

1st November 2018
Bar, Montenegro

ENERGEAN
OIL & GAS



**Environmental Impact Assessment Study (EIA)
for 3D Geophysical Survey in Offshore Montenegro
Blocks nos. 26 and 30**

Subjects discussed within the presentation:

- ❑ Energean and its HSE performance (slides 4-5)
- ❑ The Project (slides 7-19)
- ❑ Potential impacts of the survey (slides 21-30)
- ❑ What we will do to minimize any effects (slides 32-41)
- ❑ Prinos example and the 2015 survey (slides 43-46)

Energiean and its HSE performance

Who we are: Energean at a glance

An LSE Premium Listed FTSE 250 Company, was also listed on the Tel Aviv Stock Exchange on October 2018

4

Countries



13

E&P
licenses



385

highly skilled
employees



1.5

TCF net gas
2P reserves



7.1

TCF net gas
prospective
resources



73.3

mmbbls net oil
2P reserves



48.1

mmboe
2C resources



1.6

US\$bn ongoing
development in Israel



1.275

US\$bn project finance
arranged for Karish
and Tanin development



12

Israeli GSPAs



Prinos: Oil & Gas, Tourism And Environment Coexist

Gulf of Kavala: Over 10 Blue Flags Every Year for the Last 10 Years



Energean's HSE Mission

Transfer 37 years experience of working safely in environmentally sensitive locations in NE Greece to every area we operate



Safety of Offshore Oil & Gas Operations Directive

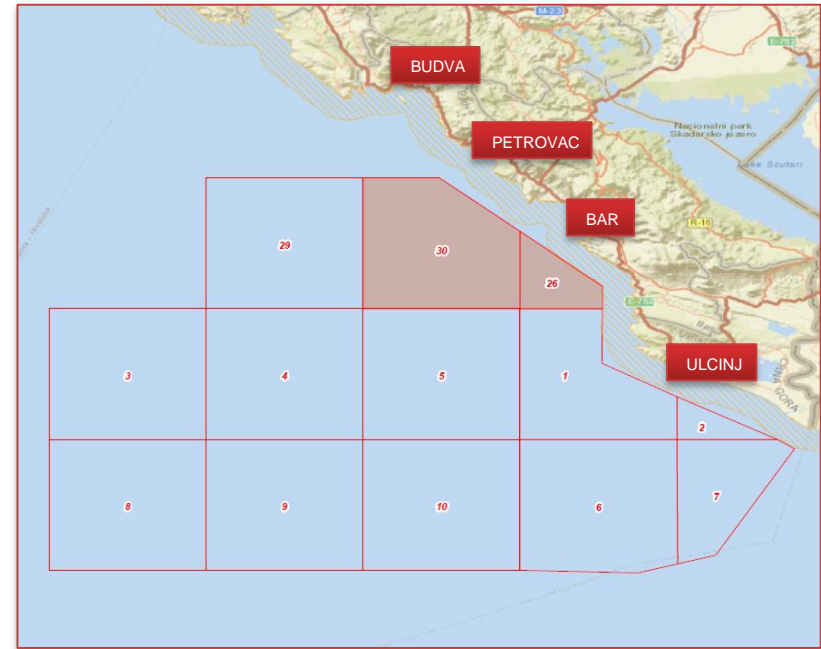
Thasos: Traditional tourist destination in the Aegean



The project

Environmental Permitting process in Montenegro

- ❑ In March 2017, Energean Oil & Gas signed an exploration and production Concession Contract covering the Montenegro offshore blocks nos. 26 and 30
- ❑ Energean planned to carry out a 3D geophysical seismic survey during the last quarter of 2018 (Q4 2018) or the first part of 2019 (Q1 2019)
- ❑ The Environmental Impact Assessment Study (EIA) has been submitted to the Environmental Protection Agency of Montenegro (EPA) on 1st October 2018



Legend

- Montenegro Offshore Blocks
- Energean licenced blocks

Delimitation national waters for the exclusive use

- National water boundaries (EEZ Montenegro 2016)

No activities Zone (Governmental Decision n.42/12)

- Forbidden Zone for O&G Exploratory Activities (3km from the coastline)



Wood Plc (Amec Foster Wheeler)

Focused supplier of consultancy, engineering and project management services in the world's oil and gas, minerals and metals, clean energy, environment and infrastructure markets.



Centre for Architecture and Urbanism (CAU)

Operating in spatial planning development, regional and international cooperation, multidisciplinary studies including ESHIA, sustainable development and renewable energy.



HR Wallingford Ltd

Specializing in innovative modelling and application of several tools to investigate underwater noise levels and the potential impact on species behavior.



Oceanomare Delphis Onlus (ODO)

Non-profit organisation dedicated to the research, monitoring and conservation of cetaceans in the Mediterranean Sea.



Institute of Marine Biology of Montenegro (IBM)

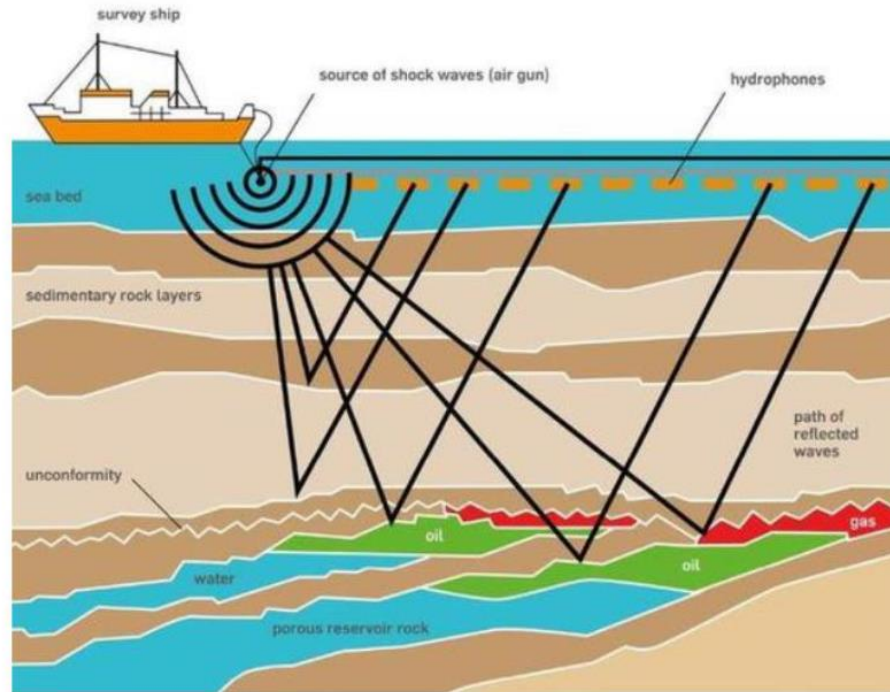
Institution dedicated to the research and preservation of the biological, ecological, taxonomic and hydrographical marine life population dynamics

- ❑ Scope of the EIA is to assess the project potential generated impacts on the environment receptors/indicators

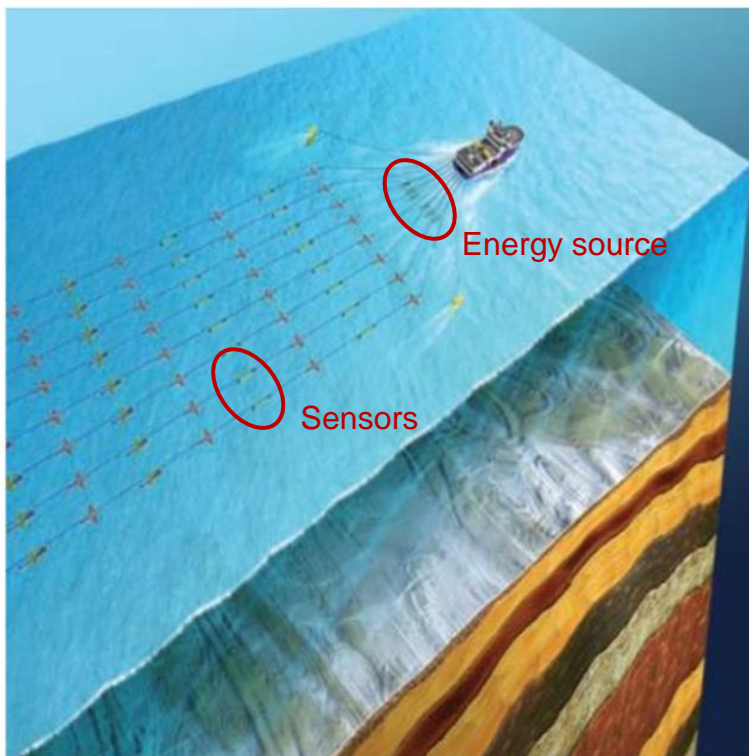
- ❑ The structure of an EIA is composed by:
 - Project description
 - Environmental Baseline – Study of the existing conditions
 - Environmental Impact Assessment
 - Mitigation Measures
 - Environmental Monitoring Programme (EMP)

Seismic reflection method

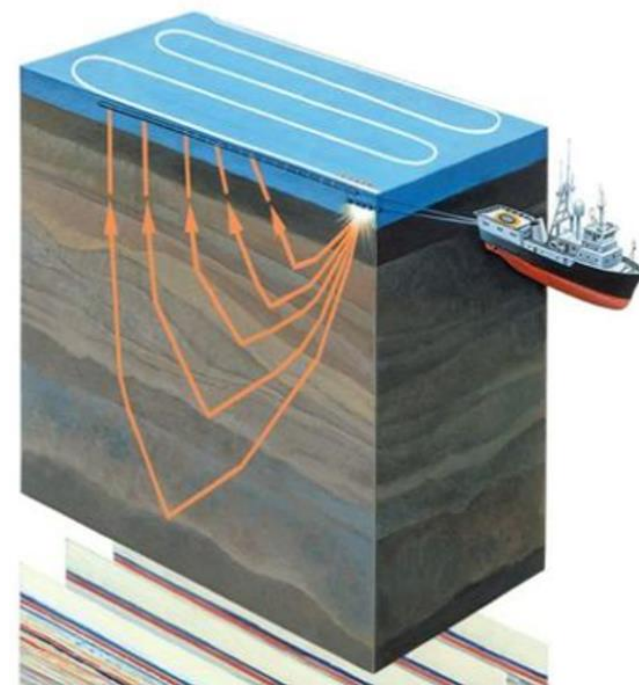
- ❑ The seismic acquisition involves the transmission of controlled acoustic waves into the earth and recording the energy that is reflected back from the geologic boundaries in the subsurface
- ❑ Main purpose of the seismic acquisition is to render the most possible accurate representation of the earth's subsurface geologic structure



3D offshore geophysical survey



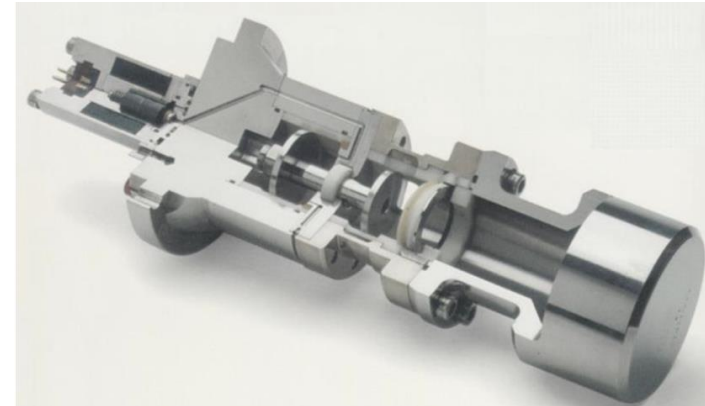
Energy source releases the acoustic waves at regular intervals as the vessel moves along the survey lines.



The signal reflected from beneath the seafloor is detected by numerous sensors contained inside long, neutrally buoyant cables towed behind the vessel.

Airguns

The airguns are the source of acoustic waves most commonly used for marine geophysical surveys; those devices are submerged below the water surface and towed behind a vessel.



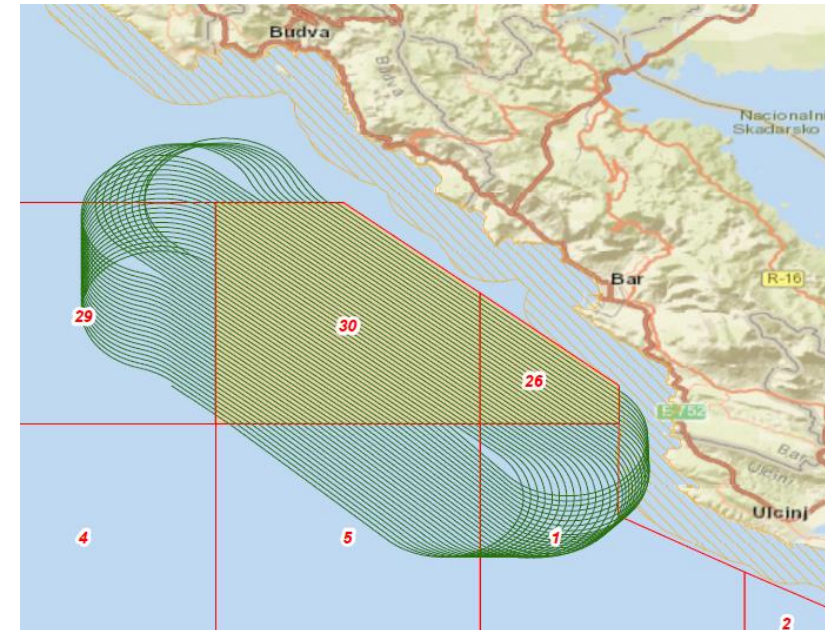
Streamers

The “oil free” streamers consist of tubes of neoprene floating on the water and towed by the geophysical vessel; the streamer contains sensors (hydrophones) recording the acoustic waves produced by the sound source and reflected by the seabed.







Project overview – 3D Offshore Geophysical Survey

- ❑ 3D geophysical survey will be performed within the blocks involving an area of 338 km²
- ❑ Bathymetry: between 50 m bsl up to 100 m bsl
- ❑ Depth of the source: 6 (8) m
- ❑ Depth of streamers: up to 10 m
- ❑ Fleet: one geophysical vessel, one support vessel and one guard vessel
- ❑ Vessels will be operating 24 hours per day, seven days per week for the entire duration of the survey
- ❑ 30 days for the survey execution:
 - Mob/Dem → 9 days
 - Geophysical survey (inclusive of estimated infill and stand-by) → 21 days
- ❑ Support operations are planned to be based in Bar harbour
- ❑ The survey will be carried out ahead the touristic season: last quarter of 2018 (Q4 2018) or first part of 2019 (Q1 2019)

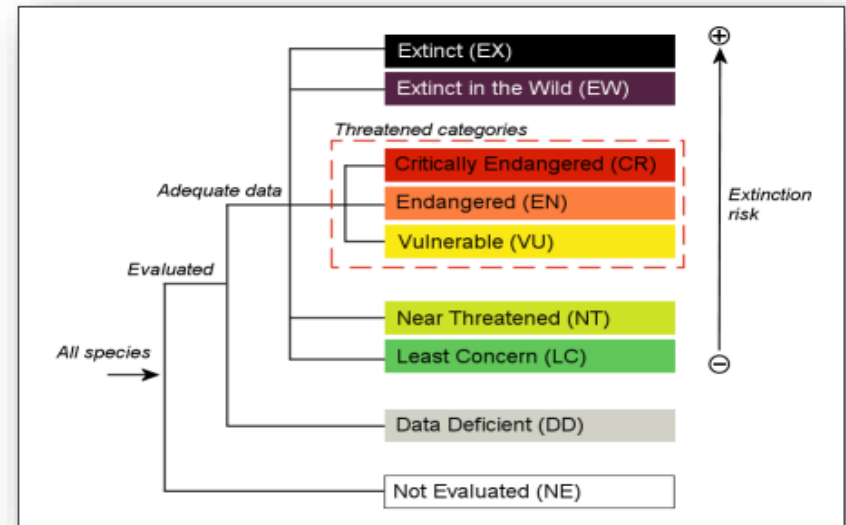


Legend

-  Montenegrin Offshore Blocks
-  Energy licenced blocks
-  Tentative geophysical acquisition lines (Energy Blocks)
- No activities Zone (Governmental Decision n.42/12)**
-  Forbidden Zone for O&G Exploratory Activities (3km from the coastline)

- ❑ The EIA Study focused on all the environmental components potentially affected by the project:
 - Demography and population employment;
 - Seismicity;
 - Fauna (marine mammals, marine reptiles, avifauna, arthropoda, mollusca, fishes, zooplankton, zoobenthos, corals and economically important species in fisheries);
 - Flora (seagrasses and phytobenthos, mærl beds and phytoplankton);
 - Water resources and sea water conditions;
 - Existing noise level;
 - Air quality and climate;
 - Existing infrastructures, busi
 - Cultural heritage sites;
 - Sensitive habitats;
 - Protected areas and Propose
 - Fisheries and aquaculture;
 - Tourism.

- ❑ The IUCN Red List of Threatened Species™ provides taxonomic, conservation status and distribution information on plants, fungi and animals
- ❑ The main purpose of the IUCN Red List is to catalogue and highlight those species that are facing a higher risk of global extinction
- ❑ The species conservation status has been also investigated according to National laws, appendices of the Habitat Directive and relevant conventions that Montenegro ratified



Analysis of the environmental components existing conditions (3/4)

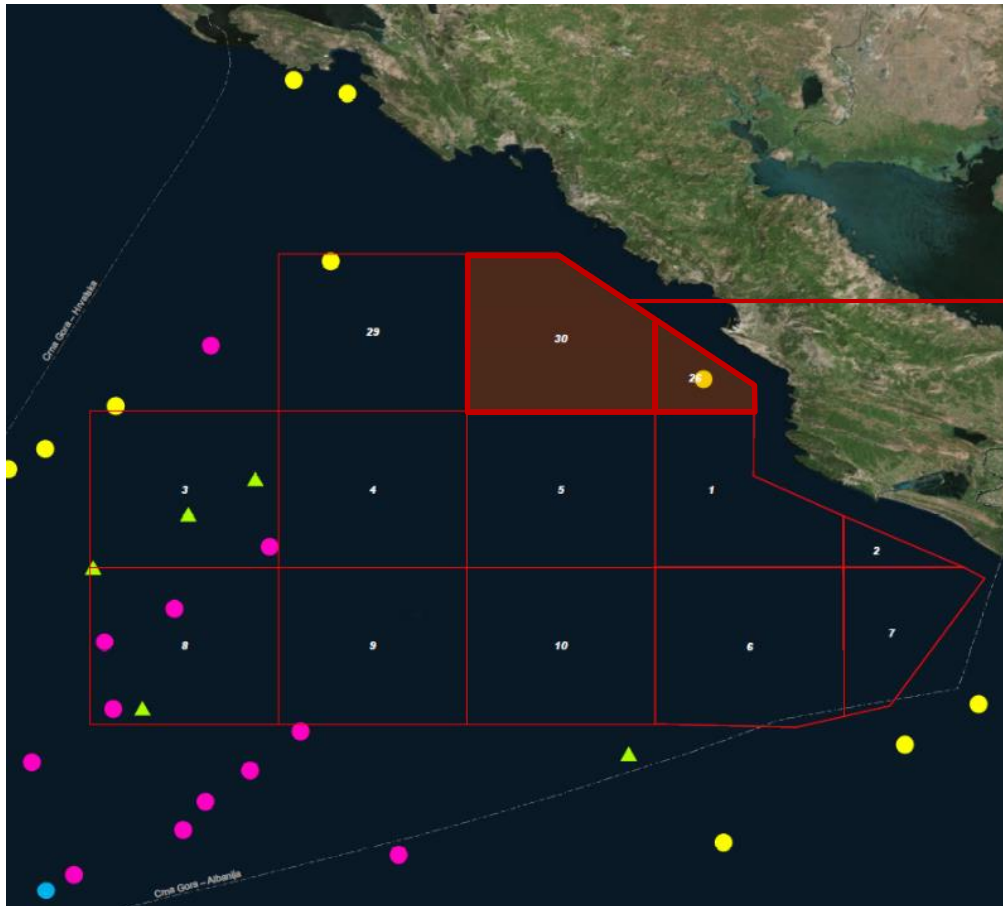
Marine Mammals

Species level of presence	Species type	IUCN class, Conservation status
Regularly present	Common bottlenose dolphin	VU, protected at National and European level
	Striped dolphin	VU, protected at National and European level
	Risso's dolphin	DD, protected at National and European level
	Cuvier's beaked whale	LC, protected at European level
Occasionally present	Sperm whale	LC, protected at European level
	Fin whale	VU, protected at National and European level
Visitors	Humpback whale	LC, protected at European level
Extinct	Short-beaked common dolphin	EN, protected at National and European level
	Mediterranean monk seal	CR, protected at National and European level


Verified presence during the Aug-Sept 2018 biodiversity monitoring

Analysis of the environmental components existing conditions (3/4)


Marine mammals and threatened fish sightings (2010-2013, UNEP)



12 sightings of Bottlenose dolphins inside the blocks during the Aug-Sept 2018 biodiversity monitoring (Slide n.36)

 Bottlenose dolphin (*Tursiops truncatus*) - (VU - IUCN)

 Cuvier's beaked whale (*Ziphius cavirostris*) - (DD - IUCN)

 Giant devil ray (*Mobula mobular*) - (EN - IUCN)

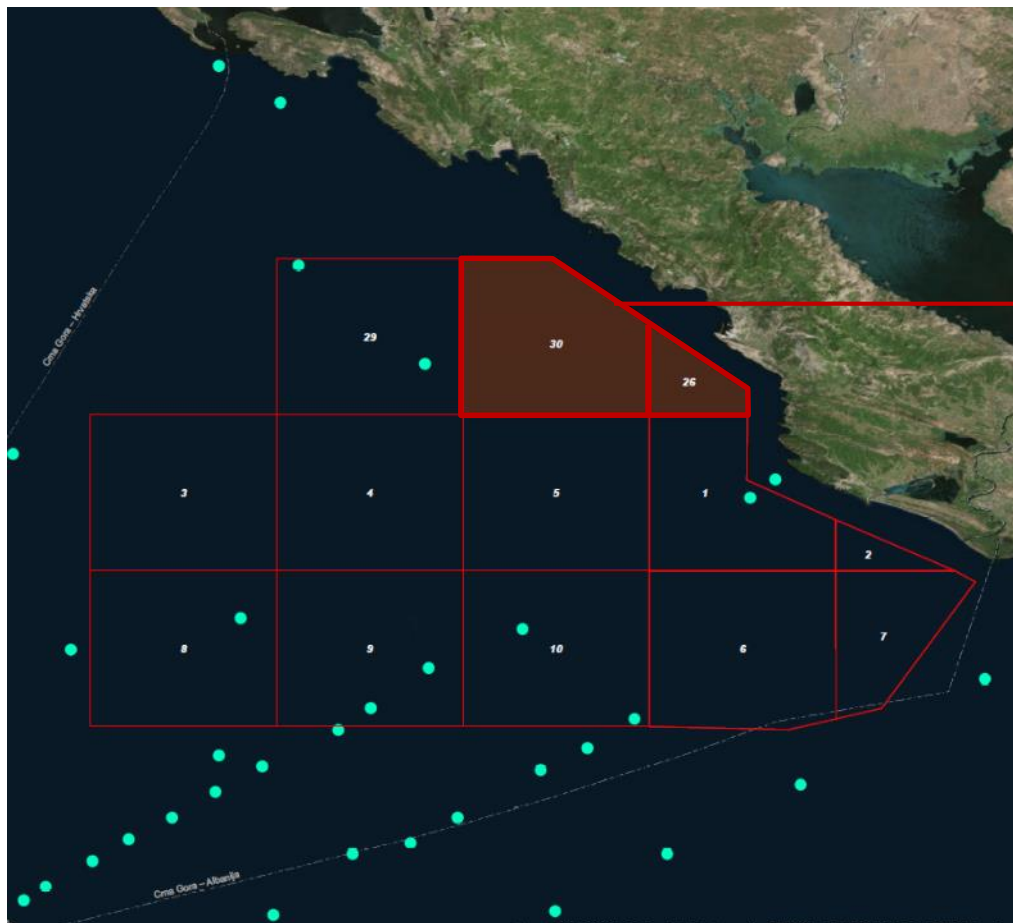
 Striped dolphin (*Stenella coeruleoalba*) - (VU - IUCN)

Marine Reptiles


Species level of presence	Species type	IUCN class, Conservation status
Regularly present	Green turtle	EN, protected at National and European level
	Leatherback turtle	VU, protected at European level
	Loggerhead turtle	LC, protected at National and European level

Verified presence during the
Aug-Sept 2018
biodiversity monitoring

Marine reptiles sightings (2010-2013, UNEP)



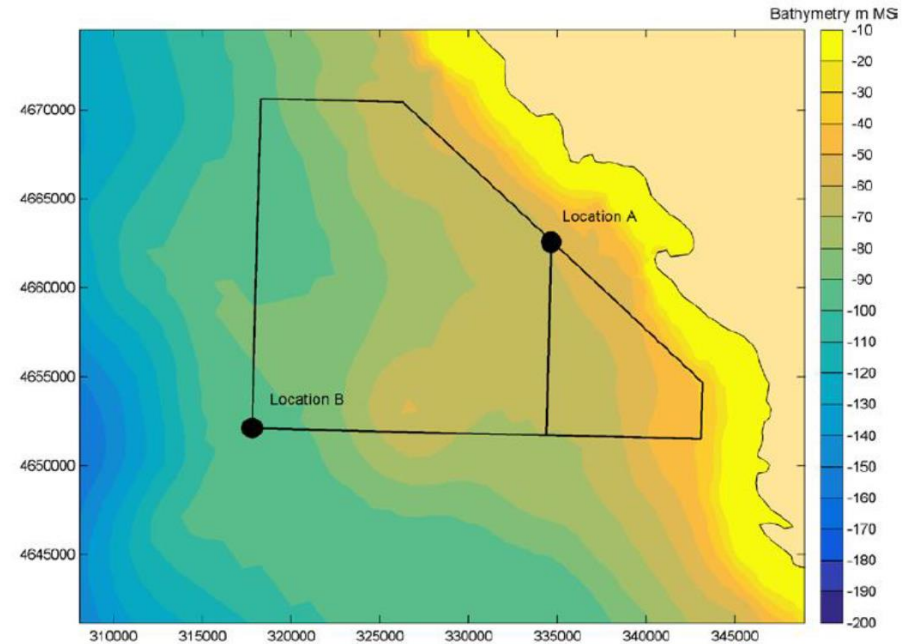
1 sighting of Loggerhead turtle inside the block n. 30 during the Aug-Sept 2018 biodiversity monitoring (Slide n.36)

 Loggerhead turtle (*Caretta caretta*) - (LC - IUCN)

Potential impacts of the survey

Underwater Noise Model (1/2) - Methodology and assumptions

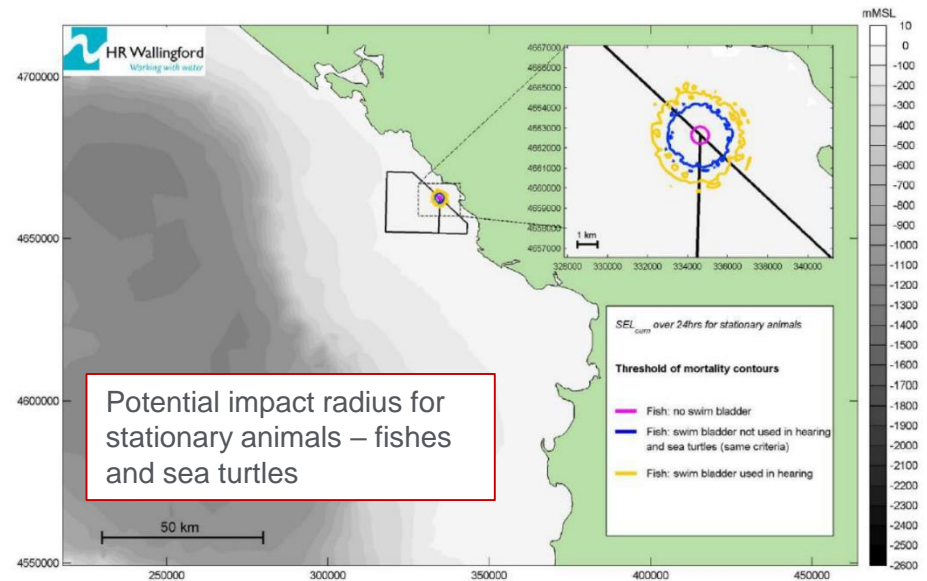
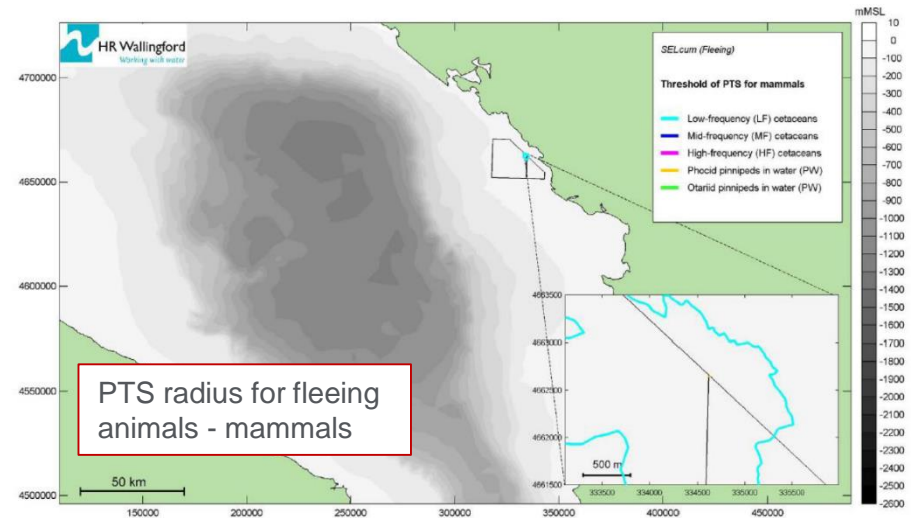
- ❑ An Underwater Noise propagation Model (UnaCorda) has been implemented by considering two locations (A and B) to simulate the geophysical airgun noise propagation within the survey area and the potential effects induced on marine fauna.
- ❑ Broadband metrics of cumulative **SEL_{cum}** (Sound Exposure Level) and Peak **SPL** (Sound Pressure Level) were used to assess the **minimum safety distance** from the airgun array within which the following disturbances might occur:
 - **PTS** → Permanent Threshold Shift i.e. “permanent increase of the threshold at which marine mammals can detect sound”;
 - **TTS** → Temporary Threshold Shift i.e. “temporary increase of the threshold at which marine mammals/fishes can detect sound”;
 - **injuries/potential mortality** → damages potentially induced on marine reptiles/fishes.



Underwater Noise Model (2/2) - Results

The following safety radii have been identified from the towed array in the two modelled locations:

- **Low-frequency cetaceans** (e.g. Fin whale, etc): minimum safety distance of **2.1 km** for PTS;
- **Medium-frequency cetaceans** (e.g. Bottlenose dolphin, Striped dolphin, Cuvier's beaked whale, etc.): minimum safety distance of **40 m** for TTS;
- **Marine reptiles** (e.g. loggerhead turtle, etc.): minimum safety distance of **20 m** for potential impacts;
- **Fishes**: minimum safety distance of **80 m** for potential impacts;
- **Ichthyoplankton** (fish eggs and larvae): minimum safety distance of **1.7 km** for potential impacts.



IMPERIA Project – European guidelines
Improving Environmental Assessment by Adopting Good Practices and Tools of Multi-Criteria Decision Analysis

- ❑ Results of IMPERIA project are reported in scientific articles and various reports, the project was also presented in several international conferences
- ❑ This structured approach and tool could have a great potential in EIA/SEA projects throughout European Environmental Impact Assessment of projects
- ❑ The project aimed to increase collaboration and information exchange between EIA, Multi-Criteria Decision Analysis and participatory planning professionals all over Europe.



LIFE 11 ENV/FI/905



Impact assessment analysis (2/6)

- ❑ The impacts evaluation analysis has been conducted for both the mobilisation/demobilisation phase and the geophysical acquisition phase
- ❑ The following parameters have been defined for each identified environmental receptor:
 - Magnitude of the change (intensity and direction, spatial extent and duration)
 - Sensitivity of the receptor
- ❑ The impact significance, classified as No impact, Low, Moderate, High or Very High, has been assessed by combining the Magnitude and the Sensitivity identified levels

Impact significance		Magnitude of change								
		Very high	High	Moderate	Low	No change	Low	Moderate	High	Very high
Sensitivity of the receptor	Low	High*	Moderate*	Low	Low	No impact	Low	Low	Moderate*	High*
	Moderate	High	High	Moderate	Low	No impact	Low	Moderate	High	High
	High	Very high	High	High	Moderate*	No impact	Moderate*	High	High	Very high
	Very high	Very high	Very high	High	High*	No impact	High*	High	Very high	Very high

* Especially in these cases, significance might get a lower estimate, if sensitivity or magnitude is near the lower bound of the classification

Impact assessment analysis (3/6)

**Mob/Demob
phase**

Category	Affected environmental components	Impact Value
Air and Sea	Air quality and climate	Low -
	Seawater quality	
	Seascape	
Socio-economic context	Human health	Low -
	Tourism	
	Maritime traffic	Moderate -
	Fishery	No impact
Biodiversity and Ecosystems	Seagrasses, Mäerl beds and Benthos	Low -
	Marine invertebrates	
	Plankton	
	Marine mammals	Moderate -
	Marine reptiles	
	Fishes and Ichthyoplankton	Low -
	Seabirds	
	Sensitive habitats	
Protected areas		

No particular issues have been detected, in some cases a “Moderate –” level of impact has been outlined, which is mainly due to the High sensitivity of the receptors/indicators

Impact assessment analysis (4/6)

		Mob/Demob phase	Acquisition phase
Category	Affected environmental components	Impact Value	Impact Value
Air and Sea	Air quality and climate	Low -	Low -
	Seawater quality		
	Seascape		
Socio-economic context	Human health	Low -	Low -
	Tourism		
	Maritime traffic		
	Fishery	Moderate -	High -
	Aquaculture	No impact	No impact
Biodiversity and Ecosystems	Seagrasses, Mäerl beds and Benthos	Low -	Low -
	Marine invertebrates		Moderate -
	Plankton		
	Marine mammals	Moderate -	High -
	Marine reptiles		
	Fishes and Ichthyoplankton	Low -	Moderate -
	Seabirds		
	Sensitive habitats		Low -
	Protected areas		

For some receptors/indicators a “Moderate - / High - ” level of impact significance has been assessed, which is due to the combination of the receptors/indicators Moderate/High sensitivity and the induced Moderate/High change magnitude

Impact assessment analysis (5/6) - Fishery and related resources

Fishery			
<i>Characteristics of sensitivity</i>	<i>For both the project phases</i>		
Existing regulations and guidance	Moderate		
Societal value	High		
Vulnerability for changes	Low		
SENSITIVITY	High (Moderate to high)		
	<i>Mob/Demob phase</i>	<i>Acquisition phase</i>	
<i>Drivers of change</i>	<i>Increased marine traffic due to the vessels use</i>	<i>Increased marine traffic due to the vessels use</i>	<i>Generation of noise from airguns</i>
<i>Characteristics of magnitude</i>			
Intensity and direction	Low -	Low -	Moderate -
Spatial extent	Low	Low	Low
Duration	Low	Low	Moderate
MAGNITUDE	Low -	Low -	Moderate -
SIGNIFICANCE	Moderate -	High -	

Fishes and Ichthyoplankton				
<i>For both the project phases</i>				
Moderate				
Moderate				
Moderate				
Moderate				
	<i>Mob/Demob phase</i>	<i>Acquisition phase</i>		
<i>Drivers of change</i>	<i>Wastewater, potential fuel leaks and waste generation/disposal</i>	<i>Generation of noise from vessel transit</i>	<i>Generation of noise from vessel transit</i>	<i>Generation of noise from airguns</i>
<i>Characteristics of magnitude</i>				
Intensity and direction	Low -	Low -	Low -	Moderate -
Spatial extent	Low	Low	Low	Low
Duration	Low	Low	Low	Moderate
MAGNITUDE	Low -	Low -	Low -	Moderate -
SIGNIFICANCE	Low -		Moderate -	

	<i>potential fuel leaks and waste generation/disposal</i>	<i>Generation of noise from vessel transit</i>	<i>Wastewater, potential fuel leaks and waste generation/disposal</i>	<i>Generation of noise from vessel transit</i>	<i>Generation of noise from airguns</i>	<i>Use of nightlights</i>
<i>Characteristics of magnitude</i>						
Intensity and direction	Low -	Low -	Low -	Low -	Moderate -	Low -
Spatial extent	Low	Low	Low	Low	Low	Low
Duration	Low	Low	Low	Low	Moderate	Low
MAGNITUDE	Low -	Low -	Low -	Low -	Moderate -	Low -
SIGNIFICANCE	Low -		Moderate -			

Impact assessment analysis (5/6) - Fishery and related resources

Fishery	
<i>Characteristics of sensitivity</i>	<i>For both the project phases</i>
Existing regulations and guidance	Moderate
Societal value	High
Vulnerability for changes	Low
SENSITIVITY	High (M)
	<i>Mob/Demob phase</i>
<i>Drivers of change</i>	<i>Increased marine traffic due to the vessels used</i>
<i>Characteristics of magnitude</i>	
Intensity and direction	Low -
Spatial extent	Low
Duration	Low
MAGNITUDE	Low -
SIGNIFICANCE	Moderate -

Fishes and Ichthyoplankton						
<i>Characteristics of sensitivity</i>	<i>For both the project phases</i>					
Existing regulations and guidance	Moderate					
Societal value	Moderate					
Vulnerability for changes	Moderate					
SENSITIVITY	Moderate					
	<i>Mob/Demob phase</i>			<i>Acquisition phase</i>		
<i>Drivers of change</i>	<i>Wastewater, potential fuel leaks and waste generation/disposal</i>	<i>Generation of noise from vessel transit</i>	<i>Wastewater, potential fuel leaks and waste generation/disposal</i>	<i>Generation of noise from vessel transit</i>	<i>Generation of noise from airguns</i>	<i>Use of nightlights</i>
<i>Characteristics of magnitude</i>						
Intensity and direction	Low -	Low -	Low -	Low -	Moderate -	Low -
Spatial extent	Low	Low	Low	Low	Low	Low
Duration	Low	Low	Low	Low	Moderate	Low
MAGNITUDE	Low -	Low -	Low -	Low -	Moderate -	Low -
SIGNIFICANCE	Low -		Moderate -			

Impact assessment analysis (6/6) - Marine mammals and marine reptiles

Marine mammals									
Characteristics of sensitivity	For both the project phases								
Existing regulations and guidance	High								
Societal value	Moderate								
Vulnerability for changes	Moderate								
SENSITIVITY	High								
	Mob/Demob phase				Acquisition phase				
Drivers of change	Increased marine traffic due to the vessels use	Waste water, potential fuel leaks and waste generation/disposal	Generation of noise from vessel transit	Use of nightlights	Increased marine traffic due to the vessels use	Waste water, potential fuel leaks and waste generation/disposal	Generation of noise from vessel transit	Generation of noise from airguns	Use of nightlights
Characteristics of magnitude									
Intensity and direction	Low -	Low -	Low -	Low -	Low -	Low -	Low -	High -	Low -
Spatial extent	Low	Low	Low	Low	Low	Low	Low	Moderate	Low
Duration	Low	Low	Low	Low	Low	Low	Low	Moderate	Low
MAGNITUDE	Low -	Low -	Low -	Low -	Low -	Low -	Low -	High -	Low -
SIGNIFICANCE	Moderate -				High -				

MAGNITUDE	Low -	Low -	Low -	Low -	Low -	Low -	Low -	Moderate -	Low -
SIGNIFICANCE	Moderate -				High -				

Marine reptiles					
For both the project phases					
High					
Moderate					
Moderate					
High					
	Acquisition phase				
Use of nightlights	Increased marine traffic due to the vessels use	Waste water, potential fuel leaks and waste generation/disposal	Generation of noise from vessel transit	Generation of noise from airguns	Use of nightlights
Low -	Low -	Low -	Low -	Moderate -	Low -
Low	Low	Low	Low	Low	Low
Low	Low	Low	Low	Moderate	Low
Low -	Low -	Low -	Low -	Moderate -	Low -

Impact assessment analysis (6/6) - Marine mammals and marine reptiles

Marine mammals				
Characteristics of sensitivity	For both the project phases			

Existing regulations and guidance				
Societal value				
Vulnerability for changes				
SENSITIVITY				
	<i>Mob/Demob phase</i>			
<i>Drivers of change</i>	<i>Increased marine traffic due to the vessels use</i>	<i>Waste water, potential fuel leaks and waste generation/disposal</i>	<i>Generation of noise from vessel transit</i>	<i>Use of nightlights</i>
<i>Characteristics of magnitude</i>				
Intensity and direction	Low -	Low -	Low -	Low -
Spatial extent	Low	Low	Low	Low
Duration	Low	Low	Low	Low
MAGNITUDE	Low -	Low -	Low -	Low -
SIGNIFICANCE	Moderate -			

Marine reptiles										
Characteristics of sensitivity	For both the project phases									
Existing regulations and guidance	High									
Societal value	Moderate									
Vulnerability for changes	Moderate									
SENSITIVITY	High									
	<i>Mob/Demob phase</i>					<i>Acquisition phase</i>				
<i>Drivers of change</i>	<i>Increased marine traffic due to the vessels use</i>	<i>Waste water, potential fuel leaks and waste generation/disposal</i>	<i>Generation of noise from vessel transit</i>	<i>Use of nightlights</i>	<i>Increased marine traffic due to the vessels use</i>	<i>Waste water, potential fuel leaks and waste generation/disposal</i>	<i>Generation of noise from vessel transit</i>	<i>Generation of noise from airguns</i>	<i>Use of nightlights</i>	
<i>Characteristics of magnitude</i>										
Intensity and direction	Low -	Low -	Low -	Low -	Low -	Low -	Low -	Moderate -	Low -	
Spatial extent	Low	Low	Low	Low	Low	Low	Low	Low	Low	
Duration	Low	Low	Low	Low	Low	Low	Low	Moderate	Low	
MAGNITUDE	Low -	Low -	Low -	Low -	Low -	Low -	Low -	Moderate -	Low -	
SIGNIFICANCE	Moderate -					High -				

What we will do
to minimize any effects

Mitigation measures (1/7)

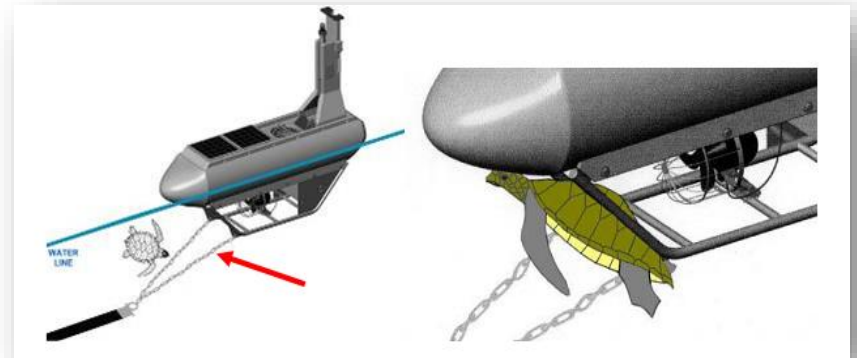
- ❑ Mitigation measures are defined with the aim of avoiding/reducing/restore as much as reasonably practicable all the project generated potential negative impacts;
- ❑ Several preventive and mitigation measures have been suggested, based on the findings of the Underwater Noise Modelling and taking into account the most comprehensive internationally recognized guidelines:
 - Adverse impacts of anthropogenic noise on cetaceans and other migratory species – Annex VI “EIA Guideline for Seismic Surveys (Air Gun and Alternative Technologies)” (UNEP/CMS, 2017);
 - Guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017);
 - Recommended monitoring and mitigation measures for cetaceans during marine seismic survey geophysical operations (IOGP & IAGC, 2017);
 - Seismic Surveys and Marine Mammals (IOGP & IAGC, 2017);
 - Implementation of and considerations for revisions to the JNCC guidelines for seismic surveys (JNCC, 2015);
 - Mitigation Measures for Cetaceans during Geophysical Operations (IAGC, 2015);
 - Guidance on underwater noise mitigation measures (ACCOBAMS, 2013) - based on the adopted Resolution 4.17 “Guidelines to address the impact of anthropogenic noise on Cetaceans in the ACCOBAMS area”;
 - Guidance for Marine Life Visual Observers (IAGC, 2011).

The following procedures will be adopted with the aim of mitigating potential effects on marine species:

- ❑ **Least sensitive period (winter season) for marine species** to conduct the project operations
- ❑ **Avoid unnecessary strong energy sources**
- ❑ **2.1 km Exclusion Zone (EZ)** to ensure marine species would not be exposed to dangerous sound level
- ❑ **Marine Mammal Observers (MMOs)** to perform visual monitoring
- ❑ **Passive Acoustic Monitoring (PAM)** to increase MMOs detection capabilities
- ❑ **Pre-shooting** before commencement of airguns use
- ❑ **Ramp-Up/Soft Start** to built up slowly the airguns power

In addition to MMOs/MWOs and PAM measures, the following measures will be adopted:

- ❑ **Protective and exclusion devices** to reduce the risk of turtles becoming trapped in the empty space in the submerged part in front of the tail buoy
- ❑ **Deflection devices** to exclude turtles from the openings on the tail buoy and to push them away.



Mitigation measures (4/7) - Marine Species

After the adoption of the adequate mitigation measures:

- ❑ Marine mammals and reptiles → potential impact reduced to a “Moderate –” level
- ❑ Marine invertebrates, plankton, fishes and ichthyoplankton → potential effects will remain of a “Moderate –” level given the difficult of detecting and monitoring the species presence at sea

Category	Affected components	Impact significance before mitigation measures application	Mitigation	Impact significance after mitigation measures application
Biodiversity and Ecosystems	Marine invertebrates	Moderate -	<ul style="list-style-type: none"> ▪ Soft-start method ▪ Marine Mammal Observers ▪ PAM system ▪ Infrared technology application ▪ 2.1 km Exclusion Zone ▪ Protective and exclusion devices for turtles 	Moderate -
	Plankton	Moderate -		Moderate -
	Marine mammals	High -		Moderate -
	Marine reptiles	High -		Moderate -
	Fishes	Moderate -		Moderate -

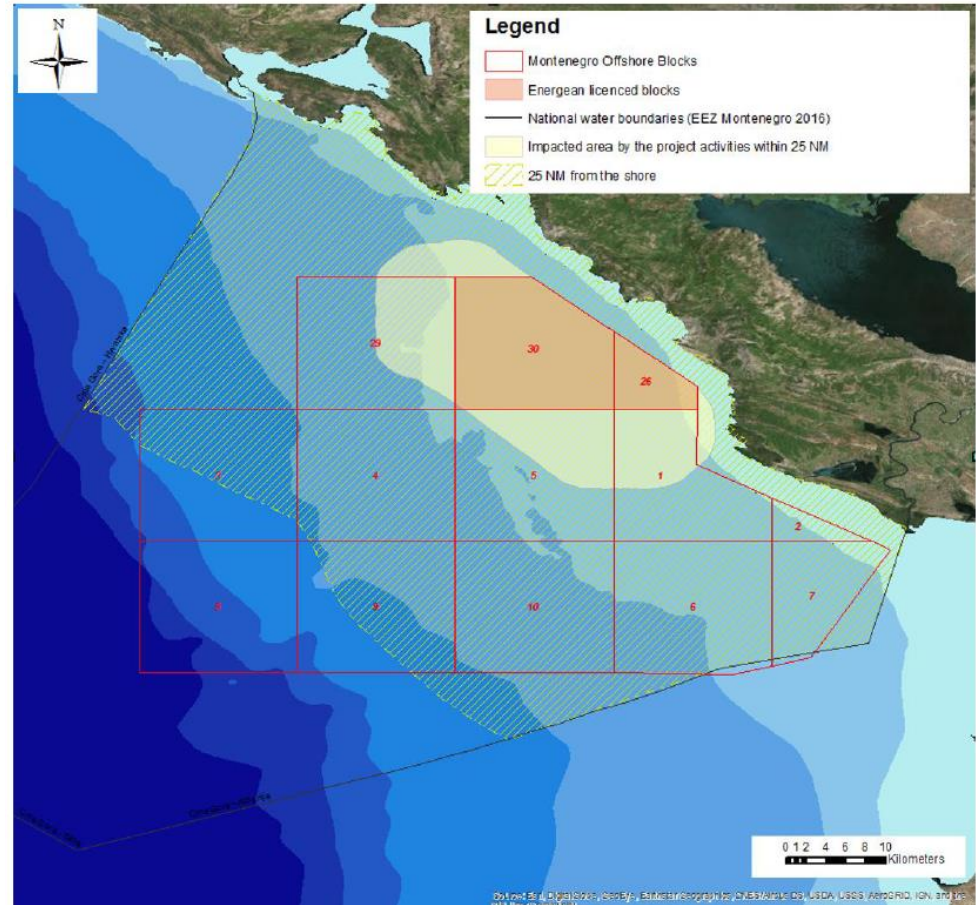
The following procedures will be adopted with the aim of mitigating potential effects on fisheries:

- ❑ **Advanced notice of geophysical activities** to avoid possible conflicts with shipping and fishing operations
- ❑ **Ensure communication with fisheries about activities to be performed** (timing, area to be investigated etc.)
- ❑ **Fisheries observer** will be boarded on the vessel to help avoiding conflict with and impacts to the fishing industry
- ❑ **Mitigation measures provided for fishes** will indirectly act as mitigation measures for fisheries too
- ❑ **Fisheries Compensation Approach** to determine the 'disturbance allowance' on fisheries deriving from project activities within the exclusion zone
- ❑ **Appropriate signals** to warn other vessels of the exclusion zone

Determination of compensation (C_{tot}):

$$C_{TOT} = (I_d \times R_{SubArea} \times D_{SubArea})$$

- ❑ I_d = total daily income or revenue deriving from fisheries sale in Montenegro determined as first sale or landing stage price
- ❑ $R_{SubArea}$ = index of relevance of the fishing activity (catch) of the defined SubArea on the total fishing activity (catch) of Montenegro within 25NM* (17,6%)
 - Total surface of fishing area of Montenegro within 25 NM = 4,211 km²
 - Total surface of the Fishing Potentially Impacted Area = 740 km²
- ❑ $D_{SubArea}$ = number of days of project activities in the defined SubArea (approximately 21 days)



* The distance limit for the performance of fishing activity according to a conservative approach has been estimate to be equal to 25 NM

Mitigation measures (7/7) - Fisheries

After the adoption of the adequate mitigation measures the impact induced on fisheries will be reduced as much as possible to a “Moderate -/Low -” level for all the drivers of change.

Category	Affected components	Impact significance before mitigation measures application	Mitigation	Impact significance after mitigation measures application
Socio-economic context	Fishery	High -	<ul style="list-style-type: none"> ▪ Advanced notice of geophysical activities ▪ Distribution of offshore activity and safety zones maps ▪ On-board Fisheries Liaison Officer - FLO ▪ Mitigation measures provided for fishes ▪ Implementation of the Fishery Compensation Approach 	Low - / Moderate -

An Environmental Monitoring Programme (EMP) has been developed in order to define monitoring and control measures that will be applied during the project execution for the effective and efficient implementation of the adopted mitigation measures.

- ❑ To make the integrated application of the mitigation measures effective and to implement the monitoring programme, the following staff will be required:
 - An Environmental Control and Communication Officer (ECCO);
 - At least two Marine Mammal Observers/Marine Wildlife Observers (MMOs/MWOs);
 - An operator of the Passive Acoustic Monitor (PAM) System;
 - Fisheries Liaison Officer (FLO).

- ❑ The EMP defines the monitoring procedures to be implemented in order to reduce/eliminate potential negative effects on the environment, e.g.:
 - Maintenance of vessel engines;
 - Wastewater treatment check;
 - MARPOL compliance verifications;
 - MMOs/MWOs reports;
 - FLO's reports.

Marine environment monitoring activities before and after the project activities

The biodiversity monitoring activities goal is to verify and quantify potential effects induced on the marine environment by the seismic survey.

The following monitoring activities concerning the most impacted receptors/indicators have been planned:

- ❑ Fishery landing survey at the ports of Bar and Ulcinj, 60 days sampling once per week
- ❑ Ichthyoplankton sampling survey, 3 days sampling
- ❑ Marine Mammals survey, 15 days surveying

- Ante operam phase (2018)
- Ongoing activities
- Institute of Marine Biology of Montenegro

- Ante operam phase (2018)
- Concluded activities
- Oceanomare Delphis Onlus

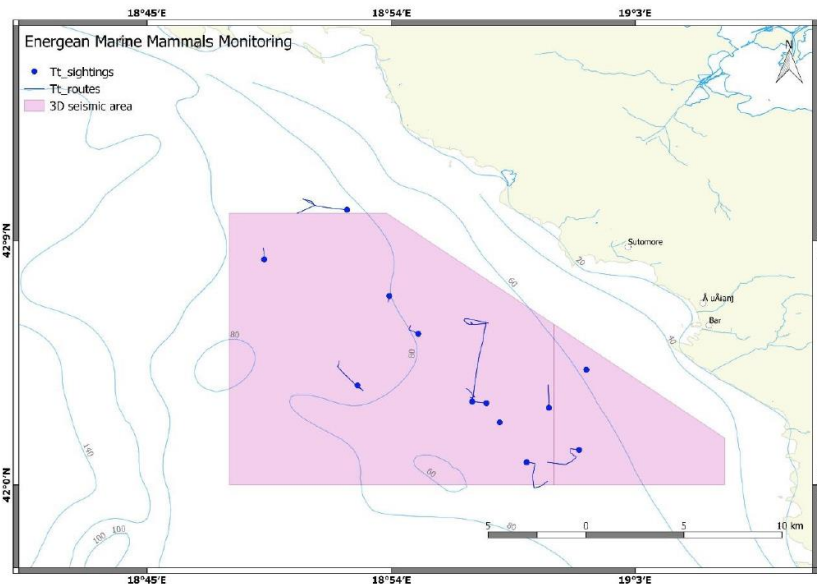
The post operam phase of the biodiversity monitoring programme will be carried out in Summer 2019

Environmental Monitoring Programme (3/3)

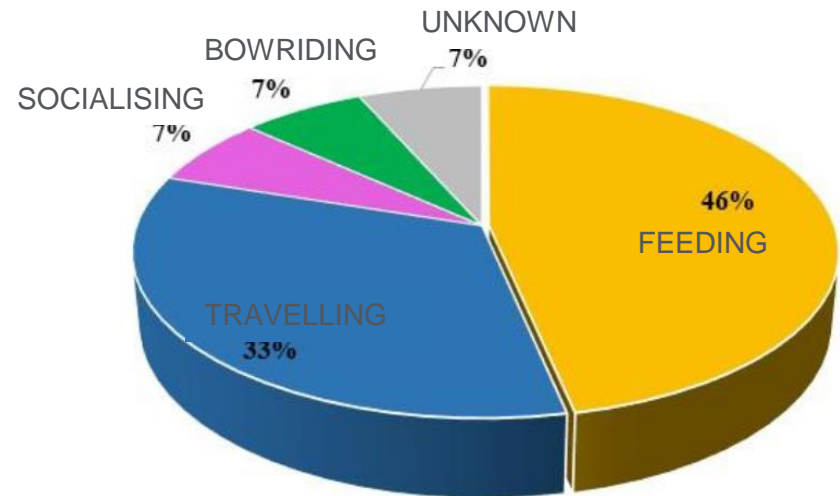
Results of the acoustic and visual monitoring conducted over the period 27th August – 9th September 2018 (*Ante operam phase*):

- ❑ 12 sightings of cetaceans → the only animals observed (excluding several species of fish) are Bottlenose dolphins and Loggerhead turtles;
- ❑ Dolphins use the study area mainly for feeding (with and without associations with trawlers) and for travelling.

Sightings and routes of Bottlenose dolphins detected



Behaviour of encountered dolphins



Prinos example and the 2015 survey

Minutes from the visit of the Montenegrin delegation to Prinos



❑ Th. Markopoulos, Vice Head of Eastern Macedonia & Thrace Region: “Congrats to Energean, it operates with no environmental issues”



❑ D. Tsanaka, Mayor of Kavala: “I am a pneumonologist for more than 20 years, never dealt with an incident related to the oil and gas operations”



❑ M. Dempas, President of Kavala Chamber: “Oil and gas increases our per capita income, you should proceed with the project right away”



❑ A. Mitzalis, Chairman of the local Hotel Owners Federation: “Never faced a problem, on the contrary they book rooms even off season”



❑ J. Manios, Chairman of the local Fishermen Federation: “We fish 100 tonnes everyday, fishes have even increased post their survey”



We have so many things in common!



Bar, Old City



Kavala, Roman Kamares



Adriatica Beach, Ulcinj



Ammolofi Beach, Kavala

We have so many things in common!



Ulcin Port



Port of Bar



Sfagia, Kavala

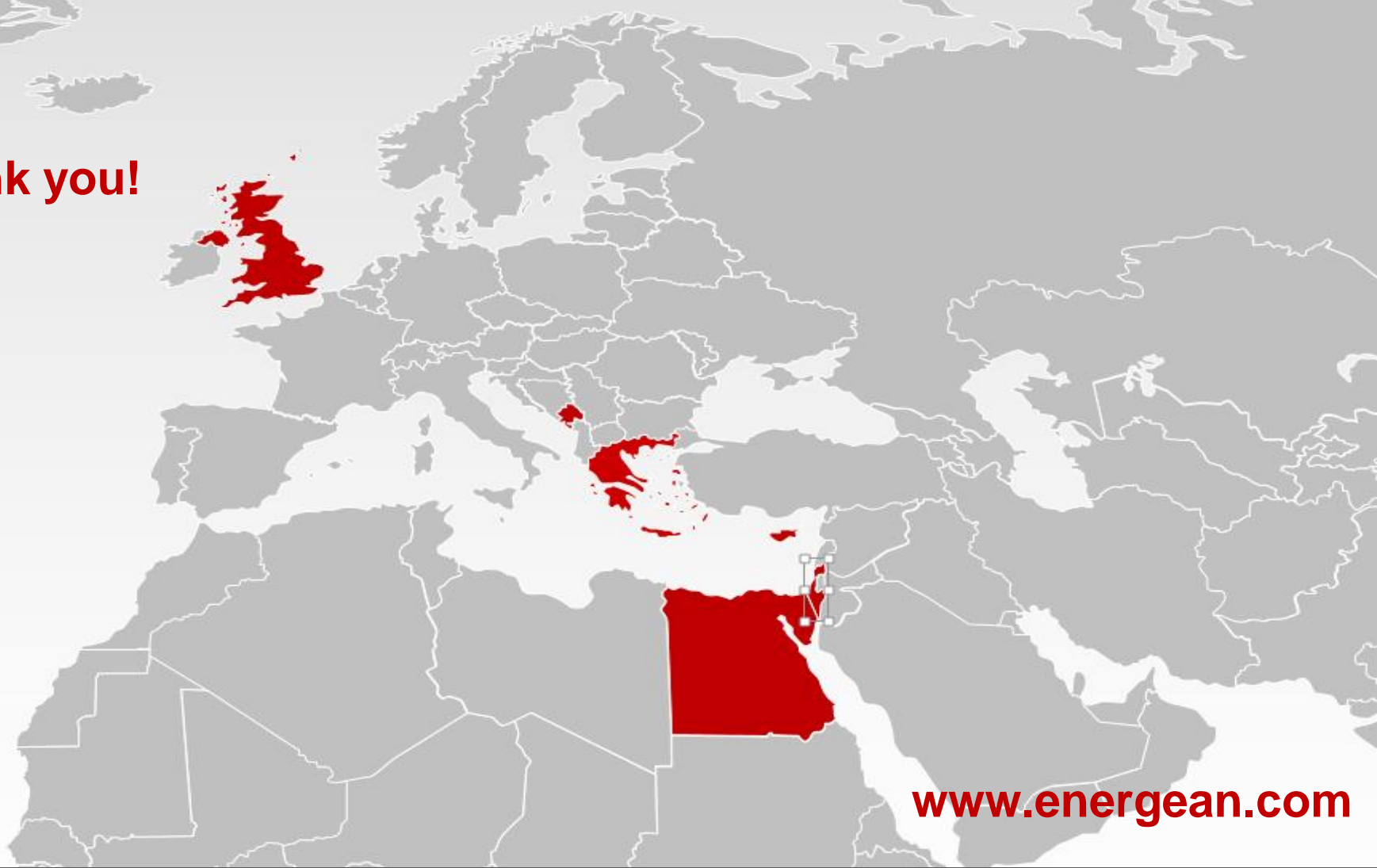


Port of Kavala

Video clip from the 2015 3D seismic survey in Prinos



Thank you!



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