km^2 located in the marine area west of the island of Thassos, Bay of Kavala, in water depths ranging from 17 to 116 metres with an average depth of 42 metres along 82 sailing lines (orientation: northeast - southwest). In

total, there were 246 hours and 32 minutes of total airgun operation.

During the survey, dedicated Marine Mammal Observers (MMO) and a Passive Acoustic Monitoring Operator (PAM) were employed by Geo-Marine Consultants in order to mitigate the impacts of acoustic disturbance to marine mammal species (4 cetacean species and the Mediterranean monk seal, *Monachus monachus*) living in these waters. Two MMOs on board the *RV Polar Marquis* and another two on *MV Artemis Arctic* conducted the visual observations. Additionally, hydrophones were used to acoustically detect cetaceans. Both survey methods MMOs and PAM covered 24 hr. On 23.06.2015, the *MV Artemis Arctic* completed its part of the survey and left the area and the two MMOs were transferred to the chase boat *MV Moonrise*, from where they continued the marine mammal observation, supporting the *Polar Marquis* MMO team. Weather conditions, sea state and visibility were generally favourable for the entire period of the survey, allowing observation during almost the entire period of the seismic survey.

A total of 21 sightings of cetaceans were registered in a total of 10 days out of the 24 days of the seismic survey (41,7% of the total number of days). Four species of cetaceans were identified: the common bottlenose dolphin *Tursiops truncatus* (10 sightings) the short beaked common dolphin *Delphinus delphis* (1 sighting) the striped dolphin *Stenella coeruloalba* (3 sightings) and the sperm whale, *Physeter macrocephalus* (1 sighting). The rest of sightings concerned unidentified delphinid species (4 sightings) and unidentified cetacean species (2 sightings).

As mentioned above, almost half of the sightings with identified species (10 sightings or 66,7% of the 15 sightings) concerned the common bottlenose dolphin. The species appeared always in groups of 3 to 7-9 animals together. The 4 sightings of the striped dolphin (26,7%) concerned 3-4 or possibly 5-6 animals together. The sighting of the short beaked common dolphin concerned 4 animals together. These three delphinids are known to permanently exist in the Thracian Sea. Generally, the short beaked common dolphin is found in the coastal waters of Northern Aegean and striped dolphin has as main habitat the pelagic waters after the continental shelf, though it can be found and in shallower waters. The single sighting of sperm whales concerned 2-3 animals together at a distance of 8,000 metres from the ongoing operation. It is unknown if the sperm whale permanently exists in this area; however, the deep basin between the N. Sporades islands and the peninsula of Chalkidiki is known to be frequented by sperm whales. As mentioned above, this species prefers deep waters.

The table below provides a summary of information on the marine mammals likely to be found within the Kavala Gulf and Aegean Sea generally according to the seismic survey and the literature review.

Table 8-19: Cetaneans species likely to be found within the Kavala Gulf

Species	Mediterranean Sub-population (MS) or Sub-species (SSP)	Red Book of Endangered Species of Greece (2009)	IUCN Threat status		Recorded During Seismic Survey	Geographic Distribution	Functional Hearing Group (after Southall et al 2007)	Habitat			Main threats
			Mediterranean	International				Type	Depth	Distance from coasts	
Fin whale	MS	Data Deficient	Data Deficient	Endangered		Present in N Ionian Sea and especially from NW of Lefkada Island north up to N Corfu; at least occasionally in Saronikos	Low-frequency cetacean	Pelagic, occasionally coastal	81 m (coastal) 670 m (50-1337 m)	2.9 km (coastal) 14.7 km (0.1-22.8 km)	Ship strikes in the western Mediterranean
Sperm whale	MS	Endangered	Endangered	Vulnerable	Y	Mainly along the Hellenic Trench from Kefallonia to E Rodos, also in deep basins/trenches of the Aegean Sea (Myrtoon, Cretan, N Ikarion, NW Aegean Sea)	Mid-frequency cetacean	Slope, secondarily pelagic	1235 m (510-2933 m)	8.1 km (1.6-25.2 km)	Ship strikes Noise Plastic debris
Cuvier's beaked whale	MS	Data Deficient	Data Deficient	Vulnerable		Present and locally (S Crete, W Lefkada) common all along the Hellenic Trench; present or common over steep depressions of the Aegean (e.g. N. Sporades)	Mid-frequency cetacean	Slope, probably pelagic as well	1066 m (491-2279 m)	8.6 km (2.1-26.5 km)	Sonar Noise Plastic debris
Risso's dolphin	MS	Vulnerable	Data Deficient	Least Concern		Common in Myrtoon Sea south to NW Crete, present or common in N. Sporades and Chalkidiki, present or rare or seasonal in all other Aegean and Ionian Seas	Mid-frequency cetacean	Slope, probably over its shallower part	737 m (165-1717 m)	8.2 km (0.3-28.3 km)	Bycatch in long-lines Plastic debris
Common bottlenose dolphin	MS	Vulnerable	Vulnerable	Vulnerable	Y	Present in all coastal areas, straits, gulfs, and also between islands in the entire Ionian, Aegean and Cretan Seas with no exceptions.	Mid-frequency cetacean	Typically coastal, also over shallow waters “offshore”	121 m (1-1504 m)	3.0 km (0.0-26.0 km)	Prey depletion Direct killing Bycatch in artisanal fishery Noise
Striped dolphin	MS	Vulnerable	Vulnerable	Least Concern	Y	Common in all areas over depths >500 m (present in >200 m) including Gulf of Corinth. Absent/vagrant in depths	Mid-frequency cetacean	Typically pelagic and slope	1024 m (75-2920 m)	8.7 km (0.6-37.1 km)	Chem. pollution Direct killing Bycatch in driftnets

Species	Mediterranean Sub-population (MS) or Sub-species (SSP)	Red Book of Endangered Species of Greece (2009)	IUCN Threat status		Recorded During Seismic Survey	Geographic Distribution	Functional Hearing Group (after Southall et al 2007)	Habitat			Main threats
			Mediterranean	International				Type	Depth	Distance from coasts	
Short-beaked common dolphin	MS	Endangered	Endangered	Least Concern	Y	Thracian Sea, Thermaikos Gulf, Northern Sporades, Pagasitikos Gulf, NE Aegean Sea, Cyclades; S Evvoikos Gulf, Dodecanese; Gulf of Corinth, Inner Ionian Sea, recorded in N Evvoikos Gulf	Mid-frequency cetacean	Coastal and shallow	86 m (11-274 m) Gulf of Corinth: 713 m (275-935)	4.3 km (0.2-20.8 km) Gulf of Corinth: 5.9 km (1.2-10.4)	Prey depletion Direct killing Bycatch in artisanal fishery
Harbour porpoise, Black Sea Sub-species	SSP	Endangered	Endangered	Least Concern		Thracian Sea, possibly present in Thermaikos Gulf and Chalkidiki peninsula. Only vagrant further to the south.	High-frequency cetacean	Probably coastal and shallow	-	-	Climate change Bycatch in artisanal fishery Prey depletion
Mediterranean Monk Seal	MS	Critically Endangered	Endangered	Endangered		Widely distributed throughout the entire coastline of the country and show a strong preference for isolated and inaccessible islands, islets or parts of the coastline on the mainland. The largest and most closely monitored populations are those at the Northern Sporades Islands and at the Kimolos – Polyaigos island complex.	Pinniped	Coastal and shallow	-	-	Deliberate killing, Drowning from accidental entanglement in fishing gear, Overfishing, Habitat degradation and destruction

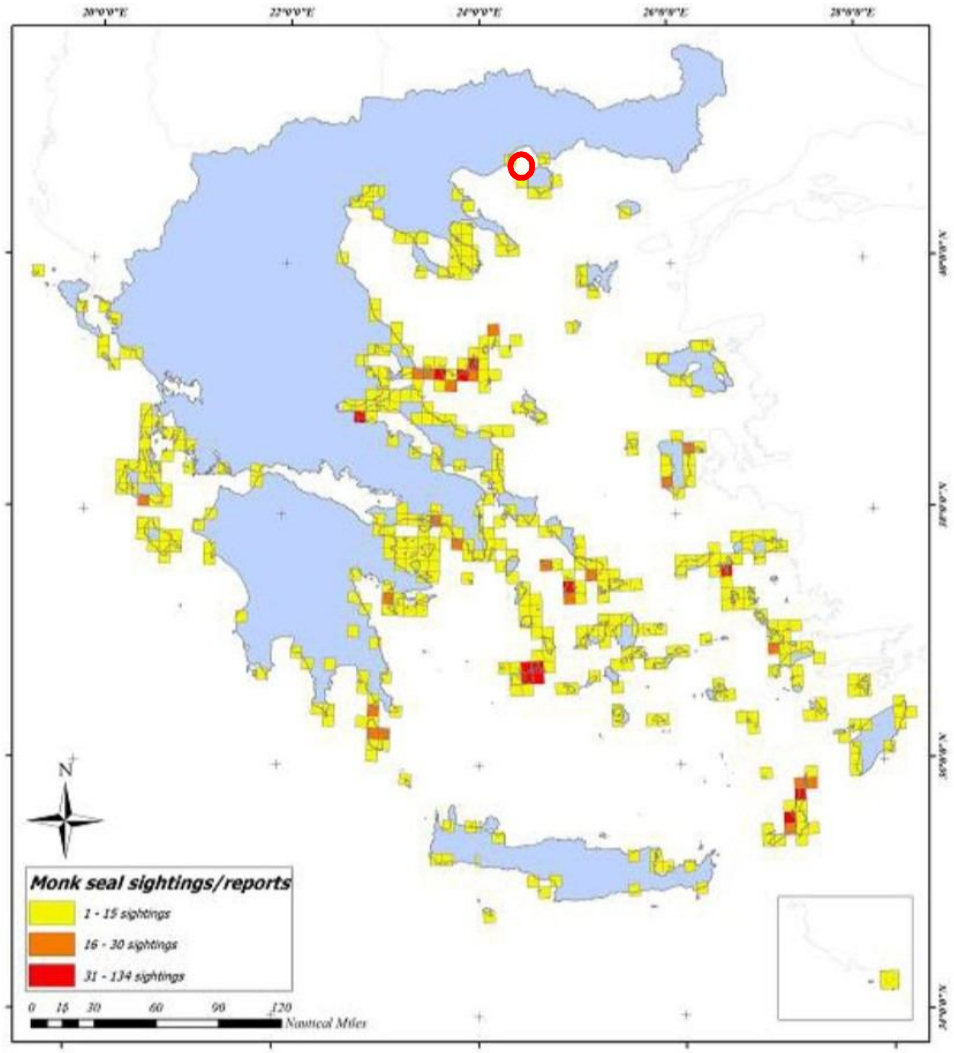
Source: Frantzis A. 2009. Cetaceans in Greece: Present status of knowledge. Initiative for the Conservation of Cetaceans in Greece, Athens, Greece, 94 pp and MOm/ The Hellenic Society for the Study and Protection of the Monk seal - Greek non–governmental environmental organization with the legal status of a Non–profit association

Mediterranean monk seal

Only few data exist about the monk seals in the study area. Since 1976, when biologist Th. Schultze-Westrum first started actions for the preservation of the Mediterranean monk seal in the area of the N. Sporades, most of the effort was placed to the establishment and the operation of the Alonnissos - Northern Sporades National Marine Park as also in the areas of Milos, Kimolos, Polyaigos islands, Cyclades, of Carpathos and Saria islands, Dodekanese, and in the Ionian islands of Kefalonia, Ithaca, Lefkada and Zakynthos. Similar systematic effort is also being invested recently in the island of Yiaros, Cyclades (Dendrinos *et al*. 2008). Below, all data in the last decade available from the area of study are presented, starting from the most recent data:

2009 – 2010 (Kapiris *et al*. 2010). According to the data on stranding's of dead or injured marine mammals in Greece collected by the local port police authorities and forwarded to and processed by the Hellenic Centre for Marine Research, for the period of January to May 2009, only one case of a monk seal -found on Thassos- was registered, whereas no case was registered for the same period in 2010. The Thassos case constitutes 14,3% of a total of 7 reports of monk seals found at various locations in the country for the year 2009, whereas for 2010 a total of 11 cases were reported. The majority of cases concerning monk seals were reported from the Cyclades: 43% of the total number at national level for the year 2009 and 55% for 2010.

1996 – 2009 The following map displays the areas from which monk seal sightings were reported during the period 1996 – 2009 to the so-called "Rescue and Information Network" (RINT) run by the NGO Mom/Hellenic Society for the Study and Protection of the Monk Seal. The yellow colour represents the areas from which 1–15 sightings were reported; the brown colour represents the areas from which 16– 30 sightings were reported and the red colour represents the areas from which 31–134 sightings were reported (Kotomatas 2009). Areas marked with yellow colour (1 – 15 sightings) exist practically throughout the NW Aegean Sea, including Thassos, Limnos, Agios Efstratios and Samothraki islands.

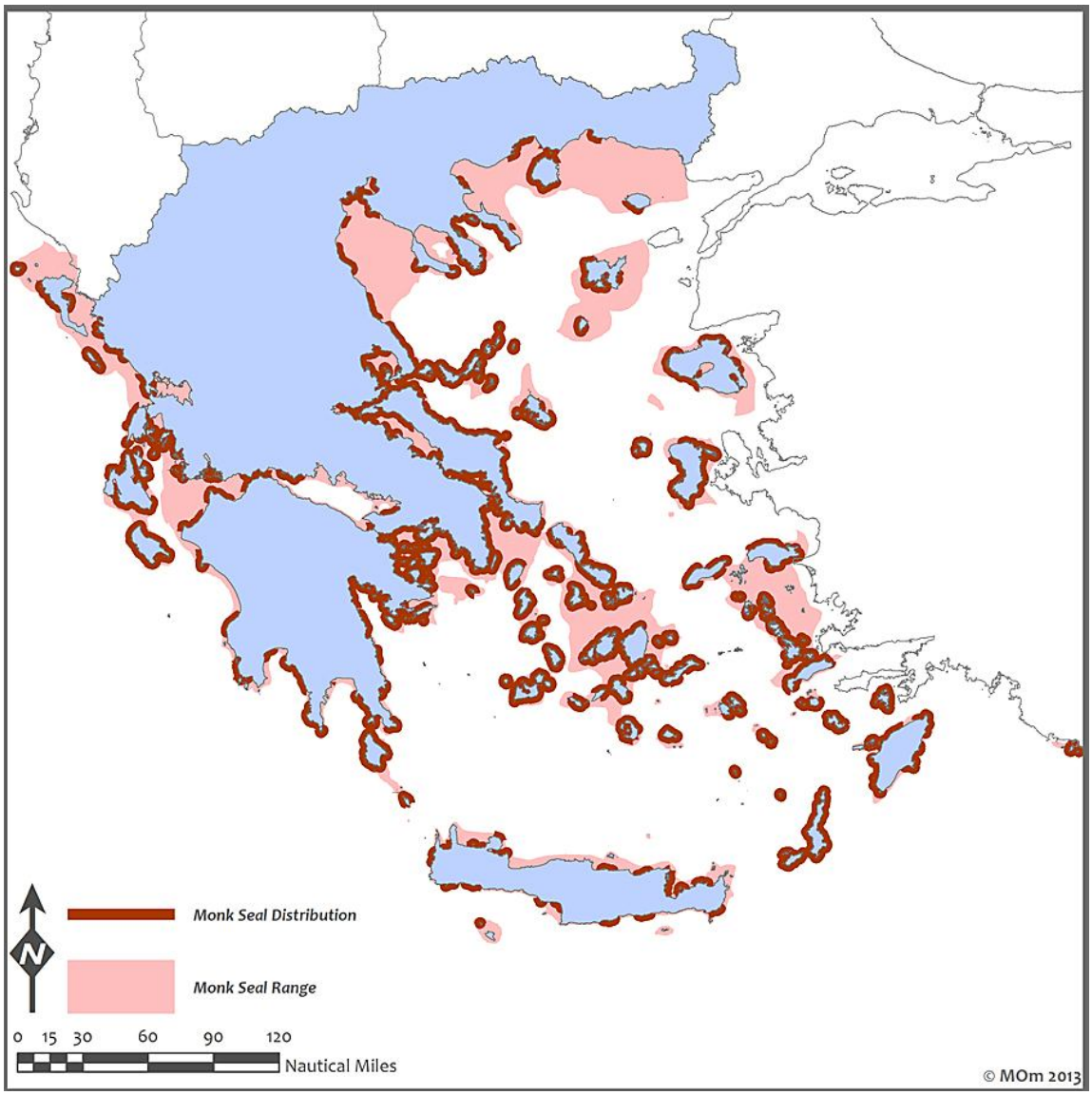


Map 8-13: Appearance of monk seal in Greece during the period 1996 – 2009 - red circle: project area (source: Kotomatas, 2009)

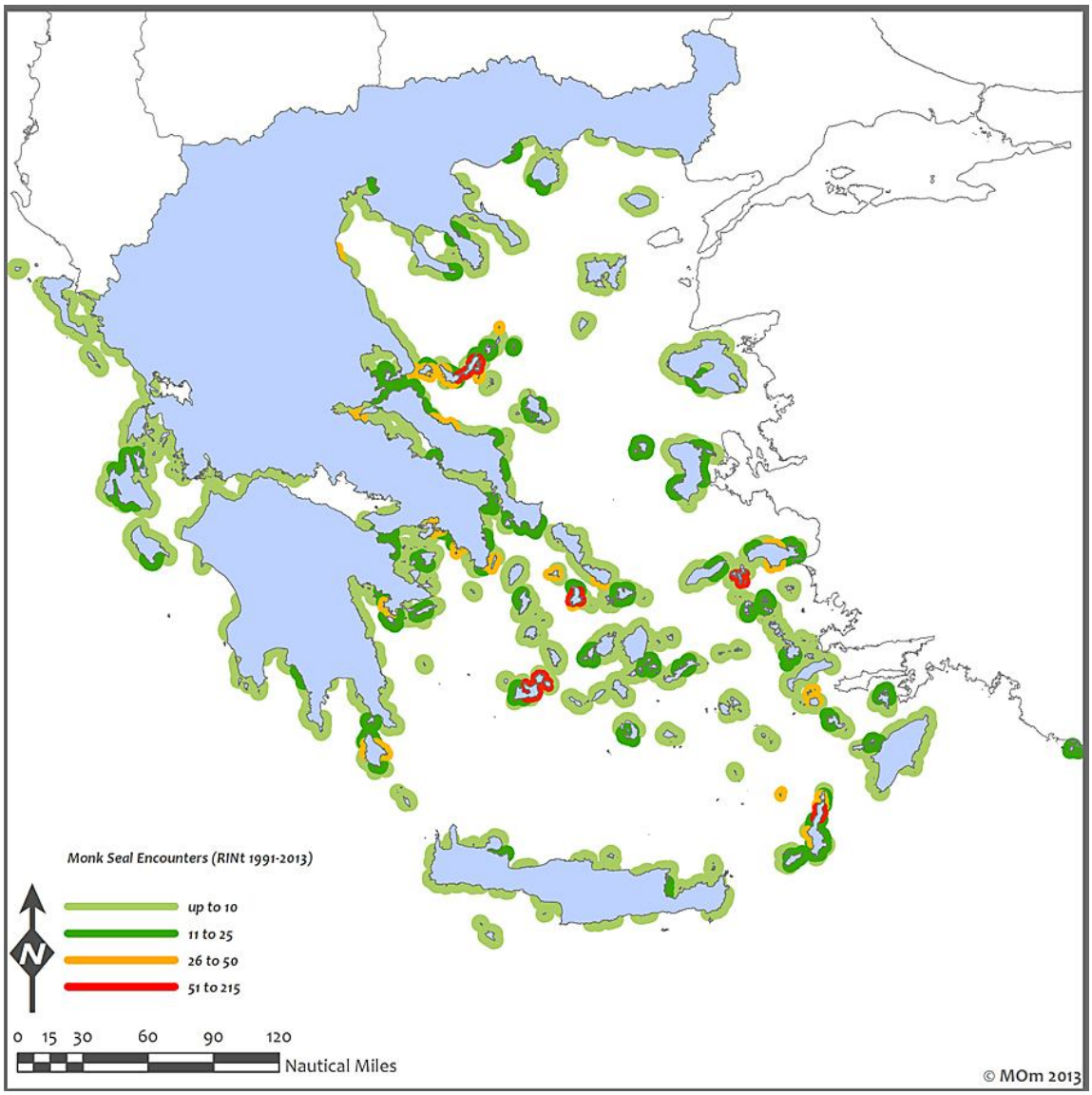
Conservation of the Mediterranean monk seal in Greece: achievements, drawbacks and potential of an MPA network. Proceedings of the 1st International Conference Marine Mammal Protected Areas. Maui, Hawai'i, USA, 30 March - 3 April 2009. Mom / Hellenic Society for the Study and Protection of the Mediterranean Monk Seal Athens.

The breeding period of monk seal is, mainly, between August – December. Although, the species in the past used open beaches, the last decades, due to tourism growth and intense expansion of residential uses in the coastline, the monk seals are using underwater caves. These habitats are very far from the study area, thus the sensitivity of the species in respect to nuisance from Project activities are negligible.

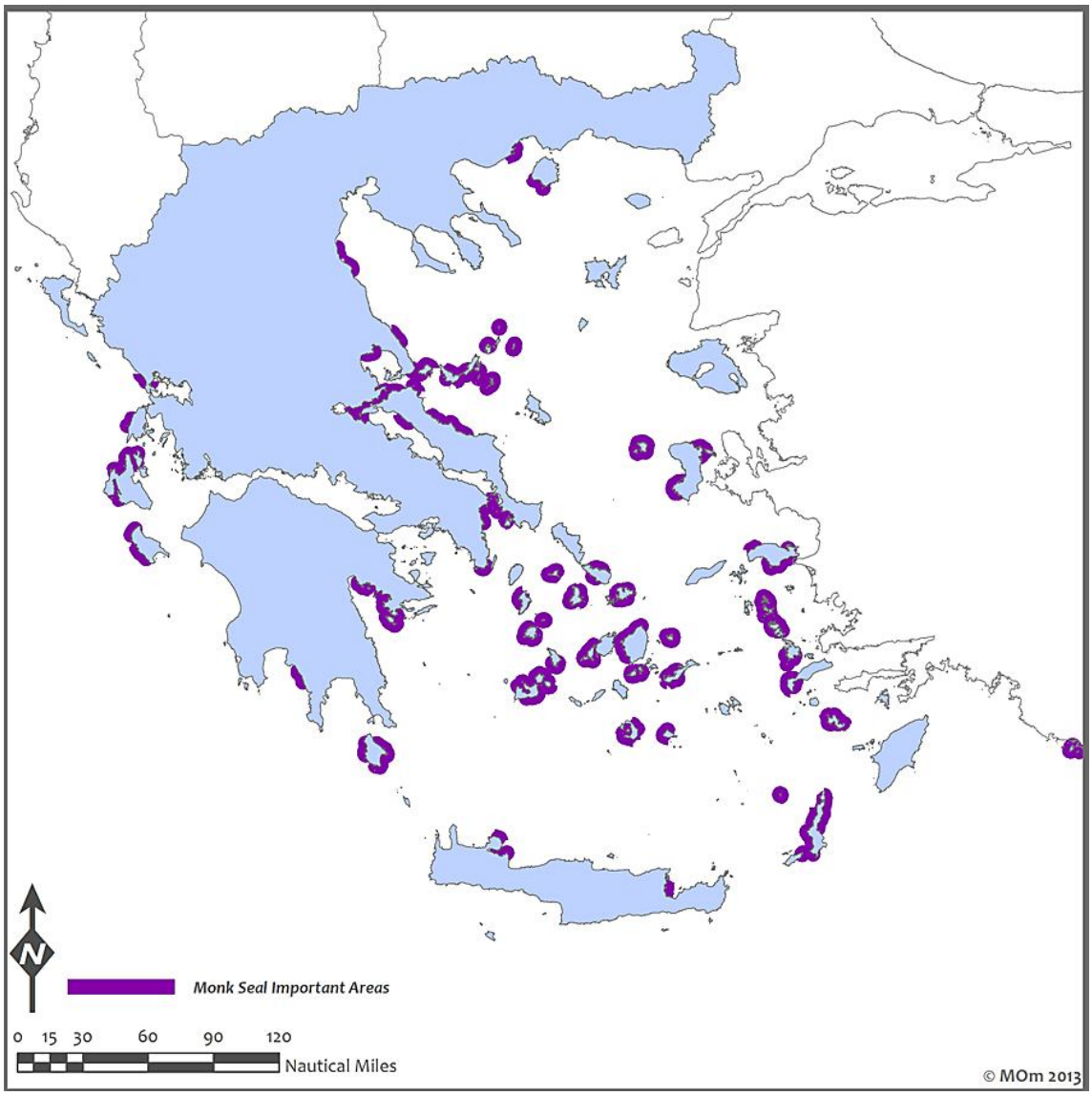
The monk seal distribution, encounters and important areas in the wider project area are shown in the following maps. Not official information on the location of caves is available.



Map 8-14: Monk seal distribution in Greece (MOm 2013)



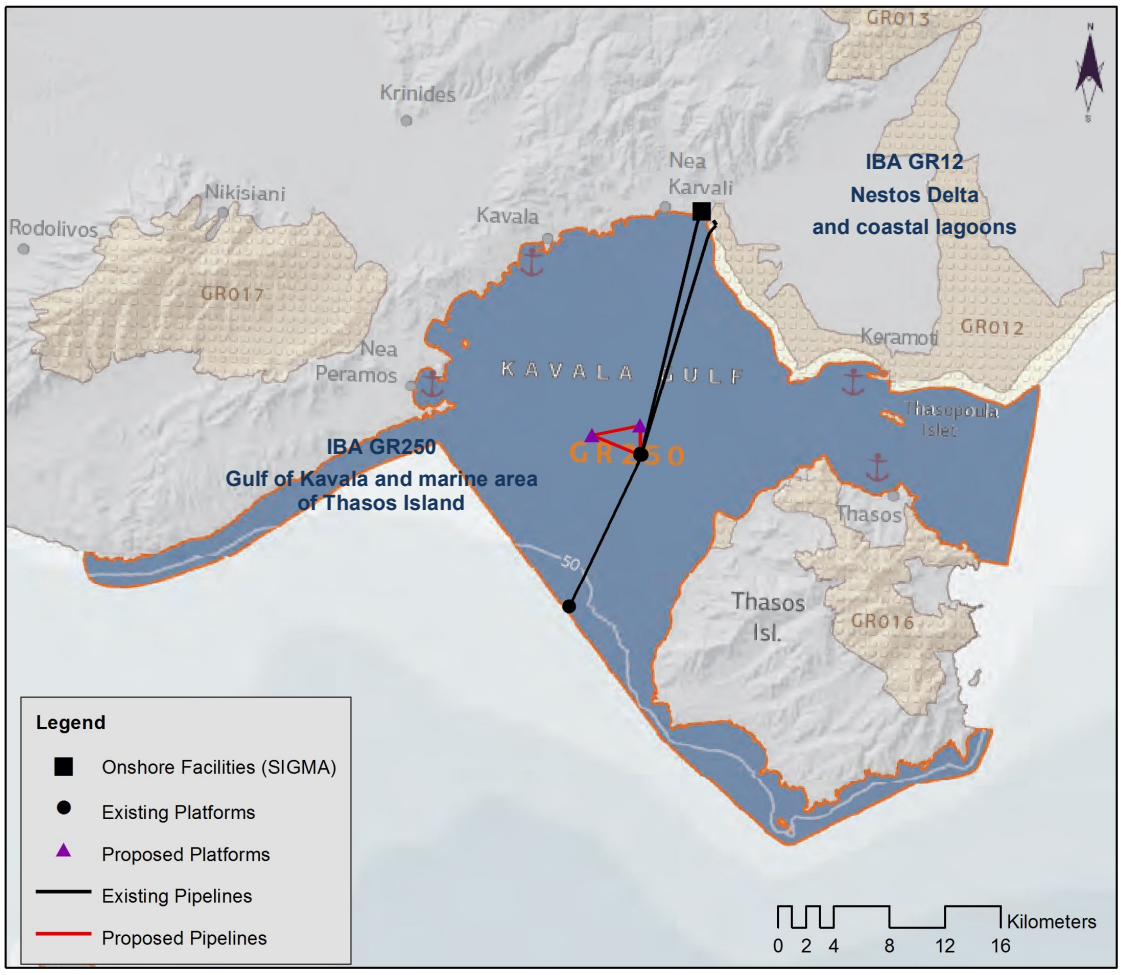
Map 8-15: Monk seal encounters in Greece (MOM 2013)



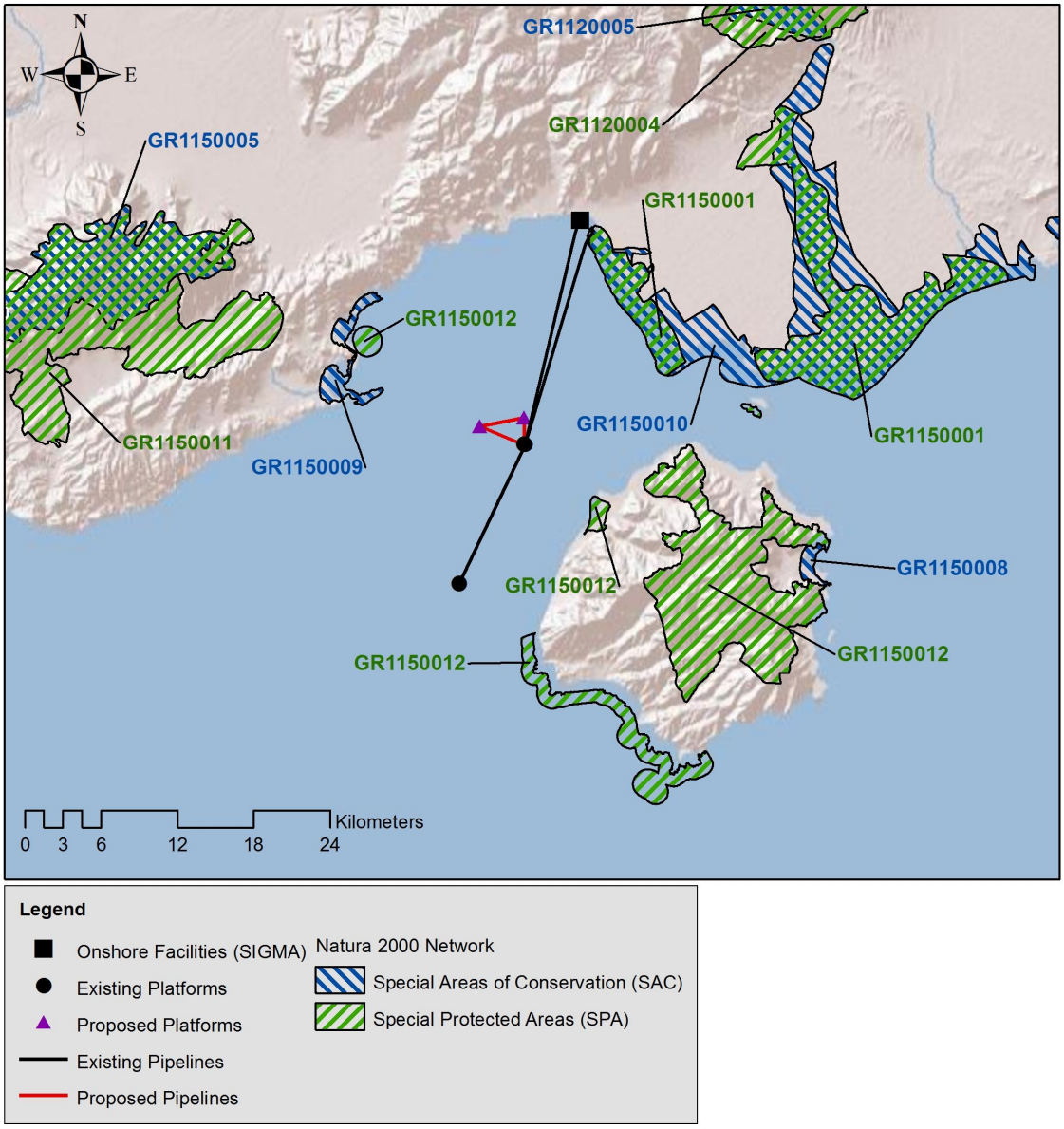
Map 8-16: Monk seal important areas

8.7.5 Avifauna

The international importance of the area is further supported by its inclusion in the network of Important Bird Areas (IBAs) identified by the BirdLife International i.e. the study area is part of the IBAs GR12 "Nestos Delta and coastal lagoons" and GR 250 "Gulf of Kavala and marine area of Thasos Island". Based on the decision of the European Court of Justice the IBAs constitute baseline reference information of the determination of SPAs therefore the marine areas covered by the IBA GR250 (part of it or as a whole), currently not included in the Natura 2000 network, could be included in the future in the Natura 2000 network. The marine part of the Study Area overlaps with the Marine IBA GR250 and IBA GR12 as shown in the following figure.



Map 8-17: Important Bird Areas (IBAs) in the Project area (adopted from BirdLife International, Important Bird and Biodiversity Areas (IBAs) http://www.birdlife.org/datazone/site)



Map 8-18: NATURA 2000 Areas within the broader Project area (existing and proposed platforms - red circle)

According to the report “Important Areas for Seabirds in Greece, LIFE07 NAT/GR/000285 – Hellenic Ornithological Society (HOS / BirdLife Greece, 2012), the qualifying species for the IBA250 GR250 "Gulf of Kavala and marine area of Thasos Island" include *Phalacrocorax aristotelis* and *Puffinus yelkouan*. This Marine IBA includes the entire Gulf of Kavala, the Straits of Thassos, coastal waters along southern Thasos Island and along the mainland up till Drakopetra in the west. This IBA has been designated for its importance for the Mediterranean Shag (*Phalacrocorax aristotelis desmarestii*) and for the Yelkouan Shearwater (*Puffinus yelkouan*). More specifically, the area includes the foraging and maintenance marine areas of the largest breeding population of the Mediterranean Shag in Greece which breeds in the Natura SPAs GR1150001 "Delta Nestou kai limno thalasses Keramotis kai nisos Thasopolula" and

Natura GR1150012 "Thasos (Oros Ypsario kai parakatia zoni)" and consists 10% of the national breeding population of the species. After the end of the breeding season, Mediterranean Shags from other areas migrate to the area, due to abundant food sources present in the area, resulting in the 17% of the national wintering population of the species spending its post-breeding period in the area. Due to shallow waters (<50m) of the Gulf of Kavala, the Mediterranean Shags use the entire area of the Gulf for foraging. Additionally, the area also host large foraging concentrations (up to 2000 individuals) of the Yelkouan Shearwater (*Puffinus yelkouan*), which regularly feed in the area in both coastal and pelagic waters (Fric et al. 2012), south and eastwards beyond the boundaries of the IBA250.

Table 8-20: Main phenology variables of the 2 main seabirds in the Kavala Gulf

Species	Arrival to breeding sites	Colonies	Clutch size (eggs)	Egg-laying period	Incubation period (days)	Chick stage (days)	Fledging period
Yelkouan Shearwater	March	Mono-specific or mixed	1	End of April to beginning of May (March till May)	48-52	60-68	July
Mediterranean Shag	December - January	Mono-specific	1-6	End of January, peaking in mid-February	30	53	End of May

The IBA12 qualifying species which are included in the Annex I (species being a subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution) of the Birds Directive 2009/147/EC (JMD 37338/1807/01.09.2012) are the followings: *Anser erythropus, Branta ruficollis, Aythya nyroca, Puffinus yelkouan, Ixobrychus minutus, Ciconia ciconia, Casmerodius albus, Pelecanus crispus, Phalacrocorax pygmeus, Phalacrocorax carbo, Phalacrocorax aristotelis, Falco naumanni, Accipiter brevipes, Aquila clanga, Burhinus oedicnemus, Vanellus spinosus, Charadrius alexandrinus, Numenius tenuirostris, Glareola pratincola, Larus melanocephalus, Sterna albifrons, Dendrocopos syriacus, Lanius minor, Lanius nubicus* and *Calandrella brachydactyla*.

Table 8-21: Species of conservation concern recorded or expected to be present in the wider area including qualifying species for IBAs and Natura, species included in Annex I of the Birds Directive

Code	Species	Conservation status[1]	Population in Natura 2000 sites[2]			
			Resident	Migratory		
				Breed	Stage	Winter
A293	*Acrocephalus melanopogon*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; RDB-Greece: VU IUCN: LC			P	
A402	*Accipiter brevipes*	2009/147/EC: Annex I; IUCN: LC		P		

Code	Species	Conservation status[1]	Population in Natura 2000 sites[2]			
			Resident	Migratory		
				Breed	Stage	Winter
A042	*Anser erythropus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix I IUCN: Vulnerable				26-26i
A060	*Aythya nyroca*	2009/147/EC: Annex I; Bonn Convention: Appendix I IUCN: Near threatened			P	P
A229	*Alcedo atthis*	2009/147/EC: Annex I; Bern Convention Appendix II; RDB-Greece: DD IUCN: LC		P		P
A090	*Aquila clanga*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix I, II; International Species Action Plan RDB-Greece: EN IUCN: VU				1-5i
A396	*Branta ruficollis*	2009/147/EC: Annex I; Bern Convention :Appendix II; Bonn Convention: Appendix I IUCN: Endangered				R
A133	*Burhinus oedicnemus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; RDB-Greece: NT IUCN: LC		P		
A243	*Calandrella brachydactyla*	2009/147/EC: Annex I; Bern Convention Appendix II; IUCN: LC		P		P
A027	*Casmerodius albus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; AEWA RDB-Greece: VU IUCN: LC				51-100i
A138	*Charadrius alexandrinus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; AEWA RDB-Greece: LC IUCN: LC		P		P
A081	*Circus aeruginosus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; CITES II/A RDB-Greece: LC IUCN: LC		P		
A031	*Ciconia ciconia*	2009/147/EC: Annex I; Bonn Convention : Appendix II UCN: LC		P		
A429	*Dendrocopos syriacus*	2009/147/EC: Annex I; IUCN: LC	P			

Code	Species	Conservation status[1]	Population in Natura 2000 sites[2]			
			Resident	Migratory		
				Breed	Stage	Winter
A026	*Egretta garzetta*	2009/147/EC: Annex I; Bern Convention Appendix II; AEWA RDB-Greece: LC IUCN: LC		101-250i		11-50i
A095	*Falco naumanni*	2009/147/EC: Annex I; Bonn Convention : Appendix II; IUCN: LC			P	
A135	*Glareola pratincola*	2009/147/EC: Annex I; Bern Convention: Appendix II; Bonn Convention : Appendix II; AEWA RDB-Greece: VU IUCN: LC		20-20i		
A022	*Ixobrychus minutus*	2009/147/EC: Annex I; Bern Convention: Appendix II; Bonn Convention :Appendix II; IUCN: LC		15-15i		
A131	*Himantopus himantopus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; AEWA RDB-Greece: LC IUCN: LC			P	
A176	*Larus melanocephalus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; AEWA RDB-Greece: EN IUCN: LC			P	P
A339	*Lanius minor*	2009/147/EC: Annex I; IUCN: LC		6-10i		
A433	*Lanius nubicus*	2009/147/EC: Annex I; IUCN: LC		6-10i		
A159	*Numenius tenuirostris*	2009/147/EC: Annex I; Bonn Convention Appendix I; IUCN: Critically endangered			V	
A020	*Pelecanus crispus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix I, II; CITES I/A; AEWA; International Species Action Plan; RDB-Greece: VU IUCN: VU				6-10i
A392	*Phalacrocorax aristotelis*	2009/147/EC: Annex I; Bern Convention Appendix II; International Species Action Plan RDB-Greece: NT IUCN: LC	P			
A391	*Phalacrocorax carbo*	Bern Convention Appendix III; AEWA RDB-Greece: NE IUCN: LC				101-250i

Code	Species	Conservation status[1]	Population in Natura 2000 sites[2]			
			Resident	Migratory		
				Breed	Stage	Winter
A393	*Phalacrocorax pygmeus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; AEWA RDB-Greece: LC IUCN: LC				51-100i
A035	*Phoenicopterus roseus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; CITES II/A; AEWA RDB-Greece: LC IUCN: LC				51-100i
A034	*Platalea leucorodia*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; CITES II/A; AEWA RDB-Greece: VU IUCN: LC			P	
A013	*Puffinus yelkouan*	2009/147/EC: Annex I; Bern Convention Appendix II; RDB-Greece: NT IUCN: VU			V	
A132	*Recurvirostra avosetta*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; AEWA RDB-Greece: VU IUCN: LC			P	
A195	*Sterna albifrons*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; AEWA RDB-Greece: NT IUCN: LC		51-100i		
A193	*Sterna hirundo*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; AEWA RDB-Greece: LC IUCN: LC		P		
A418	*Vanellus spinosus*	2009/147/EC: Annex I; Bern Convention Appendix II; Bonn Convention Appendix II; AEWA RDB-Greece: VU IUCN: LC		35-35i		

Code: *Natura 2000 species code*
Species: *Scientific species name*
[1]Conservation Status:
Birds directive: *Directive 2009/147/EC of the European Parliament and the Council on the conservation of wild birds (http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm):*
Annex I: Species being a subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution
Annex II/A: Species that may be hunted in the geographical sea and land area where the Directive applies
Annex II/B: Species that may be hunted only in the Member States in respect of which they are indicated
Bern Convention: *Convention on the Conservation of European Wildlife and Natural Habitats (http://www.coe.int/web/bern-convention/home):*
Appendix II: Strictly protected fauna species
Appendix III: Protected fauna species
Bonn Convention: *CMS Convention on the Conservation of Migratory Species of Wild Animals (http://www.cms.int/)*
Appendix I: Endanger Migratory Species
Appendix II: Migratory Species in unfavourable conservation status to be the Subject of Agreements where these should benefit the species and should give priority to those species in an unfavourable conservation status
AEWA: *Agreement on the Conservation of African-Eurasian Migratory Waterbirds (http://www.unep-aewa.org/en/legalinstrument/aewa)*
CITES: *Hellenic Wild Fauna Species and Native Flora of CITES Convention*

(http://www.ypeka.gr/Default.aspx?tabid=596&language=el-GR)
***RDB-Greece**: Red Data Book of the Threatened Animals of Greece (2009)*
(http://www.ypeka.gr/LinkClick.aspx?fileticket=TPsw%2b3PNVX8%3d&tabid=518&language=el-GR)
*Categories: **CR**: Critically Endangered; **EN**: Endangered; **VU**: Vulnerable; **NT**: Near Threatened; **LC**: Least Concern; **DD**: Data deficient; **NE**: Not Evaluated*
IUCN: IUCN Red List of Threatened Species (http://www.iucnredlist.org/)
*Categories: **CR**: Critically Endangered; **EN**: Endangered; **VU**: Vulnerable; **NT**: Near Threatened; **LC**: Least Concern; **DD**: Data deficient; **NE**: Not Evaluated*
*[2]**Population in Natura 2000 sites:** Population and presence data based on the GR1150001 and GR1150010 Standard Data Forms (SDF).*

According to the report "Important Areas for Seabirds in Greece, LIFE07 NAT/GR/000285 – Hellenic Ornithological Society (HOS / BirdLife Greece, 2012), the main threat for the Mediterranean Shag is disturbance at colony sites and in surrounding marine areas mainly relating to tourists and fishermen, particularly amateur fishermen. Disturbance in the past years has been intense leading to negative impacts on the breeding success of the species. During recent years amateur fishermen regularly stay overnight on those islets hosting the largest Mediterranean Shag colonies. The species' breeding performance is also affected by introduced rats and overabundant Yellow-legged Gulls which prey on eggs and chicks. Threats for Yelkouan Shearwaters and Mediterranean Shags include reduced fish-stocks and disturbance during the breeding season arising from intensive trawler operations, as well as illegal fishing practices which are frequently reported. Accidental trapping in nets and longlines also presents a significant threat for both species. In 2012, more than 70 Yelkouan Shearwaters were found entangled in one single net, although such mass incidents are rare. There are numerous aquaculture units in the area, mainly mussel and fish farms, primarily located within the Strait of Thasos. The intensity of commercial and passenger shipping traffic, fishing and recreational activities exhibits large spatial and temporal variations, however in general is considered high. It is noted that an extensive algal bloom event in winter and spring 2009-10 caused almost complete failure of the Mediterranean Shag breeding performance during 2010 and 2011 in the entire area. The national importance of the area for the Mediterranean Shag led to the systematic monitoring of its colonies carried out since 2007 by HOS in collaboration with the University of Patras. Additionally, during the period 2010-12, rat eradication and Yellow-legged Gull population control actions have been implemented to improve the breeding success of the Mediterranean Shag.

8.7.6 Environmental Protected and Sensitive Areas

8.7.6.1 Natura 2000 Network

At a European level, the Natura 2000 network is a European Environmental Network of areas hosting natural types of habitats as well as species habitats, which are considered of high ecological importance. It comprises two types of areas:

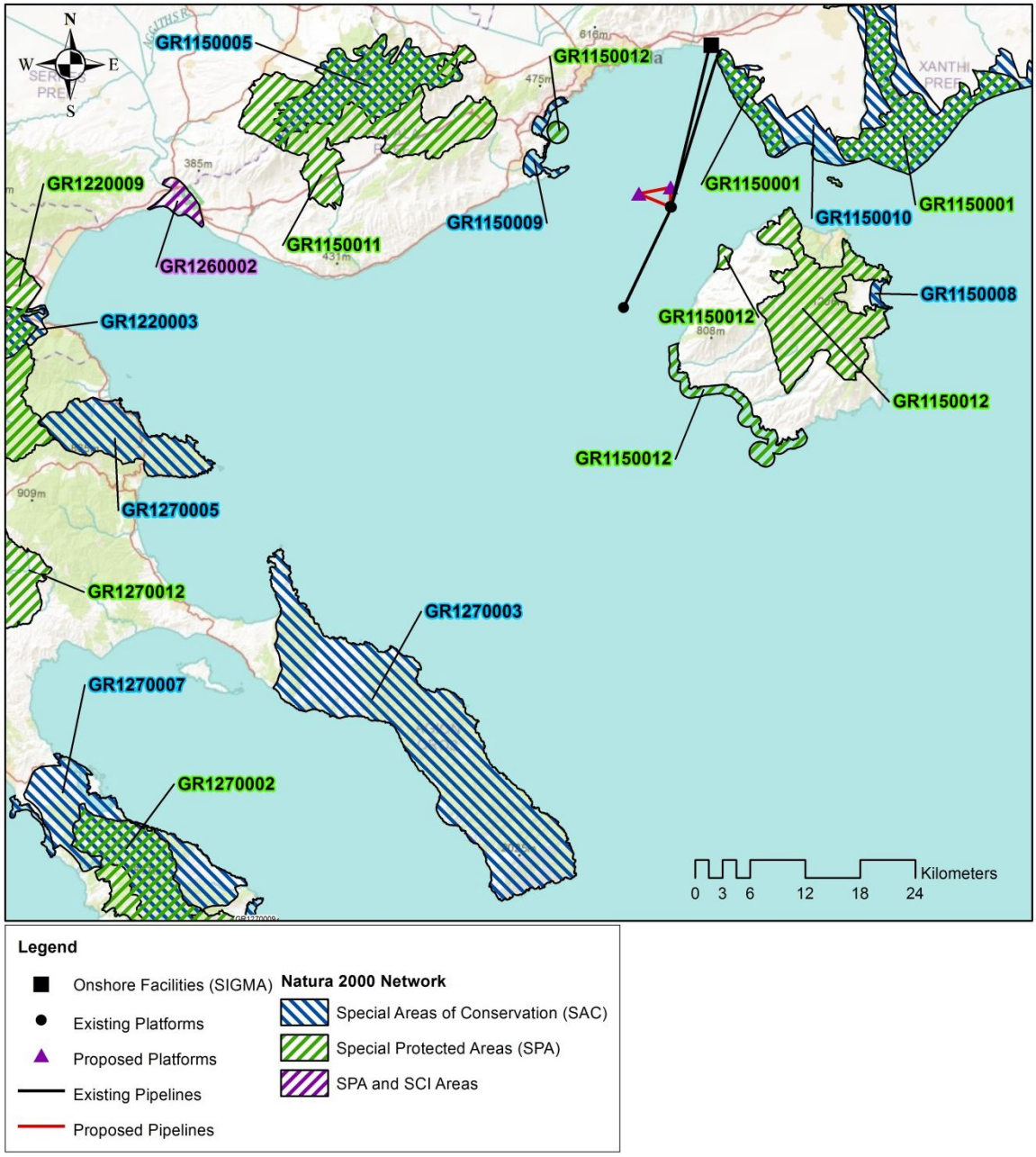
- The "Special Protection Areas – SPA" (SPA), for the protection of bird fauna, as defined in Directive 79/409/EC on the conservation of the wild birds, which was transposed into the Greek domestic legislation with JMDs 414985/29.11.1985 (GG 757/B/18.12.1985), 366599/16.12.1996 (GG 1188/B/31.12.1996), and 294283/23.12.1997 (GG

68/B/4.02.1998). Marine and/or land areas are selected as SPA, which are considered as appropriate for the conservation of the birds under Annex I (195 species and subspecies) of 79/409/EC. Usually, selection is made among the Important Bird Areas (IBA), which arises out of the Global Species Programme of Birdlife International, the aspiration of which is to ensure appropriate areas for the reproduction, wintering or the layover of migratory birds along the migration routes. Henceforth, the Greek S.P.A. amount to 196.

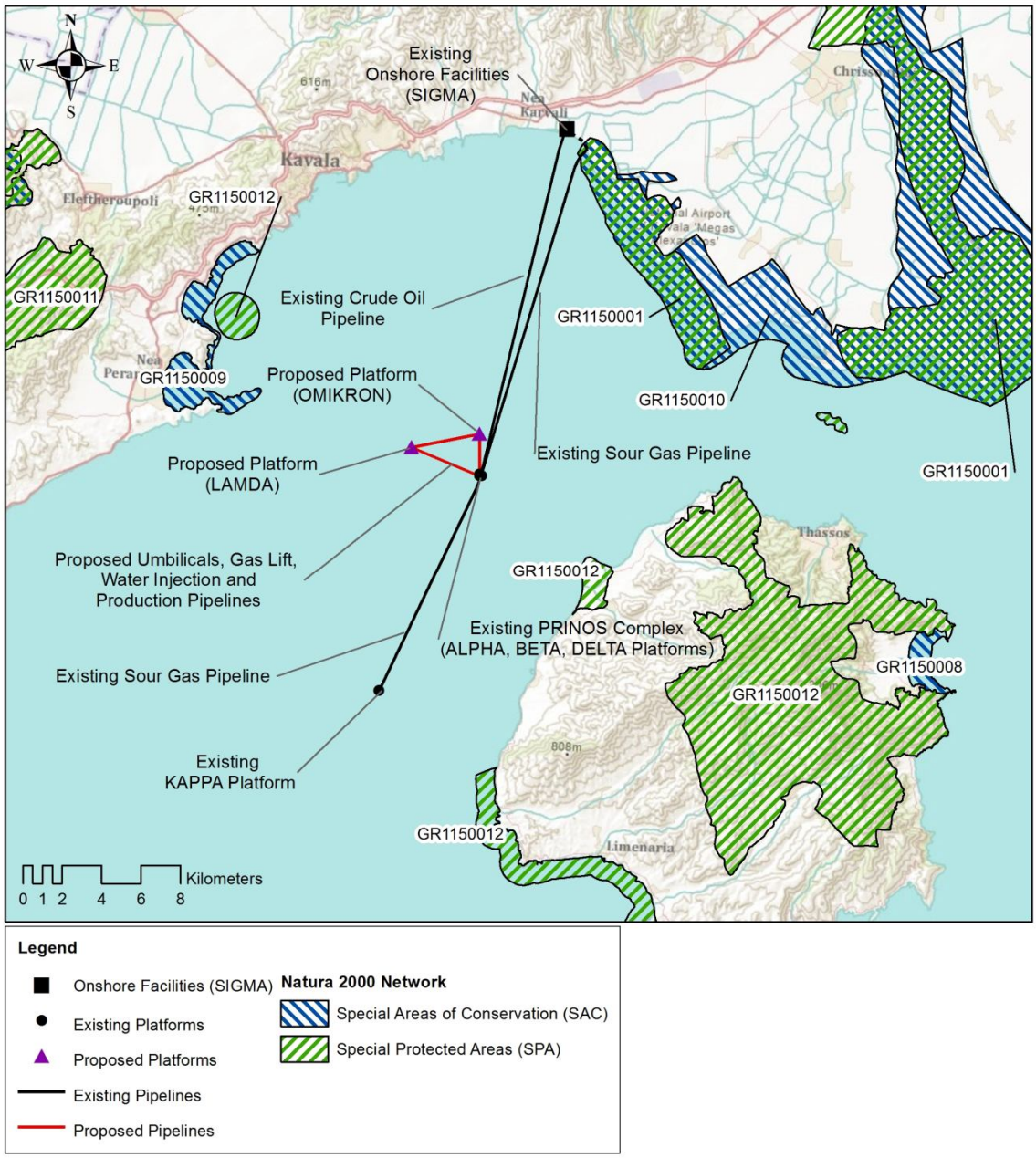
- The "Sites of Community Importance – SCI", as defined in Directive 92/43/EEC, transposed into Greek legislation with the JMD 33318/3028/11.12.1998 (GG 1289/B/28.12.1998). Particularly, the designation of SCI takes place in accordance with the habitats types referred to in Annex I to Directive 92/43/EEC, as well as the species of Annex II, pursuant to the criteria described in Annex III thereto. In particular, there are 231 natural habitats that can be classified as follows, taking into account four digit codes:
  - ⇨ Coastal and halophytic habitats
  - ⇨ Coastal sand dunes and continental dunes
  - ⇨ Freshwater habitats
  - ⇨ Temperate heath and scrub
  - ⇨ Sclerophyllous scrub
  - ⇨ Natural and semi-natural grassland formations
  - ⇨ Raised bogs and mires and fens
  - ⇨ Rocky habitats and caves
  - ⇨ Forests

At a national level, the Natura 2000 network currently comprises 241 SCI and 202 SPA. The list of SPA was published in Annexes B and C to the JMD 37338/1807/1.09.2010 (GG 1495/6.09.2010), in accordance with the transposition of Directive 79/409/EEC (which was codified by Directive 2009/147/EC – L20). By means of the additional finalization of the list of SCI – that is included in Annex I to Decision 2006/613/EC of the Commission (L 259), member-states were obliged to designate all these areas as "*Special Areas of Conservation – SAC*", in order to determine the priorities for the conservation of the types of habitats and species of community interest that can be found within such boundaries at a satisfactory condition. In Greece, the designation of the SAC was effected by Law 3937/2011 on Biological Diversity (GG 60/A/31.03.2011).

The following maps, present the Natura areas (SPA, SAC) is in the Kavala Gulf and in the broader area of significance (Northwest Aegean sea).



Map 8-19: General map of NATURA 2000 Areas in the Northwest Aegean Sea



Map 8-20: NATURA 2000 Areas within the Kavala Gulf

Due to the fact that a part of the existing sour gas pipeline (approximately 550 m offshore and 350 m onshore) is located within Natura areas and in regards to the environmental licensing of the project, the submission of a Special Ecological Assessment study is obligatory according to the Law 4014/2011 (see Annex 04).

Law 4014/2011 on the environmental licensing of works and activities establishes the Special Ecological Assessment (SpEA) study, which follows the Environmental Impact Assessment (EIA) study. SpEA is based primarily on the examination of the "appropriate assessment" of the impact of a project in an area of the Natura 2000 network (Article 6 of Directive 92/43/EEC). Specifically, it takes into account the conservation objectives of the protected area, focuses on the consequences of the project under licensing in the area, and examines whether the integrity

of this region is compromised. The requirements and the contents of the SpEA study are set out in the Joint Ministerial Decision (JMD) 170225/2014.

8.7.6.1.1 GR 1150001, DELTA NESTOU KAI LIMNOTHALASSES KERAMOTIS KAI NISOS THASOPOULA

It is the most important wetland because of the big area that occupies and because of its rich habitat-types. Nowadays, it still is a valuable part of a wetland chain included between Axios river and Delta of Evros of north Greece. Ornithologically is still important breeding site for spur-winged plover (*Hoplopterus spinosus*) (largest breeding population in Europe), purple heron, (*Ardea purpurea*) etc. It is also important for migratory waterfowl and Lesser spotted Eagles which winter. However, its importance has declined due to the lack of protection. From ichtyological point of view especially the wider part of the river mouth is important spawning and nursery ground for several commercially, intensively used species (Seabream, Seabass, Mullet, Eel, etc.). The reference on *Leuciscus cephalus* is about the subspecies macedonicus. Concerning the fauna the quality of the site is indicated by the occurrence of the invertebrate *Araschnia levana* which is the southern edge of extension, the invertebrate *Maculinea alcon* which is referred to IUCN Conservation Monitoring Centre 1988. 1988 IUCN Red List of Threatened Animals and the invertebrate *Lycaeides argyrognomon* which is referred to Koomen P., van Helsdingen P.J. 1993. Listing of biotopes in Europe according to their significance for invertebrates. Council of Europe.In the present site *Salvinia natans*, a plant species included in WCMC, as well as *Pancratium maritimum*, a plant seriously endangered by the human activities on the coast are growing wild. Keramotis lagoons are an important site from ornithological and ichthyological point of view. Some heronries are also found here. An important site for breeding, passage and wintering waterbirds, raptors and passerines associated with reedbeds. Species of concern include: *Puffinus yelkouan, Phalacrocorax aristotelis, Phalacrocorax pygmeus, Pelecanus crispus, Ixobrychus minutus, Egretta alba, Ciconia ciconia, Cygnus olor, Anser erythropus, Branta ruficollis, Aythya nyroca, Haliaeetus albicilla, Accipiter brevipes, Aquila clanga, Aquila heliaca, Falco naumanni, Burhinus oedicnemus, Glareola pratincola, Hoplopterus spinosus, Gallinago media, Numenius tenuirostris, Larus melanocephalus, Sterna albifrons, Dendrocopos syriacus, Calandrella brachydactyla and Lanius minor*. In the present site *Leymus racemosus ssp. sabulosus*, a plant taxon which reaches its extreme distribution limit in Northern Greece is growing wild.

8.7.6.1.2 GR 1150010, DELTA NESTOU KAI LIMNOTHALASSES KERAMOTIS - EVRYTERI PERIOCHI KAI PARAKTIA ZONI

The wetland is important from ornithological point of view because of the big expanse it occupies and because of its rich habitat types. Moreover, it is a valuable part of a wetland chain included between Axios river and Delta Evrou in northern Greece. The riparian forest and the coastal area are important for breeding, the lagoons for migrating and the river for the wintering of many species as grebes, ducks, herons, cormorants, pygnies, raptors, geese, flamingos, waterfowl

and others. The reference on *Leuciscus cephalus* is about the subspecies macedonicus. Concerning the fauna the quality of the site is indicated by the invertebrate Araschnia levana which is the southern edge of extension, the invertebrate Lycaeides argyrignomon which is referred to Koomen P., van Helsdingen P.J. 199, Listing of biotopes in Europe according to their significance for invertebrates, Council of Europe and the invertebrate Maculinea alcon which is referred to IUCN Conservation Monitoring Centre 1988, IUCN Red List of Threatened Animals. In the present site *Salvinia natans*, a plant species included in WCMC as well as *Leymus racemosus ssp. sabulosus*, a plant taxon which reaches its extreme distribution limit in Northern Greece, are growing wild.

8.7.6.1.3 GR 1150008, ORMOS POTAMIAS - AKR. PYRGOS EOS N. GRAMVOUSSA

The area is characterized by its rich flora and vegetation. The beds of Posidonia are in very good condition and cover a substantial part of the sea bed in the bay. Additionally, the area is free of major point pollution source and presents a typical biotope with a great species diversity. Motivation D *Posidonia oceanica*: the seagrass is at risk in the Mediterranean (WCMC 1993), *Paracentrotus lividus*: a threatened species (IUCN 1988).

8.7.6.1.4 GR 1150009, KOLPOS PALAIOU - ORMOS ELEFTHERON

The bays of Paleon and Heraklitsa are characterized by rich marine flora and vegetation. In these marine areas *Cystoseira* (motivation D) and *Phaeophyceae* communities play an important role. Limited changes in community structure and composition during the last few years may be due to anthropogenic activities (building, tourism). Posidonia beds have shown a tendency to move in greater depth, mainly in Eleftheron bay. The presence of *Paracentotus lividus* is characteristic in the area. Its coexistence with Cystoseira and Posidonia is typical for unpolluted areas. In Eleftheron bay limited species diversity was observed. Some species of gastropods live in the Posidonia leaves (Koutsoubas 1992) and other species in the algal associations. In the area were found "fruits" of Posidonia, is a fact that indicate the great vitality of the meadows. Motivation D *Posidonia oceanica*: threatened species (WCMC, 1993) *Pinna nobilis*: is protected by Greek legislation (Presidential Decree 67/1981).

8.7.6.1.5 GR 1150012, THASOS (OROS YPSARIO KAI PARAKTIA ZONI) KAI NISIDES KOINYRA, XIRONISI

Thasos Island is one of the most important nesting sites, on a European Level, for the Shag (*Phalacrocorax aristoteli*) and the Lanner Falcon (*Falco biarmicus*). Furthermore, it holds significant numbers of birds of prey such as the Golden Eagle (*Aquila chrysaetos*), the Peregrine Falcon (*Falco peregrinus*) and the Short-toed Eagle (*Circaetus gallicus*). In the past, Griffon Vultures used to nest, but now they are only visitors to the area. With appropriate conservation measures, they could re-use the area for nesting.

8.7.6.2 Ramsar Site

The Convention on Wetlands of International Importance, especially as Waterfowl Habitat, also known as "Ramsar Convention" – named after the Persian city of the same name, where it was signed in 1971, provides for the protection of wetland ecosystems.

Pursuant to Article 1 of the Convention, wetlands means: "(...) *areas of marsh, fen, peatland or water, whether natural or artificial. These areas are permanently covered with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters. The wetlands may include riparian or coastal zones, adjacent to the wetlands or islands or sea ponds that are deeper than six meters at low tide* (...)".

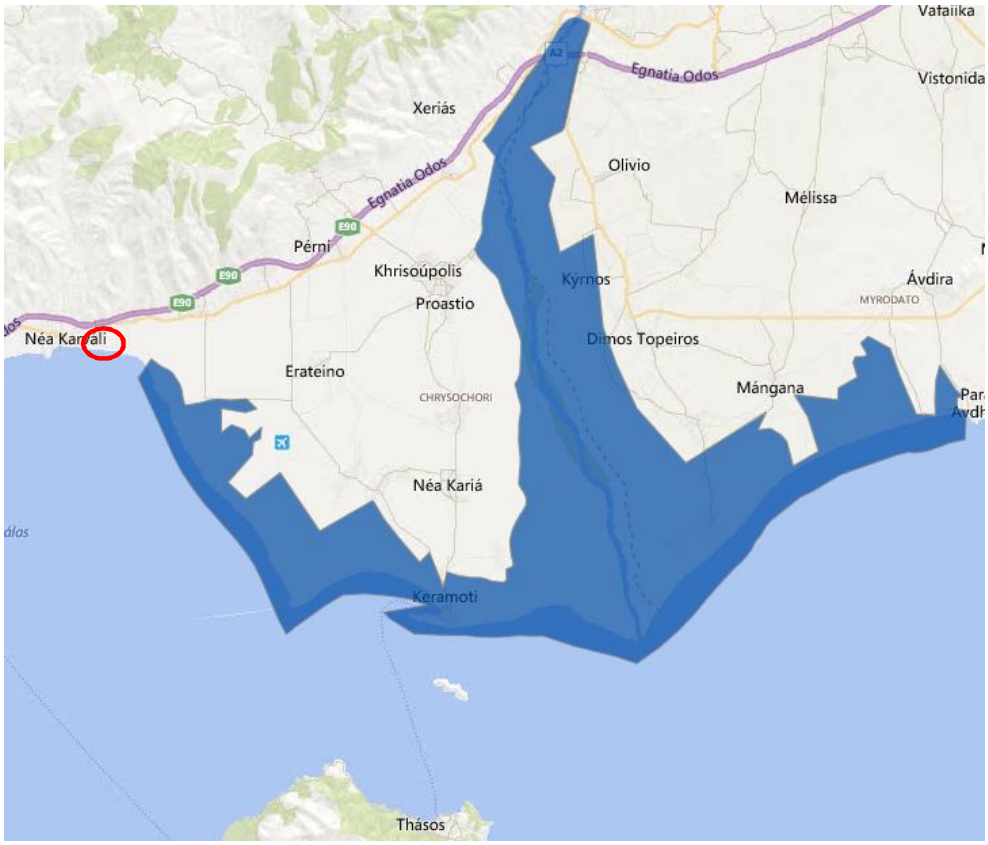
Every state party to the Convention must designate at least one wetland of international importance, whereas in accordance with the most recent survey, the 158 states that have ratified the Convention have designated 1,828 wetlands of international importance.

The Convention was ratified by Greece by means of the Legislative Decree 191/1974 (GG 350/A/20.11.1974), which was subsequently amended by Law 1751/1988 (GG 26/A/9.02.1988) and Law 1950/1991 (GG 84/A/31.05.1991) "On the Ratification of the Amendments to the Ramsar Convention". The Greek wetlands that have been designated since 21 August 1975 as wetlands of international importance (Ramsar Wetlands) are 10 and cover an area of 1,635,010, sq. meters. It must be noted that Greece, by signing and ratifying the Ramsar Convention has undertaken to conserve and properly use all wetlands of the country, through local, regional, international activities and cooperation.

The Montreux Catalog is an abstract of the Ramsar Wetlands list, which was established during the 4th Conference of Contracting Parties – COP, which was held between 27.06 and 4.07-1990 (Recommendation 4.8, Ramsar Convention). The purpose of the catalog was the registration of all Ramsar Wetlands, which are in risk of changes to their ecological character, with a corollary obligation of the contracting parties to take drastic measures for the prevention or reversal of such changes.

Upon the original establishment of the Montreux Catalog, all 10 Greek wetlands were included therein, however, in 1999 three – Small Prespa Lake, Kerkini Lake and Evros Delta, were removed therefrom. Currently, 7 out of the 10 Greek wetlands are included in the Montreux Catalog.

In the vicinity in the project development area, within the limits of the Municipality of Nestos lies one (1) Ramsar Wetland, which, in addition, is included in the Montreux Catalog (see Figure below).



Map 8-21: Area of the Ramsar Site "Nestos Delta and Adjoining Lagoons" in relation to the Onshore Facilities - SIGMA (red circle)

8.7.6.3 National Park of East Macedonia and Thrace

The National Park of East Macedonia and Thrace, as defined in 2008 by the Common Ministerial Decision (CMD) 44549/2008 (Government Gazette 497 / D / 17-10-2008), includes the protected areas of the wetland Delta Nestos, lakes Vistonida, Ismarida and the region, with the total land and water area of 930,000 acres.

The institutionalized management of the National Park of Eastern Macedonia and Thrace is the Management Body Nestos Delta Vistonidas- Ismarida which is a private legal entity, non-profit and was founded in April 2003 by the Ministry of Environment and Energy. The management of the National Park should be compatible with the requirement of the relevant Management Plan.

The wetland complex of the National Park is one of the most important in Greece, due to the large surface area and high biological, aesthetic, scientific, educational and geomorphological value. The purpose of the National Park is the effective protection of habitats and rare species of flora and fauna that inhabit and breed in the area. In the National Park, more than 326 bird species have been observed nesting, overwintering or simply passing through the area. Moreover there is a great variety of, fish, amphibian and reptilian species. The wetland also provides an important habitat to otters, wolves, roe deer and many other mammals. The main habitats are as follows:

- Sandy areas: only plants adapted to the harsh conditions live here such as the sea

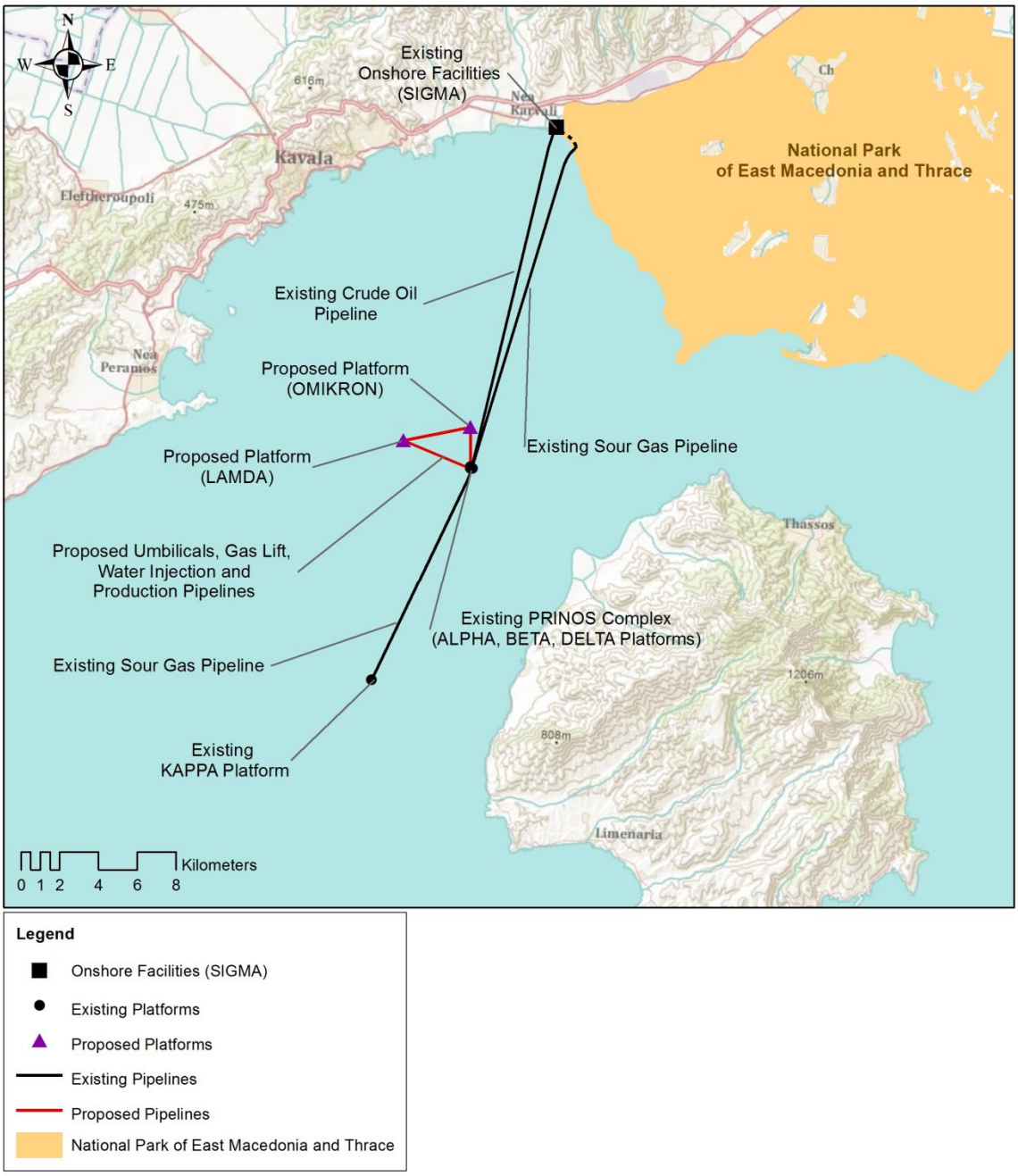
daffodil, in addition to birds which prefer sandy barren sites.

- Salt marshes and salt pans: These areas are periodically flooded by brackish or salt water. Salt tolerant plants can be found here as well as animals adapted to this unfavourable environment.
- Meadows with rushes: these are important feeding grounds for storks, birds of prey and many other bird species.
- Reeds: Reed stands are ideal nesting sites for a remarkable number and variety of bird species.
- Tamarisk shrubs hills, riverine forests: protected areas in the forests provide ideal conditions in which many birds of prey can breed and find sufficient food.

Within the area of the National Park, specific Protected Zones are specified and their boundaries follow the physical characteristics or artificial elements of the area. In these Protected Zones, specific uses and activities are allowed which are defined in CMD 44549/2008. During the Environmental Permit Procedure of new or existing projects within the National Park, consultation with the Management Body Nestos Delta Vistonidas- Ismarida is necessary.

The Protected Zones in order of decreasing severity of uses and activities are the following.

- Zone A: Nature Reserve Zone
- Zone B: Protected Landscapes
- Zone Γ: Eco development Zone
- Zone Δ: National Park Peripherial Zone



Map 8-22: National Park of East Macedonia and Thrace

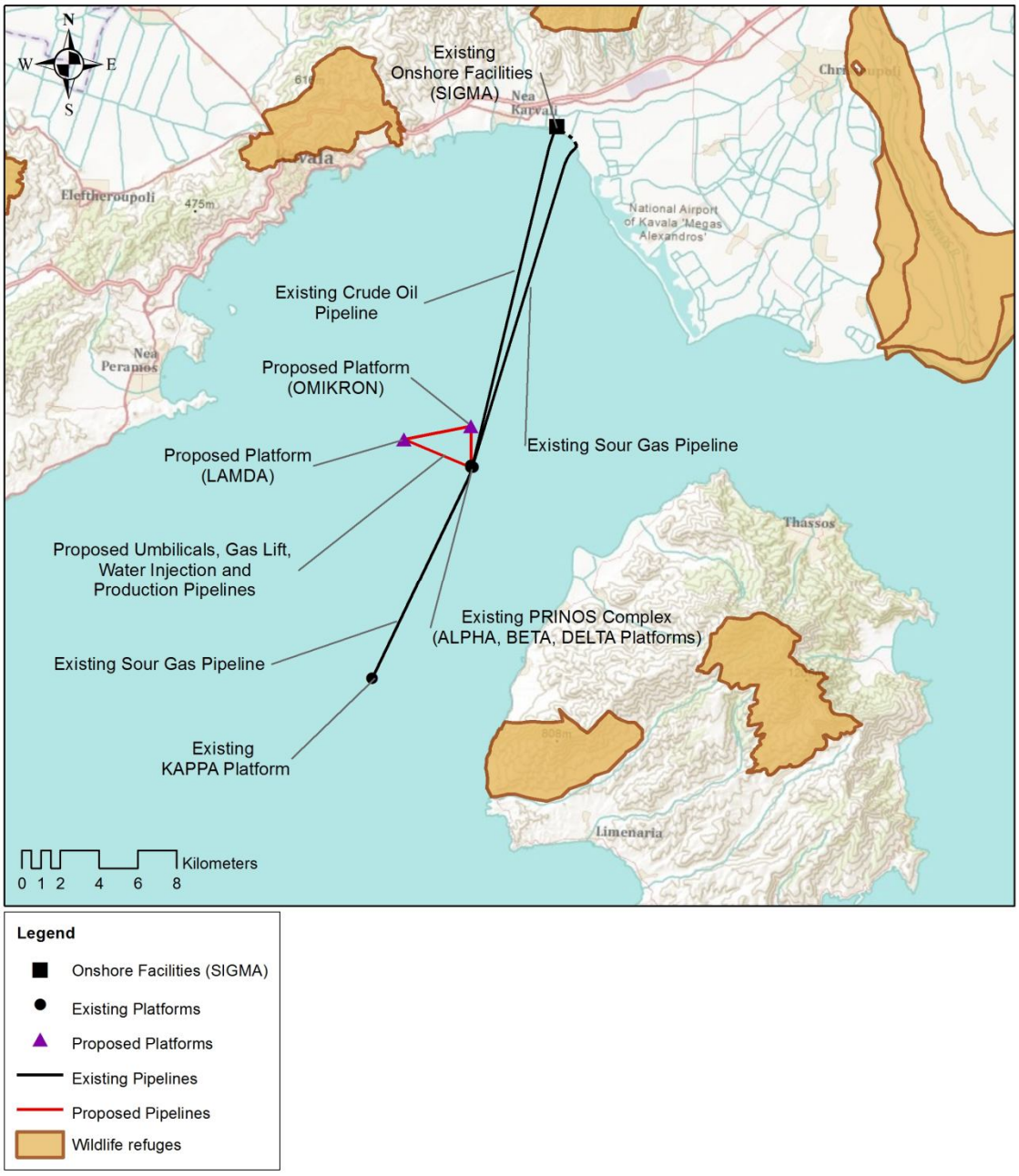
8.7.6.4 Wildlife Refuges (WR)

The establishment of the first permanent Game Refuges, within the administrative boundaries of the Thasos Forest Authority, resulting in the permanent prohibition of hunting, was effected by means of the Ministerial Decision 38098/1976 (GG 744/B/4.06.1976), while the Game Refuges were subsequently renamed to Wildlife Refuges (W.R.), as they are currently known, was effected by means of Article 57 of Law 2637/1998 (GG 200/A/27.08.1998).

The currently in force Law 3937/2011 (GG 60/A/31.03.2011) defines the WR (Wildlife Refuges)

in para. 4.3 of Article 5, as "(...) *natural areas (land, wetlands or marine) of significant importance as significant areas for the development of wild flora or as habitats for the reproduction, feeding, and wintering of wild fauna species or fish reproduction areas and spawn concentration areas or, finally, as significant marine habitats* (...)". Moreover, it provides that ecological corridors between certain categories of protected areas may also be designated as W.R.

In the project development area lies no designated WR (para. 3 of Article 6 of Law. 3937/2011). The WR within the broader Project area are shown in the following figure.



Map 8-23: Wildlife Refuges within the broader Project area

8.8 MANMADE ENVIRONMENT

8.8.1 Physical planning and land uses

Kavala city is the most developed urban centre of Eastern Macedonia and Thrace, is located exactly on tip of the road axis between Thessaloniki and the Turkish border, while its geo-strategic picture is complemented by the 2nd largest commercial port of Egnatia Odos, to the east of the city of Kavala. With one large port and one equally large marina downtown, in combination with the Nea Peramos port and the Nea Irakleitsa marina, Kavala, among others, is one of the most significant fisheries centres in Greece. One of the largest fish markets of the Mediterranean operates in the city, where goods are traded for domestic and international markets. The development of fisheries rendered it necessary to establish in Kavala one of the three Fisheries Research Institutes (FIREI) that operate in Greece.

As a commercial and industrial centre, it is ranked second in N. Greece, behind Thessaloniki. In addition to tobacco processing industries and tobacco warehouses, food and salted foodstuff factories, as well as roller mills and rice mills operate in the city, while the tobacco of Macedonia and Thrace is exported from its port.

The vast majority of residential and production zones of the secondary and tertiary sector (industrial and commercial zones) are concentrated in the coastal zone, which is located, most of the time, along the main road and developmental axis of Drama-Kavala-Xanthi.

The same applies for the basic transport facilities, as well as for arable agricultural land, permanent crops and meadows. The percentage of irrigated land is larger than the one of arable land, a fact that is related to the irrigation channels from Nestos at the Kavala plain, also located in the eastern wetland of the RU of Kavala. The land uses in the RU of Kavala based on the Corine Land Cover register are presented in the following table.

Table 8-22: Land distribution in the RU of Kavala4

RU of Kavala		
Coverage category	**Surface Area (thousands of sq. meters)**	**Percentage (%)**
Urban fabric	35,655	1.68
Production activities and other artificial surfaces	24,700	1.17
Irrigated agricultural land	246,922	11.65
Arable land	173,310	8.18

[4] *Corine Land Cover 2000, European Environmental Agency (EEA), Copenhagen, available at the link: http://www.eea.europa.eu/data-and-maps/data/corine-land-cover-2000-clc2000-seamless-vector-database (last visited 20/04/2015).*

RU of Kavala		
Coverage category	**Surface Area (thousands of sq. meters)**	**Percentage (%)**
Arboraceous cultivations	74,775	3.53
Heterogeneous agricultural areas	228,813	10.80
Coniferous forests	228,813	10.80
Broadleaved forests and mixed forests	321,578	15.17
Forest and bush areas	655,466	30.93
Natural pastures - meadows	180,632	8.52
Areas with sparse vegetation	36,744	1.73
Burnt areas	8.431	0.40
Wetlands	25,960	1.22
Water surfaces	18.702	0.88
Total	**2,119,203**	**100**

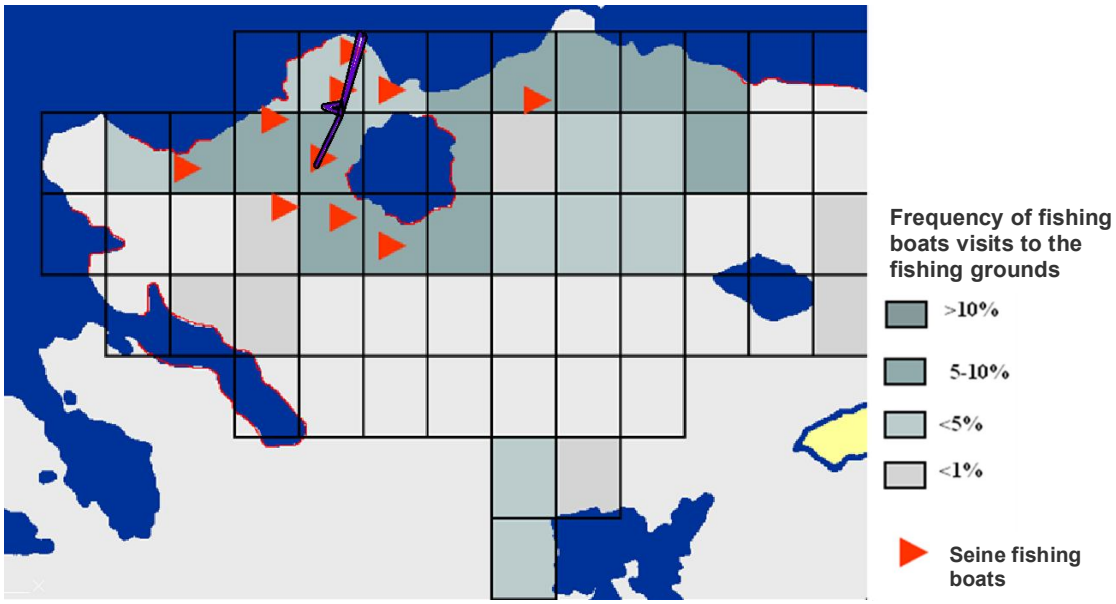
The existing offshore and onshore facilities compatible to the directions and the specifications set out by the Regional Framework of Physical Planning and Sustainable Development (RFPPSD) of the Region of East Macedonia and Thrace

8.8.2 Fisheries and aquacultures

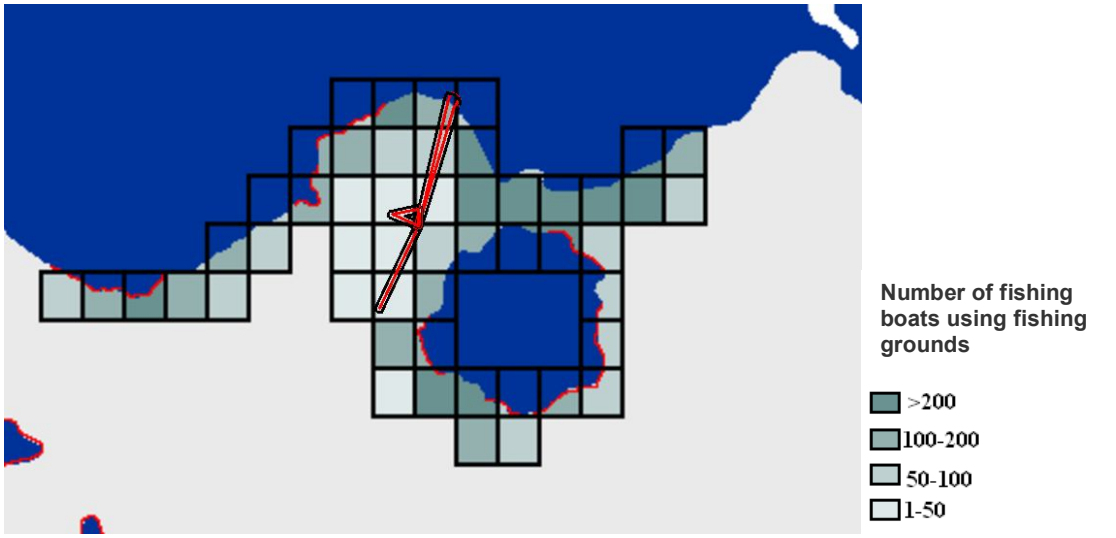
Fisheries

According to the available desk based information, the whole area of the Kavala Gulf is considered a fishing ground, especially for species such as European anchovy and sardine. Particularly abundant quantities of bivalve molluscs (mussels, oysters), crustaceans (shrimps, prawns, crabs) and pelagic fishes (sardine, European anchovy, bluefish, bonito, tuna).

The main fishing grounds of the trawlers fleet expand to a depth between 20 and 300 m, at a medium distance from the shore, which ranges from a few miles from the shore, within the territorial waters, until the limit of 450 m of depth, far away from the territorial waters of Greece. Topographically, the main grounds are located along the shores of Thrace, with the exception of the winter period, when some vessels fish at the western side of the Kavala Gulf. The main catches are red mullet, cod, octopus, prawn, shrimp and crayfish.



Map 8-24: Fishing grounds of trawlers in the RU of Kavala – red arrows show the main grounds of the seine-fishing vessels



Map 8-25: Coastal fishing grounds along the coasts of the RU of Kavala

In accordance with the recent data from the Directorate of Rural Economy & Veterinary Medicine of the RU of Kavala (Fisheries Department), approximately 250 coastal vessels (boats) have been recorded, with a length between 3 and 15 meters, 38 vessels of medium distance fishing (trawlers and seine fishing vessels), with a length between 15 and 30 m. Moreover, people, directly or indirectly, connected to the fisheries sector are estimated at 2,000 - 2,500. The catch of the Kavala fleet end up in the Kavala Fish Market in order to be auctioned. There, approximately 8,000 to 10,000 tn of fisheries are traded annually, the larger part thereof comprising small pelagic fishes (sardine and European anchovy), which constitute raw materials for processing activities. A percentage of the total catch – equal to 35%, comprises the catch unloaded by trawlers, approximately 40-50% from seine-fishing vessels and a percentage of 15-20% by the coastal vessels.

The following table shows the main catches of the trawlers fleet, as they are recorded in the Kavala Fish Market bulletin. The table shows that the main catch is cod, which provides 5.2% of income, mullet, with 5.6% of the income and octopus, which is the characteristic species of the Thracian sea, since it is massively caught with many fishing tools.

Table 8-23: Main catches of the Kavala Fish Market Trawlers

Main species	Common Name	Quantity (tn)	Percentage (%)	Euro (thousands)	Percentage (%)
Fishes					
Merluccius merluccius	Cod	92.44	1.51	1,676	5.29
Rajidae	Raja	61.4	1.02	137	0.65
Labridae	Wrasse	63	1.03	1,026	0.51
Gobiidae	Rock goby	14.3	0.23	196	0.11
Mullus barbatus	Red mullet	80.6	1.32	1,131	5.64
Pagellus erythrinus	Red snapper	15.49	0.25	119	0.58
Lophius sp.	Toadfish	70.48	1.15	196	1.37
Trachurus trachurus	Horse mackerel	110.3	1.8	256	1.72
Diplodus sp.	Seabream-type (seabream, sargo, blacktail bream)	23.5	0.38	7	0.17
Mollusks					
Illex sp.	European flying squid	18.6	0.3	101	0.48
Octopus sp.	Octopus	197.6	3.23	1,166	8.49
Eledone sp.	Horned and musky octopuses	63.7	1.04	218	0.75
Crustaceans					
Parapeneus longirostris	Prawns	160.7	2.36	741	3.45
Peneaus sp.	Shrimps	17.58	0.28	176	2.23

Fishing Prohibitions

For navigation and project safety, fishing and movement of respective vessels is prohibited in a radius of 500 m around the platforms (IOR No. 3 of 1980, Article 10– GG 63/B/24.01.1980), while the Kavala Port Authority is the competent authority for organizing, ensuring, and monitoring the safe navigation terms in the area of the facilities.

More generally and according to the Directorate of Fisheries Monitoring, in the wider area of Kavala, the following are prohibited:

- Fishing at a distance of 300m from the shore, between 15 June and 15 September each year (Decision of Kavala Central Port Authority 2134.1/09 /11/14.10.2011).
- Fishing in the safety maritime zone around the platforms and at a radius of 500 m throughout the year (Article 10 I.O.R. 03/1980 – GG 63/B/1980).
- Fishing (trawlers and seine-fishing vessels) over beds with marine vegetation, in particular *Posidonia oceanica* or other marine phanerogams (REG. EC 1967/2006, MD 167378/2007 – GG 241/Δ/2007, as subsequently corrected by GG 392/Δ/2007).
- The day seine-fishing vessels during the months of July and August and between 15 December and end of February (PD/1993 – GG 9/A/5.02.1993).
- The day-night seine-fishing vessels, at a distance of less than 100 m from the shore (R.D./1953 – ΦΕΚ 81/A/8.04.1953).
- The use of day seine or day-night seine at a distance within 300 m from the shore or at a depth less than 50 m, if this depth is located at a shorter distance from the shore. Seine-fishing vessels may not fish at depths smaller than 70% of their total vertical height – maximum 120 m (REG. EC 1967/2006).
- Fishing with bottom trawler at a distance of 2 nautical miles from the shores of Thrace until the shores of eastern Macedonia (from the mouth of Nestos until the Ierissos Gulf) between the months of March and November each year (Article 5 of RD 917 – GG 248/A/12.10.1966) (Map 8-26)).
- The use of trawling nets within 3 nautical miles from the shore or at a depth of less than 50 m (if this depth is located at a shorter distance from the shore) and, in any event, within 1.5 nautical miles from the shore, regardless of depth. (REG. EC 1967/2006).
- Fishing with trawlers in the Kavala Gulf (within the line Vrasidas cape - Eleftheres Gulf – Pachi, Thasos, as well as within the line cape Kalogeros, Thasos and mouth of river Nestos) between the months April and October each year (Article 10 of RD 917 – ΦΕΚ 248/A/12.10.1966).
- The use of trawling fishing permit in international waters, with the “bottom trawler” fishing tool in the geographical sub-area (GSA) 20, 22, 23 of GFCM as follows: (a) between 24 May and 15 July, in all sub-areas and (b) between 16 July and 1 October and to the west of the 25th meridian of the sub-area 22 (Decision by the Minister for Rural Development & Food No. 4023/64557 – GG 1307/B/22.05.2014) (Map 8-27).

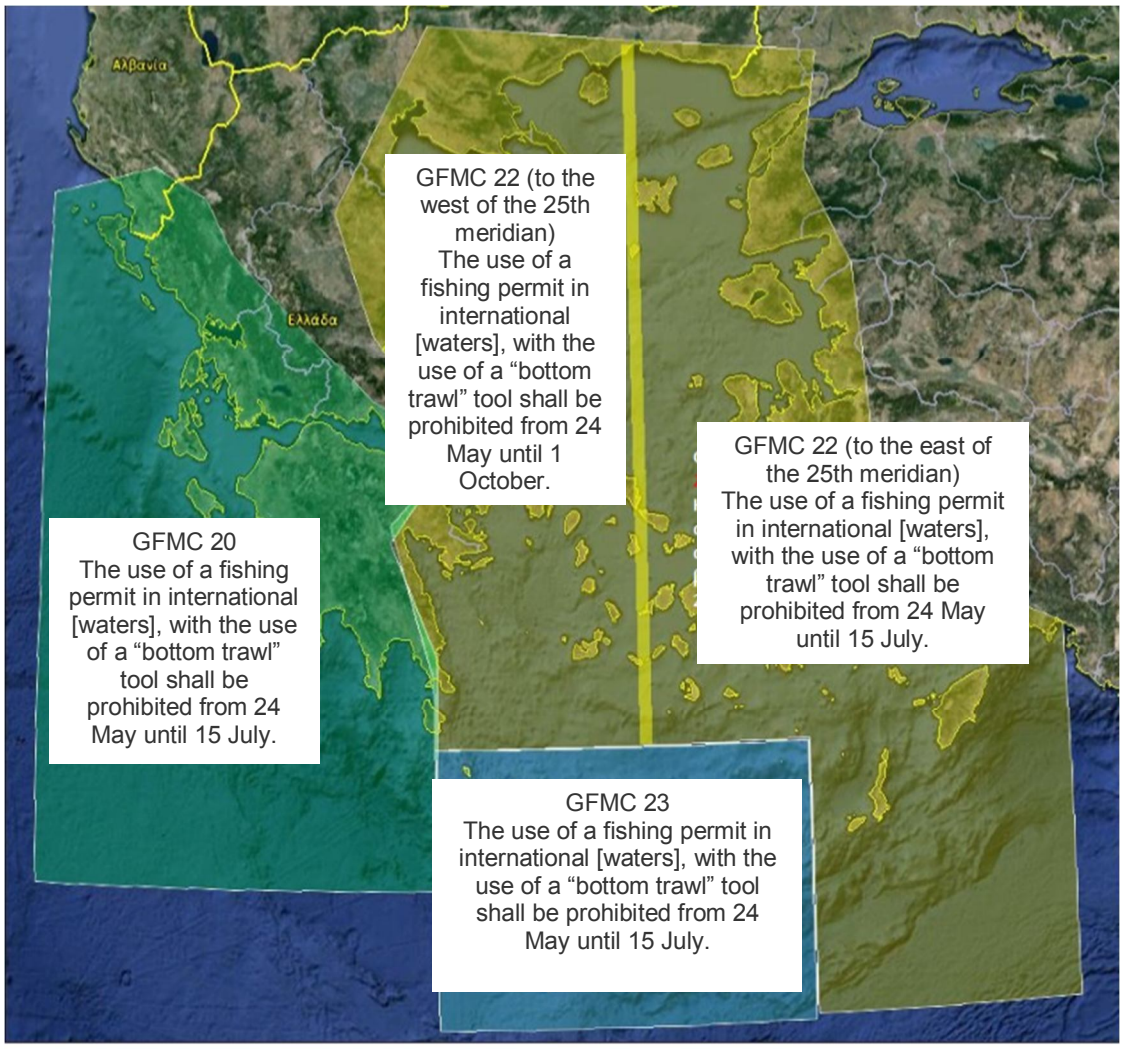
Safety zones of 500 m surrounding the existing platforms where no unauthorised vessels are permitted are designated, whereas for the existing pipelines a safety zone 200 m is also designated on each side where no anchoring and no trawling is permitted.

These zones around existing structures in Kavala Gulf cause restrictions on ship traffic, which are regulated by Kavala Port Authority. However those zones are distant from the usual ferry crossings and naval zones used by the ships approaching Kavala area ports. The irregular routes (fishing boats, leisure boats etc) are not interfering with the existing facilities as those are away of any relevant destinations and pose only a small fraction in comparison of the available

marine area of the Kavala Gulf.

Map 8-26: Fisheries prohibition with trawling net in accordance with the RD 917/19665

[5]*Fisheries Prohibitions, Hellenic Coast Guard – Directorate of Fisheries Monitoring, April 2015, available at the link:http://www.hcg.gr/alieia/etisies/GREECE/ier_thasos/1.php (last visited at 20/04/2015).*



Map 8-27: Fisheries prohibitions for trawlers in accordance with Decision by the M.R.D&F. No. 4023/64557/2014

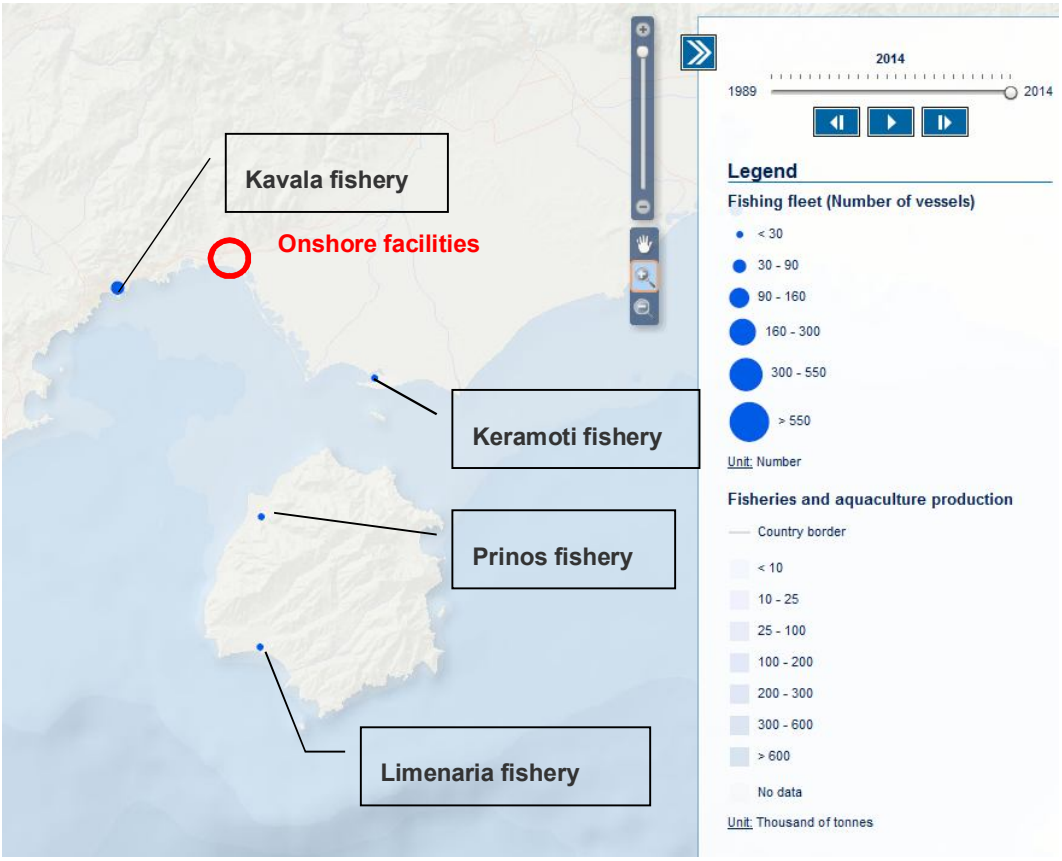
The foregoing shows that the fishing period with trawlers begins on 1st October and ends on 31st May. Fishing within the Kavala Gulf is allowed between 1st and 30 November.

In Greece, since the 1970s, fishing with bottom trawlers between July and September each year is prohibited. During years that bottom trawling fishing is productive even during May, the performance of the vessels reduces gradually, in order to cease at the end of May. Vessels with dual permits continue to fish even during this month with bottom trawlers, however, if the quantities of demersal organisms are reduced or if the demand for European anchovy is high, then the said vessels gradually change their tools and start fishing with seine. In this manner, the number of vessels unloading catches in Kavala is not stable, but it is gradually reduced around the end of May.

Normally, the seine-fishing vessels stop fishing, in accordance with a relevant provision, during the period between 15 December and 15 February. However, every year the factors that determine the alternative fishing are two: a) the quantities of demersal organisms caught and b) the price of small pelagic fish and particularly the European anchovy.

Aquaculture

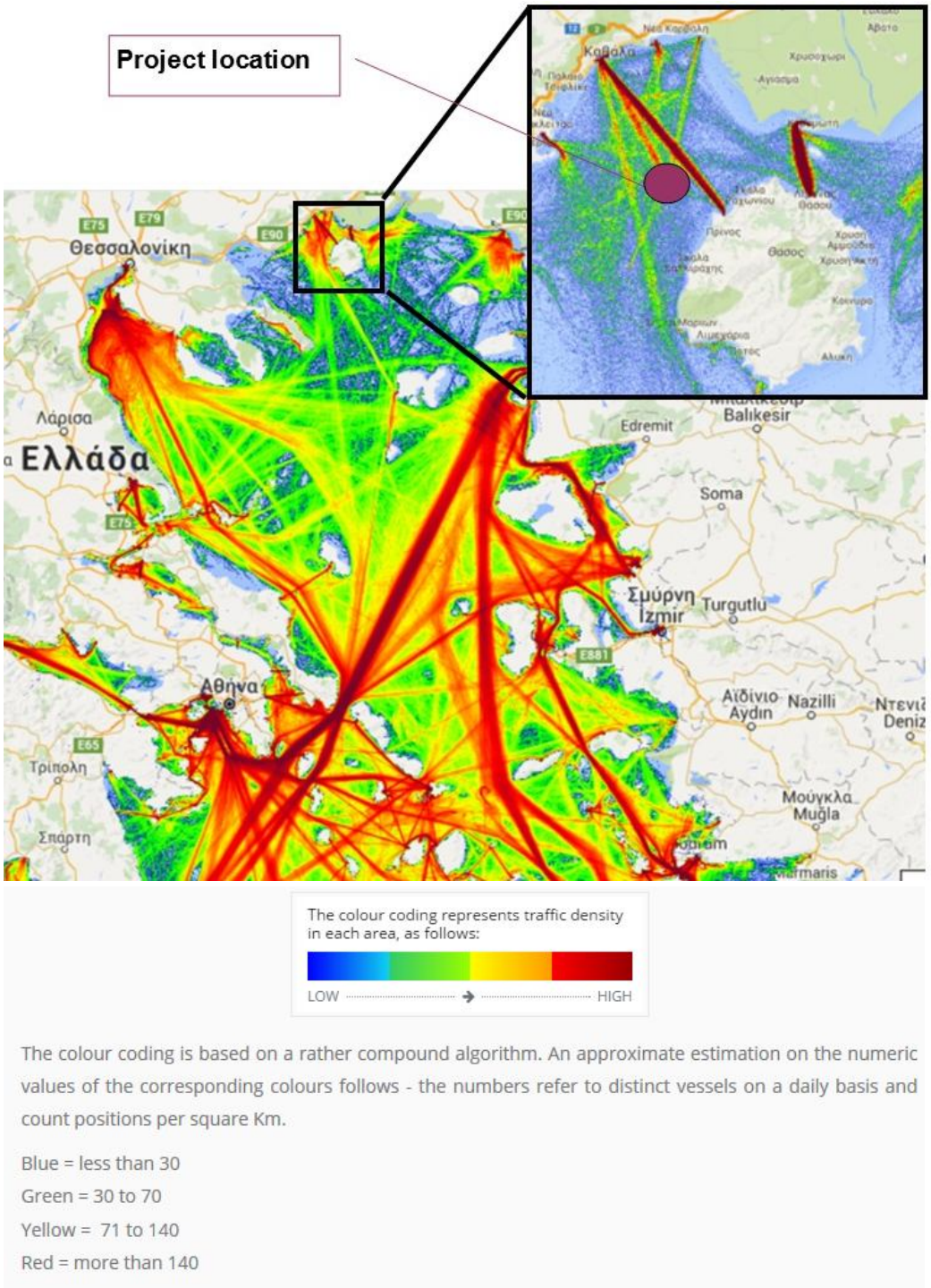
There are four aquacultures in the locations shown in the following figure.



Map 8-28: Aquaculture in the Kavala Gulf

8.8.3 Navigation

Based on the available data of the Kavala Port Authority (KPA), from the central port of Kavala there are 5 weekly routes to the S. Aegean. From Kavala, at the Prinos Ferry, three trips per day take place, whereas from Keramoti to the Thasos port approximately twelve trips per day. Currently, access to North Aegean is served by two companies and respectively, three for Thasos. As regards cruises, the number of cruisers that visited in 2013 the passenger terminal of the port of Kavala amounts to fifteen (15), in 2014 twenty six (26), whereas for 2015 the figure may reach nineteen (19).



Map 8-29: Density of marine traffic in the Aegean Sea and the Kavala Gulf (source: www.marinetraffic.com)

From the above map it can be clearly seen that the existing facilities are in between the main marine traffic areas of the Kavala Gulf. However, the routine navigation routes used by the commercial ferries presented by high frequency traffic are passing away from the existing offshore facilities and the exclusion zones defined in the naval charts, so by no means create any possible interference. The routes presented to be pointing from Kavala port to the centre of the existing facilities, actually represent the daily marine traffic carried out in the framework of

the existing operations (i.e. loading of supplies, personnel and equipment on and off the existing platforms), and therefore do not consist of any interference with the overall gulf marine traffic.

Occasional marine traffic, like recreational and commercial, also do not interfere with the existing facilities as those take up only a small fraction of the overall marine area available for navigation.

8.8.4 Tourism

In accordance with data from Hellenic Statistical Authority (ELSTAT, 2011), the RU of Kavala, shows greater specialization in tourism, absorbing 54% of all tourists staying in the region. The island Thasos is the main tourist attraction, located in the Kavala Gulf, at the northern part of Aegean Sea.

The area between the river mouth of Strymonas and Nea Peramos (western shores of Kavala), showed during the last decade a significant increase of construction activities with regard to holiday houses. The next coastal area between Nea Peramos and Kavala constitutes a tourist attraction since a long time ago, resulting in the development of a tourism activities zone, with hotels, holiday and permanent residences, as well as restaurants. The shores of the area between Kavala and Nea Karvali consist of a series of bays with sand beaches, which are formed from low hills, with steep slopes towards the sea.

The shores of the plain of Chrysoupoli, between Nea Karvali and Nestos Delta, consist of a continuous zone of sand beaches behind of which lie lakes and lagoons of various sizes, which are protected under the Ramsar Convention. The Keramoti shore can also be found in this area, with its natural port, which, however, has impacts on the marine area, since it is intensely used for fishing and for maritime commercial and passenger transports, to and from Thasos. Moreover, around the settlement of Keramoti, unlicensed buildings can be found and unregulated development of leisure facilities. Finally, the existence of the airport in Chrysoupoli contributes to the tourist development of the aforementioned areas.

The accessibility rate of the tourist resources of the regional unit, with regard to road, train, sea and air access, is considered as having improved during the last decade. Nevertheless, it is considered that further improvement is required, in order to be able to attract visitors from other places in Greece and abroad.

Table 8-24: Hotels of all types in the continental part of the RU of Kavala and the island of Thasos until 24.6.2015 (Hellenic Chamber of Hotels)

	No. of Units	No. of Rooms	No. of Beds
Continental part of the RU of Kavala	50	1,625	3,091
Thasos	206	5,144	10,267
Sum	256	6,769	13,358

Table 8-25: Rooms & apartments to let, and self-serviced accommodations in the continental part of the RU of Kavala and Thasos Island (Hellenic Chamber of Hotels)

	No. of Units	No. of Rooms	No. of Beds
Continental part of the RU of Kavala	87	531	1,444
Thasos	896	5,203	12,290
Sum	983	5,734	13,719

The spatial distribution expands to 19 areas (8 in Thasos and 11 in the continental part of the RU of Kavala). The island of Thasos concentrates 89% of the units. The most touristic areas of Thasos Island are the Port, Potos, Potamia, Limenaria, Panagia and Rachoni. The most touristic areas of Kavala are Peramos and Irakleitsa.

As regards organized camping grounds, for the year 2015 the RU of Kavala concentrated 9 (of which 4 on the island of Thasos) with a total number of spaces for tents and trailers amounting to 1226. In 2011, 25 units within the RU of Kavala ceased operations, 17 of which are located on the island of Thasos.

Moreover, in accordance with the following table, the total stays in hotel accommodations between the years 2005-2007 shows a greater increase by 11.46%, which continues with a slower rate (7%) during the subsequent year. Subsequently, between 2009 and 2010, there is a decrease by the rate of -10.39% in order to return to an increase by 6.44% in 2011.

Table 8-26: Percentages of stays in hotel accommodations in the RU of Kavala6

Regional Unit	2005/2004	2006/2005	2007/2005	2008/2007	2009/2008	2010/2009	2011/2010
Kavala	2.07 %	-0.76%	11.46	7.09%	-1.93%	-10.39%	6.44%
REMTH	1.40%	1.28%	8.32%	7.03%	-1.13%	-9.66%	1.03%

Taking into account table below, the number of stays by foreign tourists in the Region shows a significant decrease, that can be observed in 2004 (-12.4%) and, obviously, is related to the attractiveness of Athens at that period, as the host of the Olympic Games, however during a small decrease of stays in the whole country at the same period. The small decrease in the years 2009 and 2010 is probably related to the effects of the crisis in the overall image of the country. On the contrary, in 2011 there is a significant increase of foreign tourists, by 17.73%, which is larger than the respective increase for the country.

Table 8-27: Percentages of total stays of foreign tourists in hotel accommodations3 in the RU of Kavala

Unit	2005/2004	2006/2005	2007/2005	2008/2007	2009/2008	2010/2009	2011/2010
RU Kavala	3.61%	3.54%	13.90%	12.28%	-2.66%	-5.14%	16.82%
REMTH	3.03%	8.51%	8.88%	11.47%	-1.87%	-2.84%	17.73%
Country total	4.61%	5.95%	11.66%	-0.37%	-2.77%	5.05%	11.45%

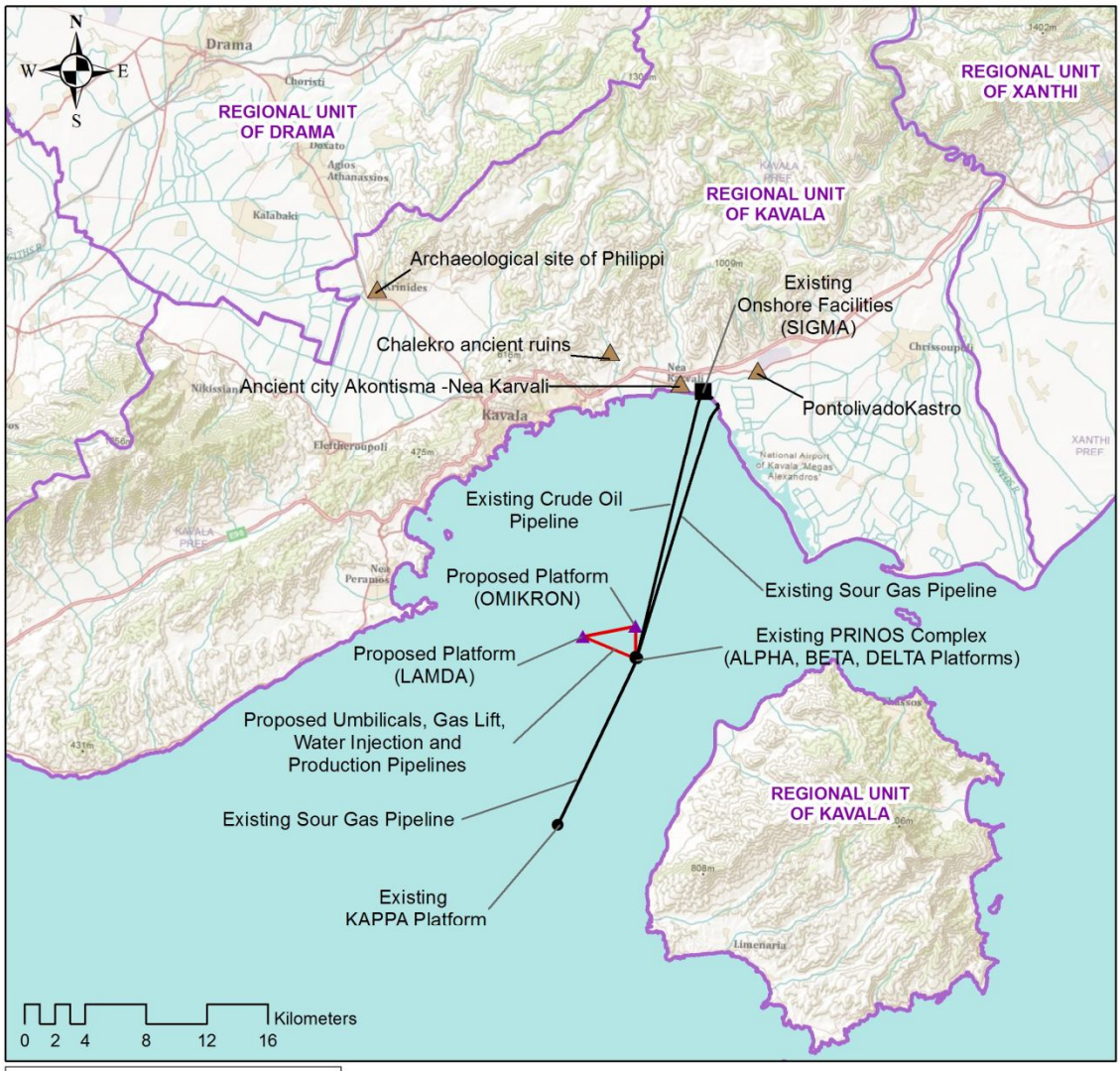
[6] *Sum of stays in hotel accommodations per RU, ELSTAT, 2011*

8.8.5 Cultural Heritage

The marine area of the Gulf of Kavala, where all offshore facilities (existing and new) are located, is well investigated and there are no signs of archaeological findings that could be of any interests. The shallow waters as well the type of the seabed do not enable the preservation of any possible ruins, through the ages.

The main archaeological and cultural sites in the Regional Unit of Kavala are briefly described below:

- Philippoi – the most important archaeological site of eastern Macedonia, 17 km to the NW of Kavala, with monuments characteristics of the Hellenistic, roman and early Christian eras. It includes the ancient city of Philippoi (GG 35/B/2.02.1962) and the monument – outside the wall of Philippoi, Basilica C (GG 36/B/3.02.1962), under the competence of the 18th Ephorate of Prehistoric and Classic Antiquities.
- The archaeological site “Remnants of the ancient city Akontisma in Nea Karvali” (MD 21220/10-8-1967 GG 527/B/24-8-1967). During the cleaning process (2005-2007) in the newer fortifications on the hill top fort in the eastern boundaries of Nea Karvali and Kavala, an ancient fortified settlement was discovered
- The archaeological site Chalkero (MD 54780/3306/10.17.2001, GG 1464/B/26-10-2001). This is the hill north of the National Road Kavala - Xanthi before crossing to Chalkero, within the limits of Kavala Municipality. It consists of visible on soil surface ancient ruins, buildings and retaining walls, attributed to what is known in the area to be the Temple of Zeus and ancient quarries.
- The site Pontolivado (YA YPPE/ARCH/A1/F18/68159/3413/12.04.1979 - GG 93/B/1.31.1980) is located 3 km east of the settlement and consists of enclosure walls, residential complex and findings of classical and Hellenistic periods (ancient Pistiros).



Map 8-30: Archaeological and cultural sites in the RU of Kavala

The Museums of Kavala are:

- The Archaeological Museum, containing findings from the Neolithic period, findings of the Dikili Tash settlement, from the Bronze Age, findings of Neapolis, the ancient Amphipolis and of the region of Thrace.
- The Tobacco Museum of Kavala Municipality is the only theme Tobacco Museum across Europe. It is a modern industrial and experiential museum with many exhibits and

archives.

- The Municipal Folklore Museum of Kavala opened in 1988. Its department are Archives, Ethnographic Collection, Art Collection, Natural History, Library, and Museum Education.
- In Nea Karvali is located the Historical and Ethnological Museum of Greek Cappadocian with costumes, carpets, paintings, jewellery, embroidery etc.

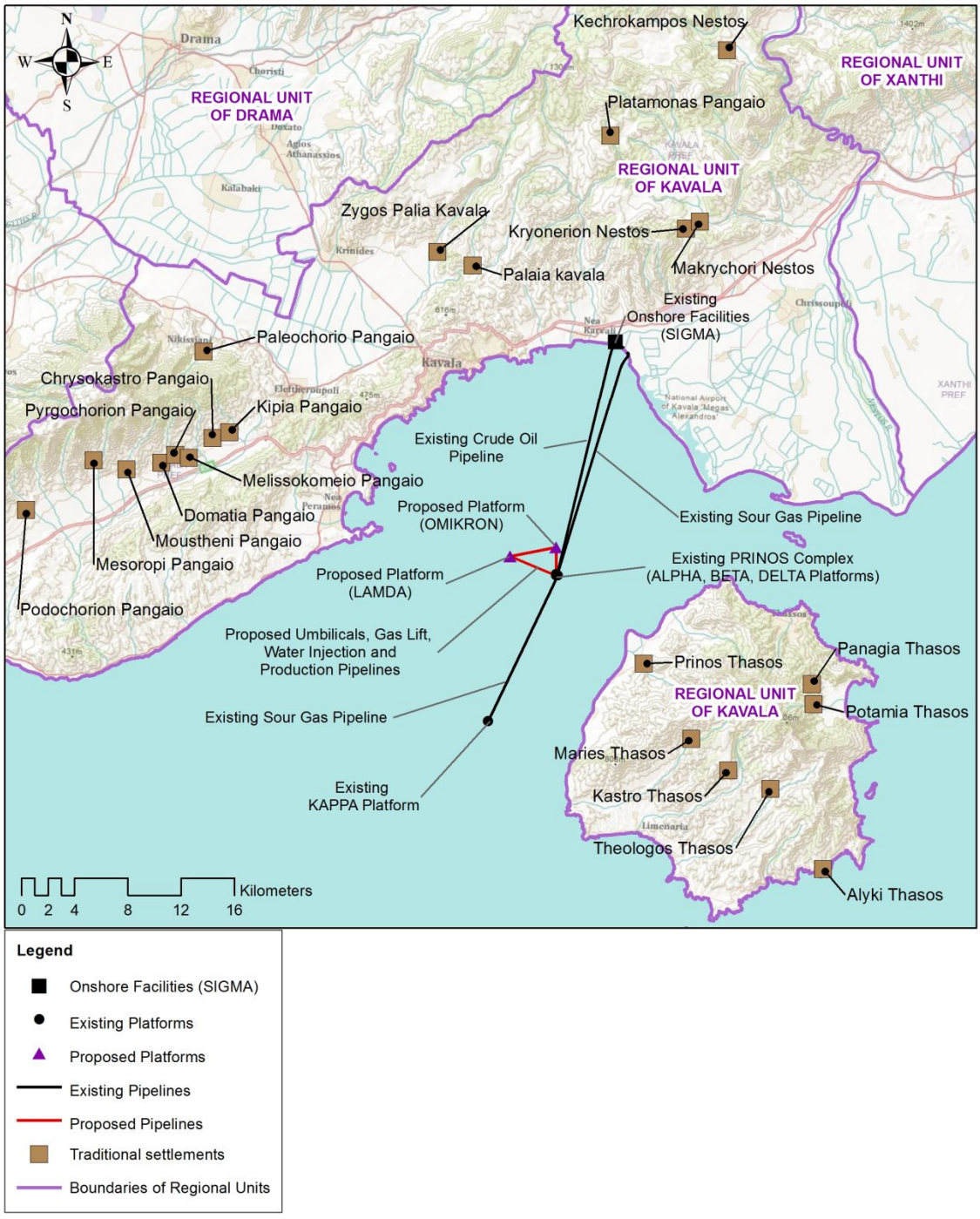
As regards cultural events taking place every year, these are:

- The Eleftheria – taking place the second semester of June in Kavala.
- The maritime week in Kavala.
- The grape festival during the months of August and September in the village of Elaiochori.
- The folk festival in Chrysoupoli.
- The potato festival in Lekani.
- The Kavazitiana, in September, at Ano Prinos, Thasos.
- The Klydona in Kavala.

The most traditional settlements in the Regional Unit of Kavala have been designated by the PD of 1978 (GG 594/Δ/13.11.1978) "*On the designation of some settlements of the country as traditional ones and determination of the terms and restriction in buildings in the plots thereof*", which are referred to in the following table:

Table 8-28: Traditional settlements in RU of Kavala)

Municipality	Traditional Settlement
Thasos	Alyki
	Theologos
	Kastro
	Mariai
	Palaiochorion
	Panagia (Anastasion)
	Potamia
	Prinos
Kavala	Zygos
	Palaia Kavala
Nestos	Kechrokampos
	Kryonerion (Karga)
	Makrychorion
	Platamon
	Stenopos
Pangaio	Domatia (Samakovo)
	Kipia
	Melissokomeion
	Mesoropi
	Moustheni
	Palaiochorion
	Podochorion
	Pyrgochorion
	Chrysokastron



Map 8-31: Traditional settlements in RU of Kavala

At a different time period, the above settlements as well as parts thereof have been designated as historical sites and Landscapes of Outstanding Natural Beauty (LONB). These are referred below, along with the respective Government Gazette issues designating them:

- Chersonisos, neighbourhood known as Panagia. It is a historical site and a LONB (GG 822/B/22.08.1974).
- Nea Peramos, beach It is a LONB (GG 363/B/11.04.1980).

- Agios Ioannis It is a LONB (MD Γ/1224/21-8-82).
- Part of the town of Eleftheroupoli. It is a historical site and a LONB (GG 128/B/28.03.1983).
- Ancient port of Thasos Port. It is a marine protected area (GG 74/B/5.02.1987).
- Alyki in Thasos. It is an archaeological site and a LONB (GG 166/B/3.03.1977).
- Astris in Thasos. It is an archaeological site and a LONB (GG 166/B/3.03.1977).
- Theologos in Thasos It is an archaeological site and a LONB (GG 166/B/3.03.1977).
- Kinyra in Thasos. It is an archaeological site and a LONB (GG 166/B/3.03.1977).
- Panagia in Thasos It is a historical site (GG 875/B/23.10.1972).

The area south of the wall of ancient Thasos, at a radius of 1,000 meters around it, is a LONB (GG 1501/B/14.12.1976).

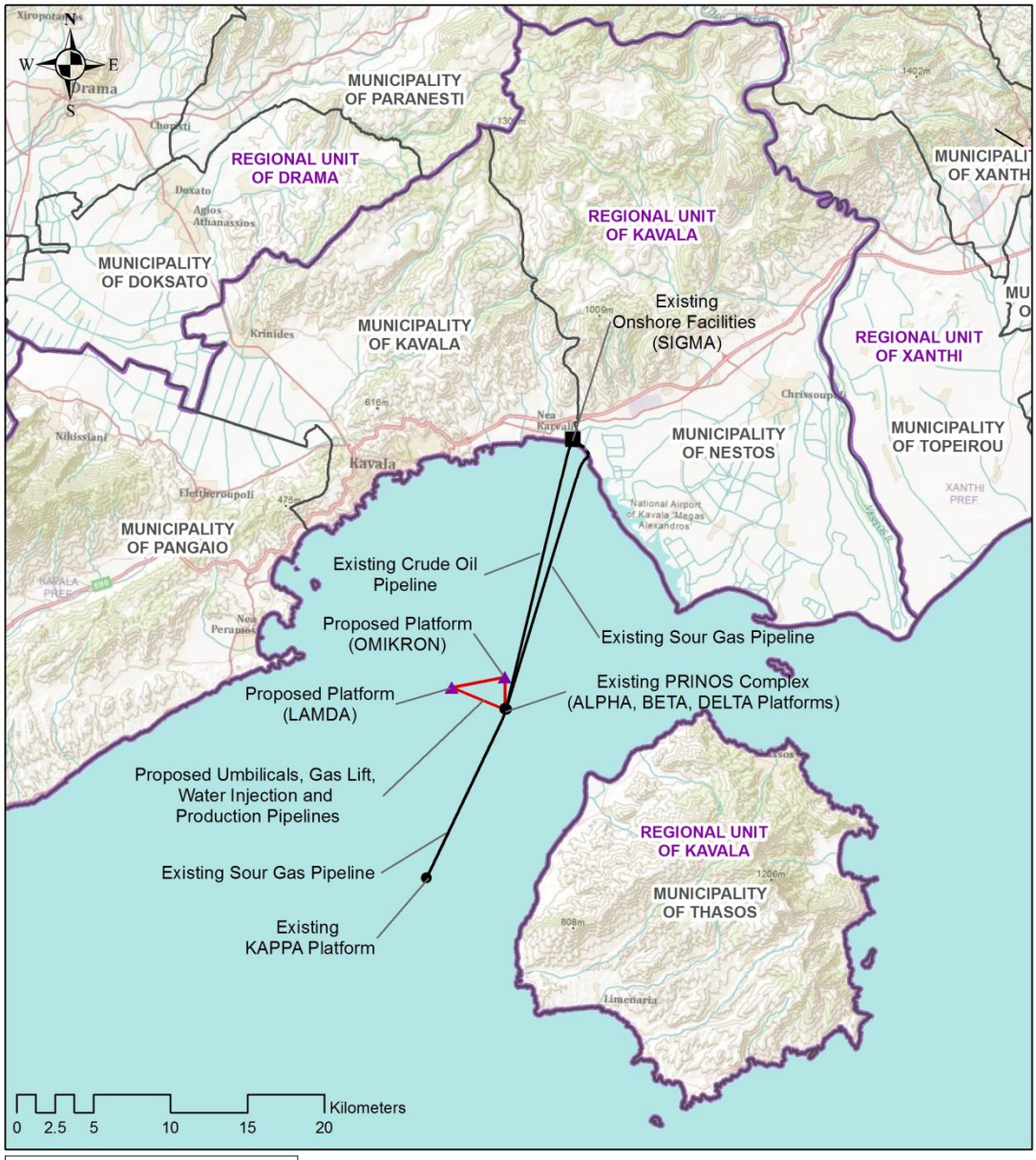
Summarizing, archaeological finding are not observed in the area of existing and proposed platforms and pipelines based on the results of the geophysical surveys. Moreover, during the environmental permitting procedure and the operation of the existing onshore and offshore facilities, there are not any negative opinions or specific suggestions from the competent archaeological department.

8.9 SOCIO-ECONOMIC ENVIRONMENT

The aim of this section – based on Greek environmental law specifications (MD 170225/14) – is to provide an overview of the socioeconomic conditions in Kavala area (Kavala Regional Unit, Kavala city, Thasos Island) in terms of demography, local GDP, employment and income sources. The information, which presented in this chapter, is based on material from secondary sources and especially from the Greek Statistic Authority or other official databases.

8.9.1 Demography

The municipalities of the Regional Unit of Kavala are Thasos, Kavala, Pangaio and Nestos as shown in the map below. The municipalities of RU of Kavala have a coastline and the main settlements are next or near the sea. The seats and the area of the above mentioned municipalities are given in the following table.



Map 8-32: Administrative divisions in the RU of Kavala

Table 8-29: Inventory of municipalities in the RU of Kavala

Regional Unit	Municipality	Seat	Area (m^2)
Kavala	Thasos	Thasos	380,097

Regional Unit	Municipality	Seat	Area (m^2)
	Kavala	Kavala	351,350
	Pangaio	Eleftheroupoli	701,427
	Nestos	Chrysoupoli	678,831

The permanent population of the RU of Kavala, according to the results of the 2011 census, amounts to 608,182 residents, covering, thus, 5.62% of the total population of the country. Out of all residents, 49.3% (299,643 residents) are male and 50.7% (308,539 residents) are female. 59.1% of the total population is classified as urban population, with an increase trend, whereas 40.9% of the population as rural population, with a decrease trend.

The following municipalities belong to the Regional Unit of Kavala (former Kavala Prefecture), based in Kavala:

- Municipality of Kavala based in Kavala
- Municipality of Nestos based in Chrysoupoli
- Municipality of Pangaio based in Eleftheroupoli
- Municipality of Thassos based in Thasos

The table below shows changes in resident population per municipality for the period 1991 - 2001 - 2011.

Table 8-30: Change in resident population in the Regional Unit of Kavala by Municipality, 1991 - 2001 - 2011.

AREA	1991	2001	2011	Change 1991 - 2001	Change 2001 - 2011
Regional Unit of Kavala	120,992	128,051	124,917	5.8%	-2.4%
Municipality of Kavala	60,784	63,572	58,790	4.6%	-7.5%
Municipality of Nestos	21,444	22,218	22,331	3.6%	0.5%
Municipality of Pangaio	29,523	31,644	32,085	7.2%	1.4%
Municipality of Thasos	13,315	13,451	13,770	1.0%	2.4%

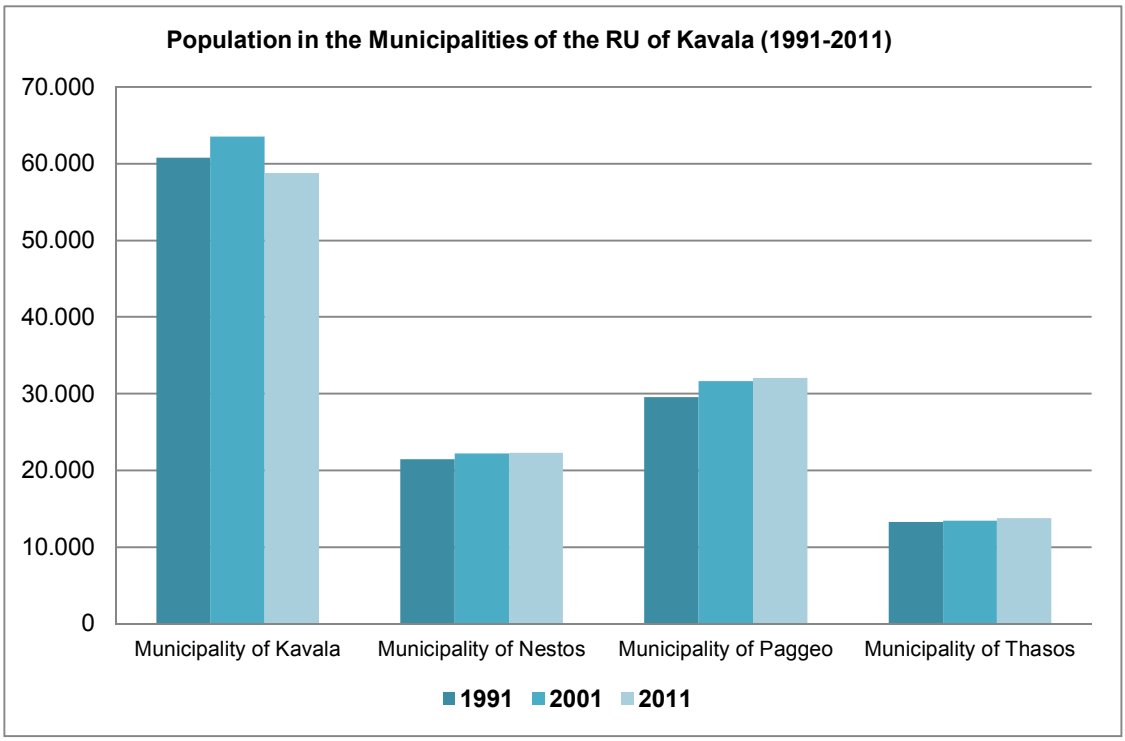


Diagram 8-13: Population in the municipalities of the RU of Kavala (1991-2011)

The quality of life is related to factors such as public and environmental health. Any potential impact, to the project's area health and safety quality, mainly relates to emissions from the release of hydrogen sulphide. The air emissions are below the permissible levels, to ensure the protection of public health and safety. Energean implements the necessary protection/prevention measures, to ensure the protection of public health, according to Protection Plans (especially, in case of hydrogen sulphide release).

The facilities are located in the offshore area of Kavala Gulf (while the onshore facilities are in an industrial area outside of the city), thus there is no interference of the operating activities in everyday life of Kavala and therefore there are not noticed any negative impacts.

Furthermore, based on the results of the measured pollutants of the sediments samples taken from the marine environment of the project area, are within the accepted limits/thresholds (Heavy Metals and PAHs), thus the impacts to environmental health are considered negligible.

Additionally, Energean has developed its own medical facilities, in order not to burden local health services. Overall the Company has been operating in the area for a very long period, without major incidents.

Under normal operating conditions there will be no impacts on public health and safety of wider Kavala area.

Taking into consideration the Safety, Prevention measures as well as the Preparedness and Emergency Response Plans of the company, in case of emergency, company's activities are and will continue to be conducted taking foremost account of the health and safety of employees, subcontractors, related personnel and the community while paying major attention to the

environment. In conclusion, under normal operating conditions, there is not any impact in the public health and public health facilities of the wider project area and especially the municipality of Kavala.

8.9.2 Refugees

It is noted that since mid 2015, Kavala port, has been used as an intermediate transport hub for refugees. The phenomenon of refugees transport through the Turkish coastline to the Eastern Greek islands of Aegean (like Chios, Lesvos, Kos and a number of smaller ones), has been largely increasing during 2015, as part of the serious deteriorating war situation in the middle east and in particular in Syria, Iraq but also in a number of African and Asian countries (Erythrea, Somalia, Pakistan, etc).

As part of the immediate strategy to cope of the situation by both the Greek government and the EU, ferry lines have been leased in order to transport the registered refugees from the islands of arrival (entry points) to various mainland locations (Athens – Piraeus, Thessaloniki and Kavala) and from these points to be then eased to be transported mainly to the northern Greek borders (mainly with FYRoM) as a gateway to Northern EU countries.

As stated above, Kavala port has been used as a transit point. The usual practice has been that those people have been spending only a few hours or so, before they get onto buses to continue their journey and therefore they are not really interfering with the local community apart form a small (possibly) commercial interaction on their way.

Generally the Region, has been in the crossroad of the different continents (Europe and Asia) and a number of countries (Greece, Turkey, Bulgaria), and all areas have the influence of the long history and exchange of habits through the ages. Also following a number of wars, a number of population changes and movements that have been taking place, a number of small ethnic and religion groups and minorities that are still apparent in most of the region's areas. However, it is safe to say that most of those communities have by now been integrated into the backbone of the Greek society with their own specific cultural, religious and in some occasion linguistic characteristics.

8.9.3 Productive structure of the local economy

The primary sector constitutes the main production activity of the RU of Kavala, both in terms of production contribution to the GDP of the REMTH and in terms of the number of persons occupied therein. Agriculture, animal farming, fishing, aquaculture (in sea and fresh water) and beekeeping are developing throughout the area and contribute significantly to its financial figures. Particular attention must be given to the problems relating to the ageing active agricultural population, the reduction of the income of the persons occupied therein, as well as the improvement of quality and promotion of the produced agricultural products, and they have to be dealt with.

The secondary sector includes, on the one hand, the businesses processing the primary sector, such as the natural and mineral wealth (oil and marble extraction), and on the other hand the businesses processing other raw materials. The RU of Kavala has a rich natural environment and climate conditions that favour the exploitation of renewable energy sources, with emphasis on the exploitation of geothermic, sunshine and wind potential. Wind farms already operate in the RU of Kavala, as well as a natural gas power plant, whereas the further utilization of these capabilities is of significant financial, social, environmental and geostrategic importance.

In addition to the growth potential offered by the primary and secondary sector, the tertiary sector is an important parameter for the RU of Kavala, mainly tourism, which is based – primarily, to summer tourism, which is focused on the island of Thasos and the coastal zone of the RU of Kavala. However, it is possible to prolong the tourist period and develop alternative forms of tourism (mountainous, religious, cultural, etc.).

As it is shown in the following tables and figures fishing activities, plus aquaculture and fisheries process units, provide income to many residents of Kavala and Thasos Island. Furthermore, tourism (hotels and restaurants) in Kavala and Thasos Island, as part of tertiary sector, contributes significantly to local GDP and employment.

The following table shows in detail the financial and production activities in the RU of Kavala (including the island of Thasos).

Table 8-31: Financial and production activities in the RU of Kavala7

AGRICULTURAL ACTIVITIES (agricultural land of 545,751,000 sq. meters)	
Businesses processing agricultural products	
19	Olive oil mills
12	Edible olive processing plants
6	Almond crushers
13	Grapes packaging plants
11	Kiwi packaging plants
11	Asparagus packaging plants
1	Cherry packaging plants
2	Ginning mills
8	Corn dryer plants
20	Wineries
1	Rice husking plants
1	Pickles manufacturing plants
ANIMAL FARMING ACTIVITIES (number)	
174	Dairy cattle
245	Beef cattle

[7] Financial & production activities in the RU of Kavala, Directorate of Rural Economy, (data retrieved on 22/04/2015)

222	Mixed cattle
1	Exotic ruminants species
650	Sheep (pure farms)
485	Goats (pure farms)
494	Sheep and goats (mixed farms)
120	Equines
32	Pigs
1	Chickens for meat production
1	Turkeys
1	Ducks
10	Geese
5	Rabbits
1	Ostriches
285	Bees
Animal farming activities (animal population)	
1,277	Dairy cattle
6,410	Beef cattle
1,554	Mixed cattle
4	Exotic ruminants species
165,086	Sheep (pure farms)
133,212	Goats (pure farms)
0	Sheep and goats (mixed farms)
179	Equines
4,014	Pigs
200,000	Chickens for meat production
300	Turkeys
200	Ducks
200	Geese
570	Rabbits
60	Ostriches
29,500	Bees (hives)
Businesses processing animal farming products	
3	Slaughterhouses
5	Meat processing
11	Dairy
6 (15 tn / day)	Fisheries
1 (110 tn / year)	Honey standardization
FISHERIES - AQUACULTURE	

Fishing boats (occupied personnel 975)	
36	Medium-distance fishing
275	Coastal fishing
Aquaculture farms	
18	Aquaculture farms
17	Mussel farms
Businesses processing fisheries products	
6 (5,470 tn)	Businesses processing fisheries products
TOURISM – SERVICES	
4	5***** Hotels
11	4**** Hotels
41	3*** Hotels
140	2** Hotels
62	1* Hotels
8	Auxiliary accommodations with 4 keys
112	Auxiliary accommodations with 3 keys
464	Auxiliary accommodations with 2 keys
221	Auxiliary accommodations with 1 key
8	Tourist camping
3615	Commercial enterprises
4359	Service provision businesses (except hotels, accommodations, tourist camping)
1	Spa tourism facilities - thermal springs (number)
ENERGY PRODUCTION	
Heat produced	
2 / 22.349 MW	Power greater than 0.5MW (number)
Hydroelectric generation	
1 / 0.94 MW	Power less than 10MW (number)
Solar generation	
63 units / 0.503 MW	Power less than 1 MWp (number)
1 unit /2 MW	Power greater than 1 MWp (number)
64 units / 2.503 MW	Total (number)
INDUSTRIAL UNITS	
1	Petrochemical plants (number)

The GDP per sector in the RU of Kavala and generally in the REMTH is given in the table below. It is noted that the local community of Kavala has received substantial economic benefits over

the last seven years through exploitation of the Prinos deposits by Energean and not least the preceding 28 years of oil and gas extraction in the RU of Kavala prior to Energean's involvement. Over the last seven years Energean has contributed over 40 mil. Euros in Greek government, through the payment of taxes, royalties and VAT, and through the contributions to employee Social Security Funds (healthcare, pension, etc). A percentage of these contributions are retroceded to the RU of Kavala. The Company has also contributed more than 90 million euros to the local economy in Kavala through:

- Salary payments to staff members;
- Employment of local contractors;
- Procurement of goods through local suppliers; and
- Use of local hotel, conferencing and restaurant facilities.

The Company employees 355 people in REMTH as well as 50 people in Athens. In addition, the Company recruits contractors on both a regular and ad hoc basis. The Company is seen as a key employer in the wider area with Company employee salaries supporting their wider families, etc. With households' sizes ranging from 3-4 people, this implies that the employee salaries support or contribute to the support in excess of 1,000 people.

Table 8-32: GDP per sector in the RU of Kavala (€ millions)

	2001				2009				AARC* 01/2009	AARC* 05/2009			
	Total	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total	Total	Primary	Secondary	Tertiary
REMTH	5,237	709	1,386	3,142	8 264	462	1,840	5,962	6%	4%	-9%	5 %	6%
REMTH/Greece	4.1%	8.6%	5.0%	3.4%	4.0%	7.2%	4.6%	3.7%	0%	0%	-3%	2%	0%
RU of Kavala	1263	129	281	853	2227	95	506	1626	7%	5 %	-8%	11%	4%

*Average annual rate of change (AARC)

8.9.4 Employment per production sector and trends

The contribution of employment of RU Kavala per sector and per respective municipality is presented in the following table and diagram.

Table 8-33: Contribution of employment of RU Kavala per production sector, 2001

Municipality	Primary sector	Secondary Sector	Tertiary sector	Total
RU Kavala	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Thasos	9.6%	8.6%	7.5%	8.2%
Kavala	14.1%	52.6%	65.4%	51.7%
Pangaio	44.2%	22.6%	15.4%	23.3%
Nestos	32.1%	16.2%	11.7%	16.8%

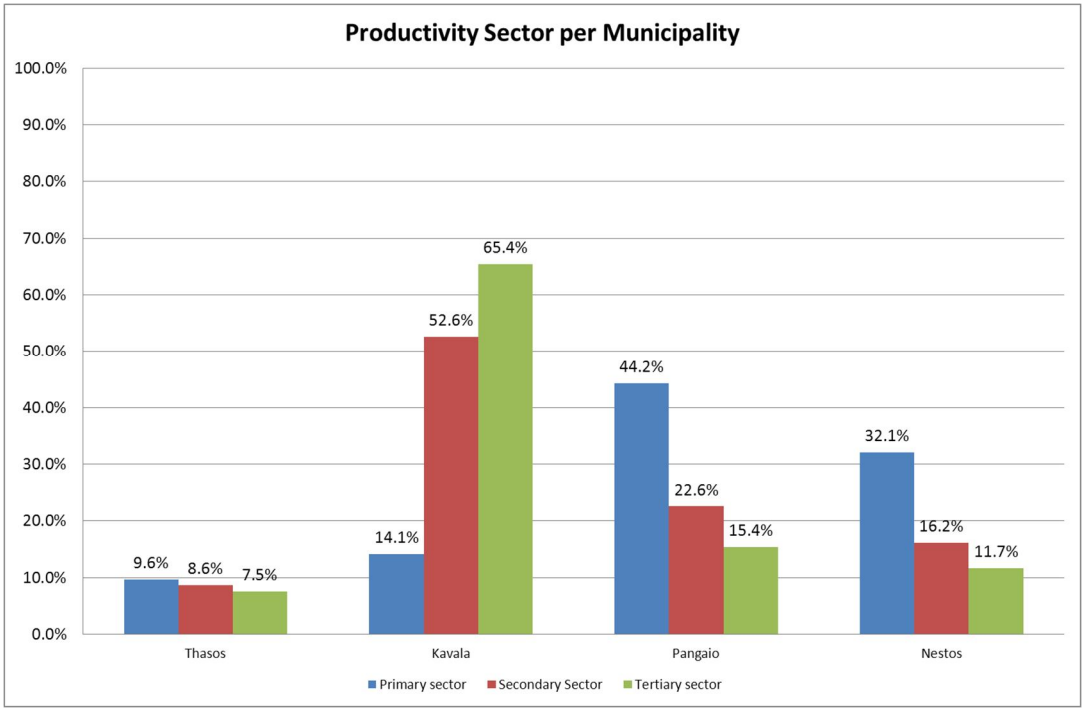


Diagram 8-14: Productivity Sector in the Regional Unit of Kavala by Municipality.

Overall the aforementioned four municipalities that constitute the RU of Kavala contribute by 23.2% in total in the productivity of the region (REMTH) and in particular 15.5% in the primary sector, 26.7% in the secondary and 26.6% in the tertiary sector as presented in the following table.

Table 8-34: Contribution of employment of RU of Kavala in the total REMTH, per production sector and per Municipality, 2001

Municipality	Primary sector	Secondary Sector	Tertiary sector	Total
RU Kavala	**15.5%**	**26.7%**	**26.6%**	**23.2%**
Thasos	1.5%	2.3%	2.0%	1.9%
Kavala	2.2%	14.0%	17.4%	12.0%
Pangaio	6.9%	6.0%	4.1%	5.4%
Nestos	5.0%	4.3%	3.1%	3.9%

Energean currently employs 355 persons either directly or indirectly from the region as well as about 50 more in various locations of Athens. The company has ensured positions of employment at sea rigs of Prinos, on the terrestrial (onshore) facilities of Nea Karvali and Athens offices, and proved that oil production could be fully compatible with the highest environmental responsibility, the health and safety conditions for personnel and the tourism activity, which is particularly popular destinations such as Thasos.

The relevant direct or indirect influence to the employment of the wider area of Kavala as well as the RU of Kavala has positive contribution the secondary production sector as well as to the local economy of the RU of Kavala.

8.9.5 Unemployment

The employment conditions in the RU of Kavala are shown in the following table.

Table 8-35: Employment conditions per municipality of the RU of Kavala

Municipality	Employees	Unemployed	Pupils/Students	Pensioners	Housewives	Others
Thasos	4,478	990	1,765	3,918	1,613	1,006
Kavala	22,033	5,987	12,282	17,449	7,702	5,048
Pangaio	9,849	2,241	4,455	9,222	3,670	2,648
Nestos	7,060	1,612	2,920	6,360	2,534	1,845

In the following diagrams is depicted the percentages of the population conditions per municipality of the Regional Unit of Kavala.

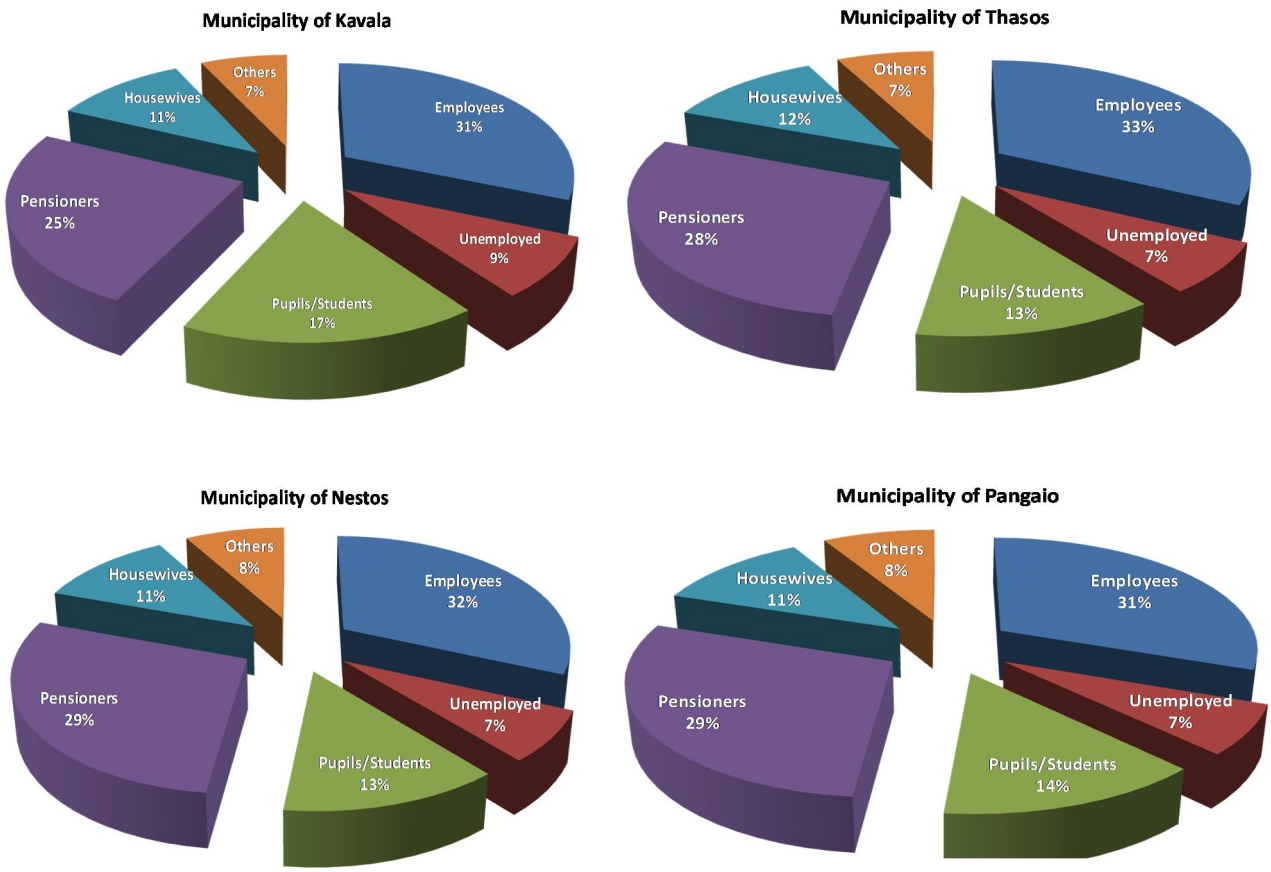


Figure 8-11: Population conditions in RU of Kavala

The employment in the Regional Unit of Kavala ranges between 31-33%, while the unemployment between 7-9%.

8.10 TECHNICAL INFRASTRUCTURES

8.10.1 Transport infrastructure

The transport infrastructure in the wider project area (road network, railway, airports and ports) is shown in the following map and is described in brief in the following paragraphs.

Map 8-33: Transport infrastructures

8.10.1.1 Road network

The road network infrastructures of RU of Kavala consist of the axes of Egnatia Odos (completed or otherwise), the national roads network (classified as primary, secondary and tertiary), as well as established and main district roads. The network is sufficiently dense, in good condition and allows smooth access. The coastal areas are connected to each other through the district roads. The Thassos road network includes a paved peripheral road, through which pass roads that lead to the most popular coastal areas.

8.10.1.2 Railway Line

The existing railway line connects Thessaloniki with Ormenio, Evros, and subsequently with the Greco-Bulgarian border, passing through all urban centres, with the exception of Kavala.

8.10.1.3 Ports

The central port of Kavala serves i) the fishing fleet, ii) tourism, iii) the passengers from and to Thassos, Limnos, Mitilini and Samothrace, iv) water sports. The Nea Karvali port named "Philippos II" is used for commercial reasons. The ports of Keramoti (Keramoti – Thassos ferry) and the central port of Thassos are also considered as significant for passenger use and fishing fleet. The ports of Prinos and Limenaria of the RU of Thasos, as well as the port of Nea Peramos mainly serve local passenger traffic. The latter also serves the transport of employees to the oil extraction facilities.

The tourism and yacht ports consist of zones in existing ports, harbours and fishing refuges. No connections between them have been planned, whereas the exclusive yacht port (marina) in Limenaria, Thasos – with a capacity of 70 yachts (against 230 yachts that were foreseen in the R.F.S.P.S.S.) has been included in the sectoral project of Competitiveness and Shipping on 26/09/2011 and it is expected that its construction will begin shortly.

The tables below show the number of passengers arriving at the ports of Kavala and Keramoti.

Table 8-36: Passenger traffic of "Kavala-Prinos" ferry line (Source: Kavala port Authority)

Passengers								
Month	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
January	12,967	9,208	7,986	3,958	7,285	6,587	7,308	8,973
February	11,928	8,175	6,956	3,879	6,471	5,631	6,517	7,960
March	14,748	12.856	8,845	7,108	7,906	10,045	9,031	9.562
April	18,952	14,648	11,125	9,296	14,004	15,711	14.077	16,023
May	23,760	17,243	17,969	13,789	19,435	19,624	21,283	22,829
June	28,849	28,884	25,419	17,142	27,429	28,243	30,133	29,360
July	50,174	43,336	45,203	41,064	52,970	50,673	52,275	52,188
August	61,963	58,448	60,561	53,119	66,976	64,700	65,823	64,386
September	28,886	23,224	23,319	16,858	24,494	29,065	30,692	30,008
October	13,398	12,249	11,398	7,221	11,588	16,914	16,589	17,426
November	10,688	7,904	7,242	9,711	11,472	10,728	12,248	10,498
December	9,755	5,571	6,430	9,365	8,742	8,320	8,726	9,014
Total	**286,068**	**241,746**	**232,453**	**192,510**	**258,772**	**266,241**	**274,702**	**278,227**

Table 8-37: Passenger traffic of "Keramoti - Thasos Port" ferry line (Source: Kavala port

Authority)

Passengers								
Month	2007	2008	2009	2010	2011	2012	2013	2014
January	32,562	38,006	36,624	35,803	33,937	32,139	28,153	31,294
February	33,645	35,966	36,682	37,017	31,405	26,912	27,146	30,414
March	50,095	57,724	48,469	48,645	44,391	38,244	37,660	39,911
April	79,038	87,405	76,150	74,730	69,306	63,335	63,070	63,158
May	113,027	134,339	109,610	113,170	102,923	91,420	100,154	101,218
June	151,822	190,371	181,632	142,452	157,889	148,826	173,713	177,135
July	248,460	259,340	272,047	248,196	261,370	253,156	259,625	301,446
August	287,882	326,556	329,260	304,866	325,196	309,364	321,981	372,384
September	144,037	159,812	152,260	139,450	165,211	158,647	173,369	190,108
October	67,731	71,259	66,043	56,324	48,212	54,935	59,705	56,457
November	43,294	48,023	49,696	44,913	39,425	35,744	35,021	37,530
December	41,645	42,791	43,858	38,221	38,676	33,393	33,749	33,692
Total	**1,293,238**	**1,451,592**	**1,402,331**	**1,283,787**	**1,317,941**	**1,246,115**	**1,313,346**	**1,434,747**

Table 8-38: Passenger traffic of “Kavala-Samothraki” ferry line (Source: Kavala port Authority)

Passengers			
Month	2007	2008	2009
January	203	112	1,096
February	217	50	101
March	75	56	-
April	155	150	-
May	190	220	-
June	281	293	-
July	1,118	986	-
August	3,222	2,061	-
September	487	572	-
October	116	107	-
November	82	78	-
December	76	44	-
Total	**6,222**	**4,729**	**1,197**

The above tables, show that the largest passenger traffic can be found in the “Keramoti - Thasos Port” ferry line, which increases every year, reaching, in 2014, 1,434,747 passengers. The line “Kavala-Prinos” follows, which, however, shows a small decline in passenger numbers The above tables, show that the largest passenger traffic can be found in the “Keramoti - Thasos Port” ferry line, which increases every year, reaching, in 2014, 1,434,747 passengers. The line “Kavala-Prinos”, however, shows a small decline in passenger numbers in 2007, but significant increase between 2008 and 2014. Subsequently, with regard to the line “Kavala - Samothraki” it

must be noted that 2014 shows a significant increase over 2013.

In addition, a table concerning cruises passenger traffic at the port of Kavala is shown, which has increased compared to 2012.

Table 8-39: Passenger traffic of cruises (Source: Kavala port Authority)

	2009	2010	2011	2012	2013
Number of ships	25	11	10	10	15
Passengers	7,325	4,233	2,708	4,323	7,099

8.10.1.4 Air transport

In the RU of Kavala one national-civil airport operates, which covers air travel to the area. The "Megas Alexandros" airport is located at Chrysoupoli, and, essentially, is the main point of entry of foreign tourists to the region and, in particular, to Thasos. It was constructed in the late 1970s and, initially, served only chartered flights.

The regular flights are flights to and from Athens, with a fixed number of 36 weekly flights (18 "Kavala-Athens" flights and 18 "Athens-Kavala" flights), as well as international chartered flights during the summer. The following table shows the arrivals of foreigners at the Chrysoupoli airport in the years 2012 and 2013.

Table 8-40: International tourist arrivals at the Chrysoupoli airport (Source: Business Plan of the RU of Kavala)

Passengers		
Month	**2012**	**2013**
January	0	0
February	0	0
March	145	592
April	1,719	1,188
May	8,165	8,268
June	12,024	13,921
July	18,127	17,245
August	15,720	16,435
September	9,843	11,760
October	1,952	2,894
November	95	178
December	143	176
Total	**67,933**	**72,657**

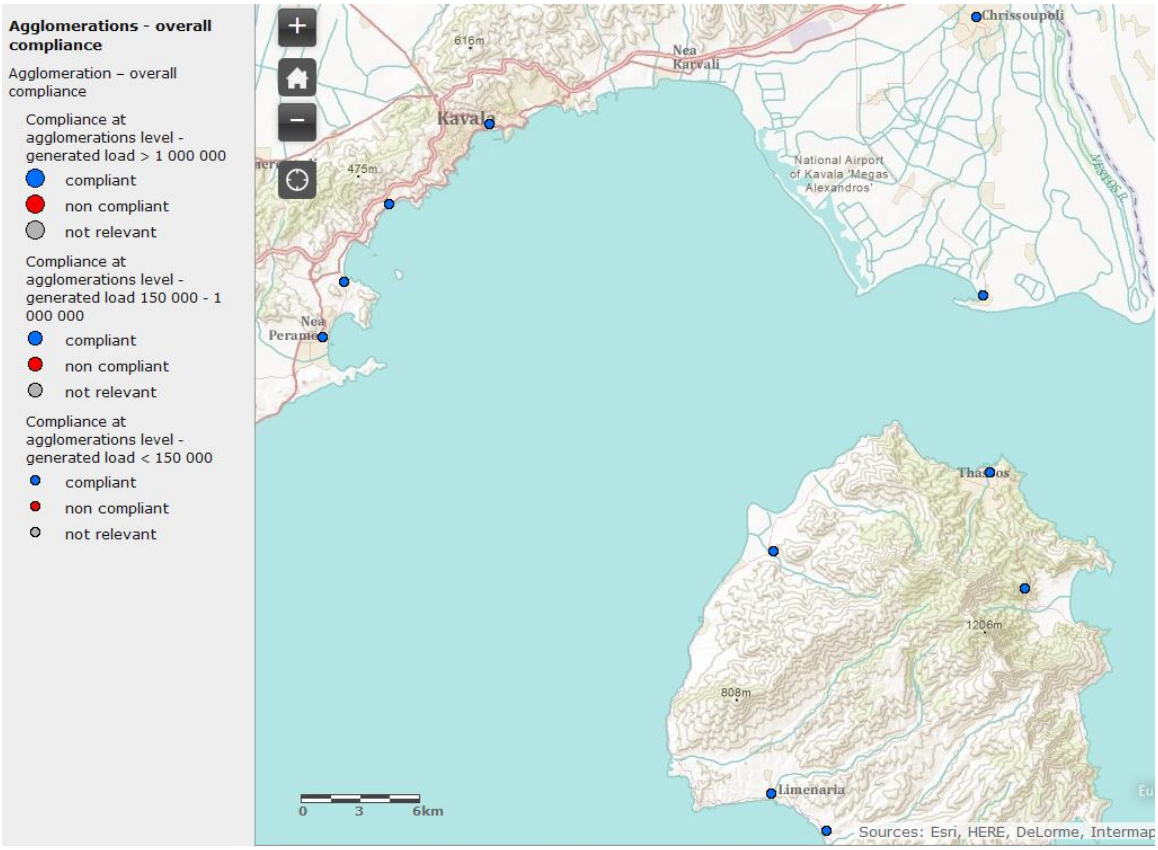
The table above shows that the arrivals of foreigners at the airport of Chrysoupoli has increased by 6.95%

During the operation of the existing onshore and offshore facility there will be no extensive use of the regional public utilities and as a result the technical infrastructure is not affected.

8.10.2 Water supply / sewerage / urban wastewater

Wastewater treatment plants

The Wastewater treatment plants in the wider area are shown in the following map.



Map 8-34: Wastewater treatment plants

Solid waste / garbage management

In Kavala operates the landfill with the same name, which is located at the Eski Kapou location, at the boundaries of the Municipality of Kavala and the municipal unit of Philippoi. The landfill serves the aforementioned areas, whereas the location of a Material Recycling Facility (MRF) is under study for the wider area of the RU of Kavala.

Electricity production

In the RU of Kavala, two private power plants are in operation (thermoelectric, combined circle, etc.).

Table 8-41: Private Power Plants

Regional Unit	Municipality	Settlement	Location	Capacity MW
Kavala	Kavala	N. Karvali	Kavala CCGT Power Plant	440
	Pangaio	Karyani	Pidima Papakosta	0.32
Thasos	Thasos	Potamia	Potamia Quarry	0.51

Renewable Energy Sources

- Wind farms: Currently one wind farm undergoing licensing procedure can be found at the location Soumadotopoi, on the island of Thasos with installed capacity of 72 MW.
- Solar parks: In the RU of Kavala, at the location Kokkinochori, there is a solar park with an installed capacity of 2 MW. Three more parks are in the licensing phase, two of which within the IZ of Kavala, with installed capacity of 3.8 and 5 MW, respectively, whereas the third on is at the location Vounochori of the Municipality of Kavala, with a capacity of 28 MW.
- Geothermal field: Two geothermal fields can be found – one located in the Municipality of Nestos, Erateino settlement (currently in the stage of signing the contract) and the other at the Akropotamos settlement.
- Small hydroelectric plants: There are two small H/P (Hydroelectric Plants) at the location Nestos and Paradeisos, with installed capacity of 0.94 and 0.75 MW, respectively.

During the operation of the existing onshore and offshore facility there will be no extensive use of the environmental infrastructure systems such water supply system, electrical energy transmission, and telecommunication network and as a result the technical infrastructure is not affected.

8.10.3 Electricity, natural gas and telecommunications networks

Power transmission network

The power transmission network to the east of Thessaloniki consists mainly of TL (Transmission Lines) of 150 kV, as well as three TL of 400 kV. More specifically:

- The single circuit TL with triplet conduit (B΄B΄B΄/400 kV) Thessaloniki HVC (High Voltage Center) – Philippoi HVC;
- The dual circuit TL with triplet conduit (B΄B΄B΄/400 kV) Philippoi HVC – N. Santas HVC;
- The single circuit TL with triplet conduit (B΄B΄B΄/400 kV) N. Santas HVC – Turkish border.

The power grid of the area under assessment consists of the TL Kavala - Philippoi HVC In order to improve the power transmission capacity to and from the REMTH, the upgrade of the line from E/150 to 2B/150 (code. ΓΜ150.Σ.41, ΑΝ150.Σ.23) is planned. Upon completion of the upgrade, the TL B/150 Kavala – Philippoi HVC and Kavala - Xanthi will be disconnected from the Kavala S/T and will be connected to each other, at the open ends, overriding the Kavala S/S. The project will also contribute to the improvement of the reliability of the power supply to the phosphate fertilizers factory.

Natural gas network

In the area under assessment the Kavala high-pressure branch (80 bar) can be found, which is

part of the national natural gas network. However, a medium and low-pressure network has yet to be implemented, in order to supply the area of Kavala and the island of Thasos. Additional provisions related to the new interstate "Trans Adriatic Pipeline", with the purpose of transporting natural gas to Italy and Europe, through Albania. Part of the routing is located in the northern part of the R.U of Kavala

Submarine pipelines and submarine cables Hellenic Electricity Distribution Network Operator S.A

According to Kavala HEDNO S.A. (Hellenic Electricity Distribution Network Operator SA), there is a submarine cable in the area of Port of Thasos - Keramoti, installed outside the area of interest. No submarine pipeline can be found in the area under assessment.

8.10.4 Health services

The Health Unit of Kavala has the following infrastructure:

- Kavala Hospital: This is the general hospital of the area. Services include surgery, internal medicine, paediatrics etc.
- Health Centres: These are primary care facilities with the ability to stabilize and transport patients and perform basic diagnostic tests. In the area there are three Health Centres at Chrisoupoli, Eleftheroupoli and Prinos (Thasos Island).

Patients or injured are transferred to health care facilities by the National Centre for Immediate Response (EKAB), which is actually the first responder. EKAB belongs to the National Health System. In the event of emergencies, accidents or casualty incidents the health care facilities act provides the first health services until casualties can access more specialised care from general hospitals or in larger centres, if required (ie. Thessaloniki).

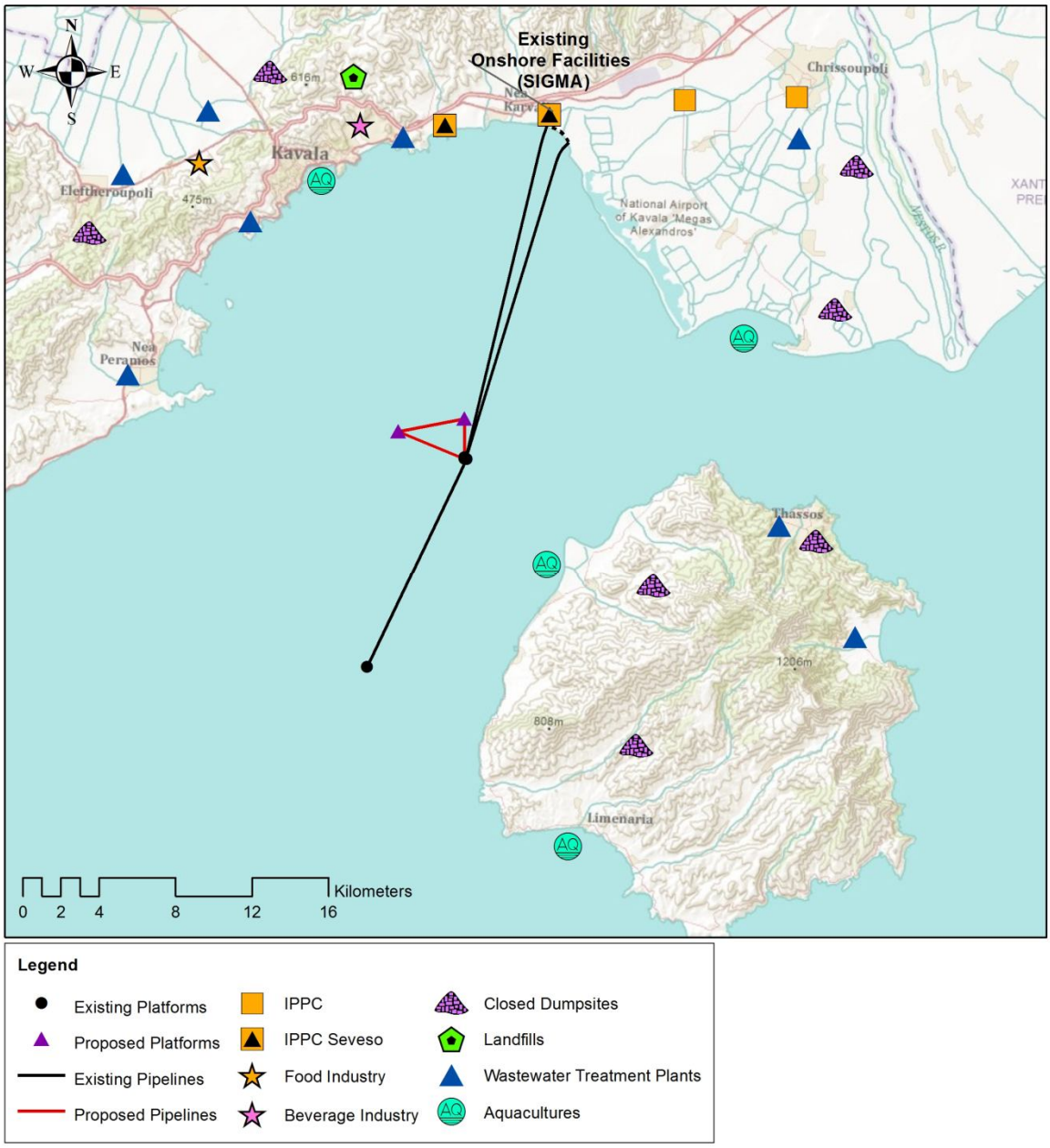
8.11 EXISTING PRESSURES ON THE HUMAN AND NATURAL ENVIRONMENT

The potential anthropogenic pressures on the environment of the wider study area (RU of Kavala) are:

- Overexploitation of the land, unregulated use of the groundwater for irrigation, over – disposal of the wastes in the aquifer;
- Contamination from the fertilizers and the pesticides;
- Wastewater treatment plants;
- Landfills and dumpsites;
- Industries in the vicinity of the project area;
- Marine traffic;
- Fishing activities and aquacultures;

- Tourism;
- Mines and quarries;
- Livestock's.

The following map shows the location of industries, aquacultures, wastewater treatment plants and landfills in the wider project area.



Map 8-35: Location of industries, aquacultures, wastewater treatment plants and landfills in the wider project area