

A Master Plan for
**Marine Nature Reserves
in Israel's Exclusive
Economic Zone**
in the Mediterranean Sea

May 2023



Israeli EEZ MPA Master Plan



The Society for the
Protection of Nature
in Israel

The Blue Half

Israeli Mediterranean Conservation Reform



Ministry of Environmental Protection



ISRAEL NATURE
AND PARKS
AUTHORITY



רשות
העתיקות
ISRAEL ANTIQUITIES AUTHORITY



Leon H. Charney School of Marine Sciences

UNIVERSITY OF HAIFA



אוניברסיטת חיפה
University of Haifa
جامعة حيفا



חקר ימים ואגמים לישראל
Israel Oceanographic & Limnological Research



אוניברסיטת תל אביב
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THE STEINHARDT
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NATURAL
HISTORY
מוזיאון
הטבע
שטיינהרדט
מוזיאון
הטבע
שטיינהרדט



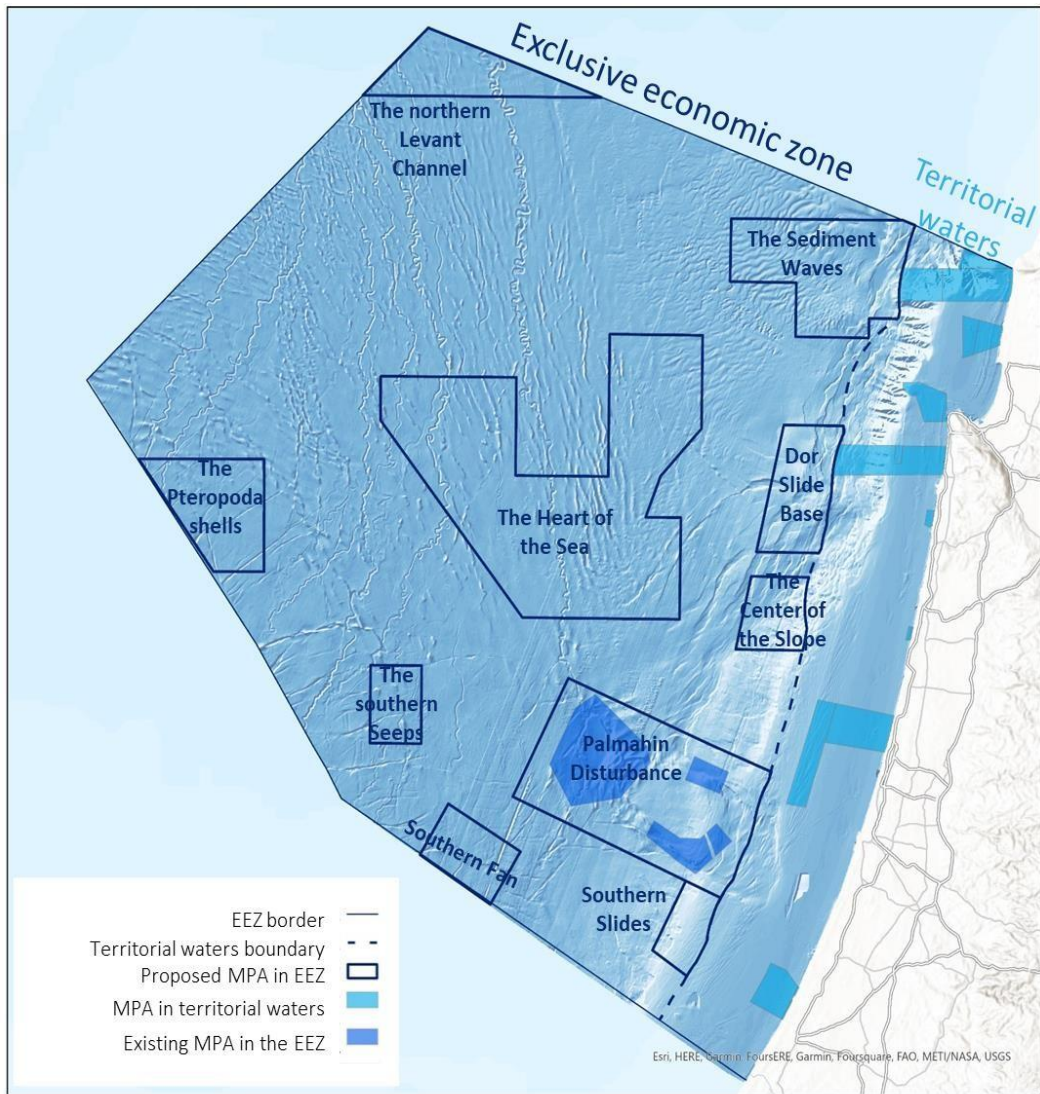
Dani Amir Environmental Planning Ltd

Israel's EEZ in the Mediterranean Sea



- Depth: ~200-2100 m
- Area: 21,000 km²





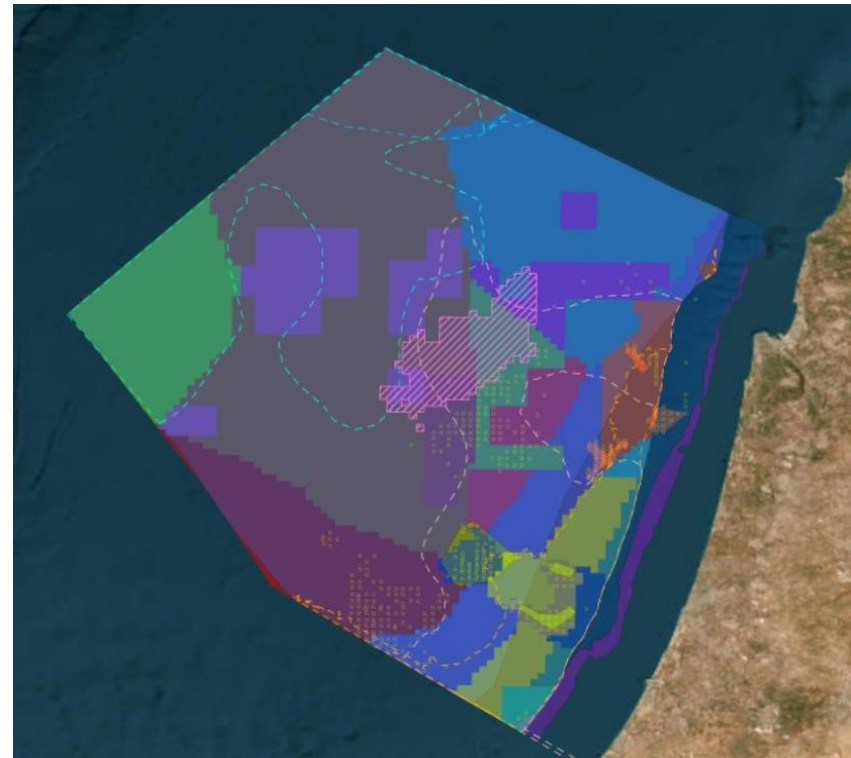
A Master Plan for Marine Nature Reserves in Israel's Exclusive Economic Zone in the Mediterranean Sea

May 2023



From here....

to there...



Strategic Environmental Assessment
Ministry of Energy 2016

MPAs masterplan project 2022

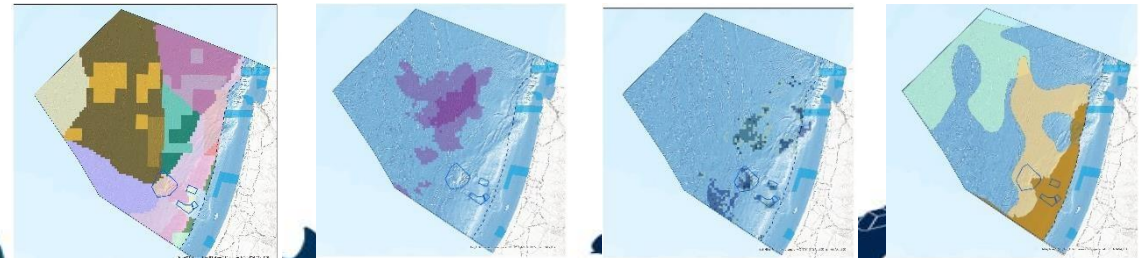
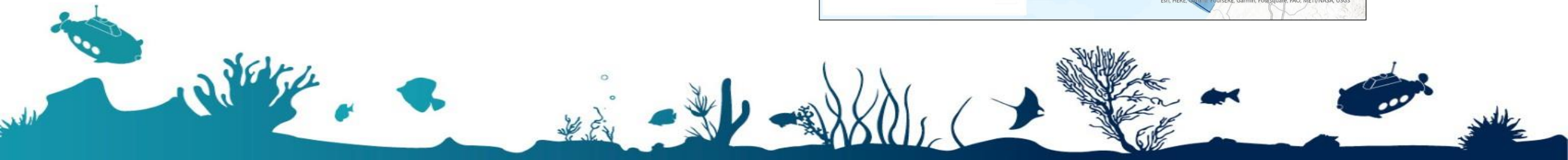
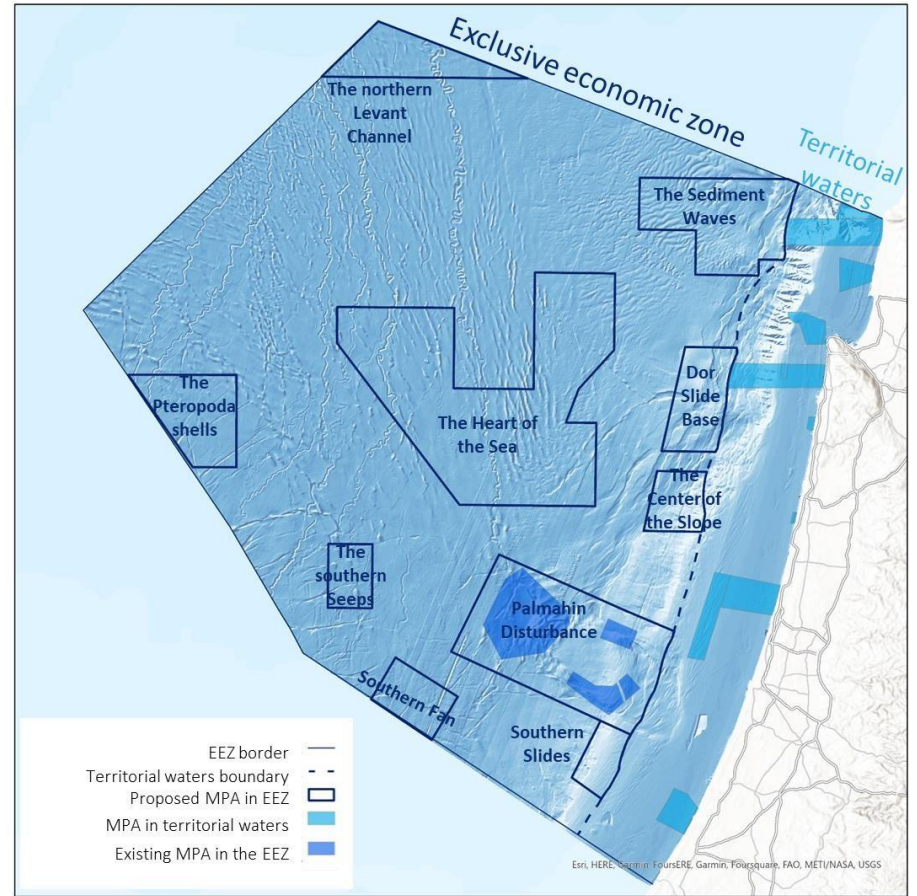
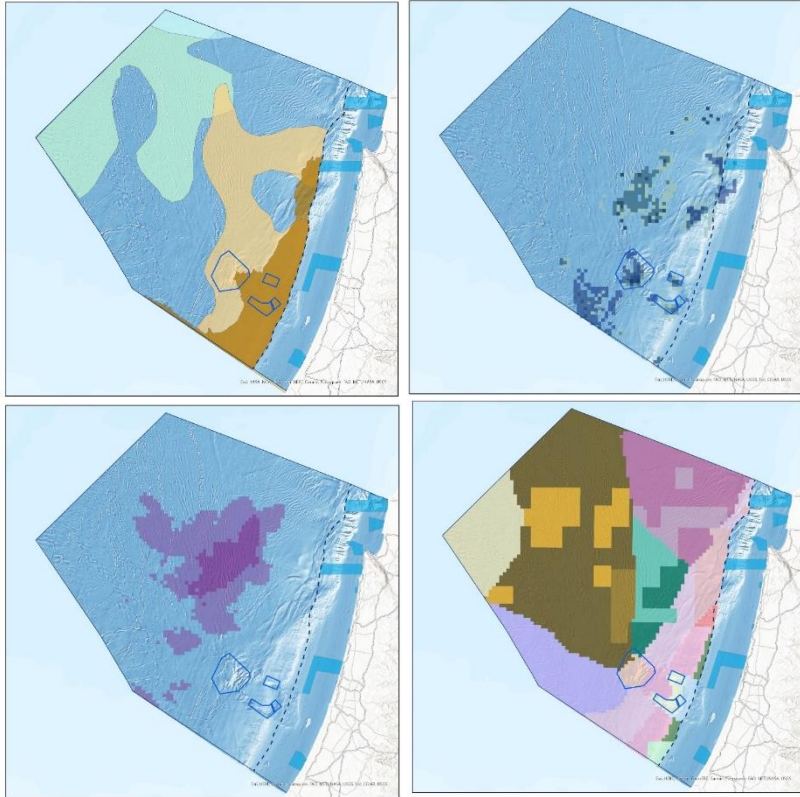


Photo: GEOMAR/MiningImpact Project
Israeli EEZ MPAs masterplan

תכנית אב לשמורות טבע באזור הכלכלי הבלעדי של ישראל

And from here....

to there...



The Master Plan in Numbers

30%

The sea area to be protected by the year 2030

21,000 km²

The area of Israel's EEZ

6300 km²

The area protected by the proposed marine reserves, according to the master plan

10

The number of marine reserves proposed in the master plan

80%

The percentage of unique habitats included in the proposed master plan

89%

The portion of conservation goals for the protection of ecological representative units met in the proposed master plan

4009

The number of observations of 332 different taxa, which served as the basis for the scientific analysis underlying the plan

14

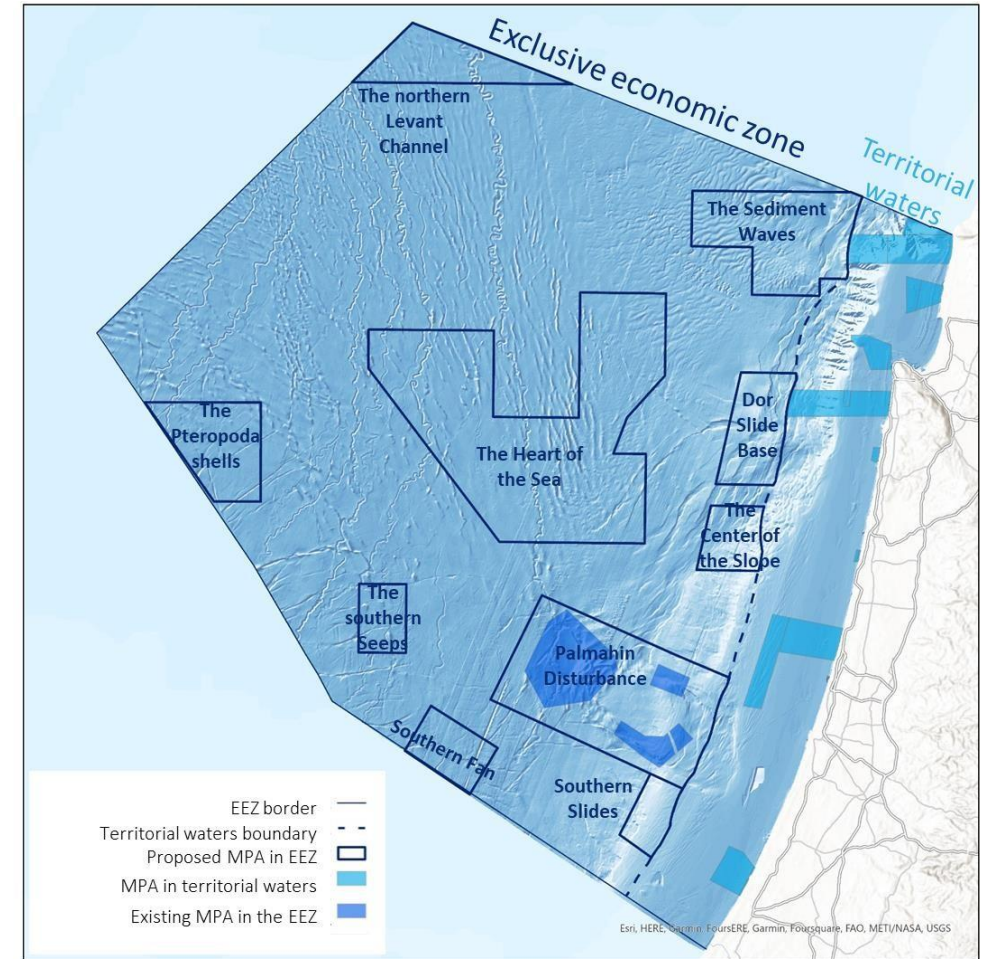
The number of tools and models used to support decision-making in the process of developing the master plan

24

Researchers and other professionals from seven different academic institutes who collaborated in preparing the master plan

75 km

The maximal distance between two adjacent reserves



Scientific committee
(25 members)

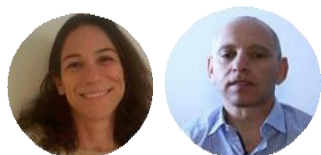
14 decision
support
tools

4,000
Observations

24
Researchers

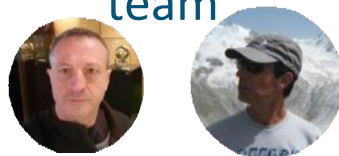
5
Professional
teams

Planning team



Dani Amir
Tzeela Karniel

Food web model
team



Dr. Gideon Gal
Dr. Eyal Ofir

Marxan team



Dr. Sylvaine Giakoumi
Dr. Emna Ben-Lamin

Pelagic ecology team



Dr. Tamar Guy-Haim
Prof. Barak Herut
Dr. Maxim Rubin-Blum
Dr. Issac Gertman
Dr. Nir Stern
Merav Gilboa
Dr. Eyal Rahav

Environment team



Prof. Yizhaq Makovsky
Adi Neuman
Dr. Tal Idan
Dr. Alex Slavenko
Dr. Liron Goren
Dr. Or Bialik
Dr. Yehezkel Buba
Shira Selingre

External scientific
consultants



Connectivity model



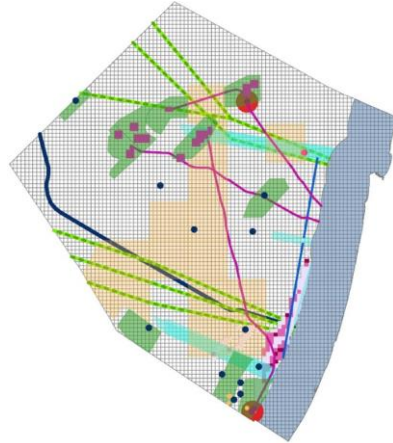
Dr. Igal Berenshtein

Main products

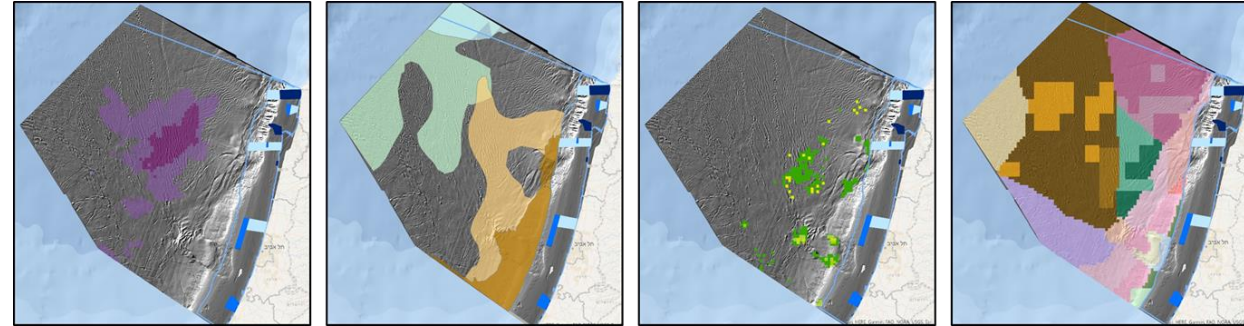
Background document



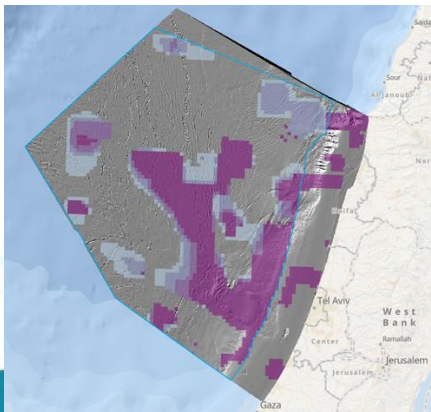
Maps of socioeconomic activities



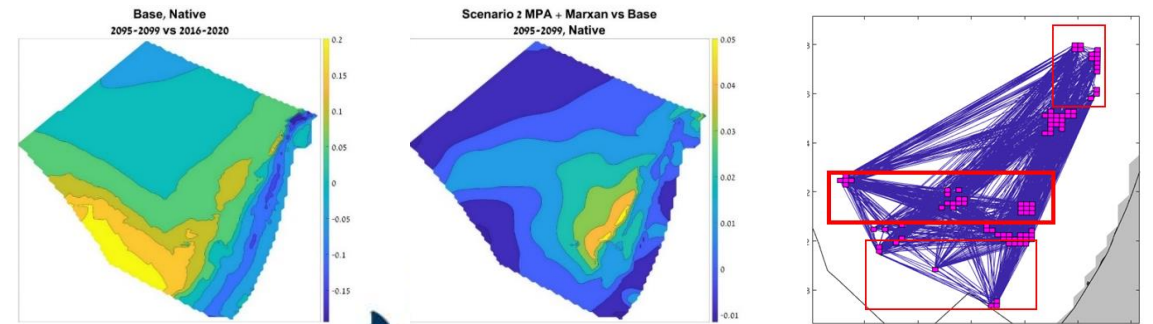
Characterization of ecological units and habitats



Spatial conservation prioritization using Marxan



Spatial conservation prioritization using EwE and CMS



The Goals

- 30% of the EEZ
- No Take, Nature Reserves
- The nature reserves that are managed, supervised, enforced, and scientific monitored by Israel's Nature and Parks Authority
- The Master Plan will be based on the most up-to-date scientific and planning knowledge
- The Plan will be updated regularly
- The plan will serve as the basis for future MSP for the EEZ and managing human activities



01

Data collection and analyses

- Characterizing the habitats and ecological units
- Setting conservation targets
- Characterizing the socio-economic activities



02

Use of decision-support tools

- Marxan program for spatial conservation prioritization
- EwE model for examining ecosystem change over time and space
- CMS to examine connectivity between Unique benthic habitats



03

Formulating the Master Plan for Marine Nature Reserves

- Integrating the scientific and planning recommendations
- Integrating feedback from steering committee members and stake holders
- Drawing the map of the reserves and writing the plan



04

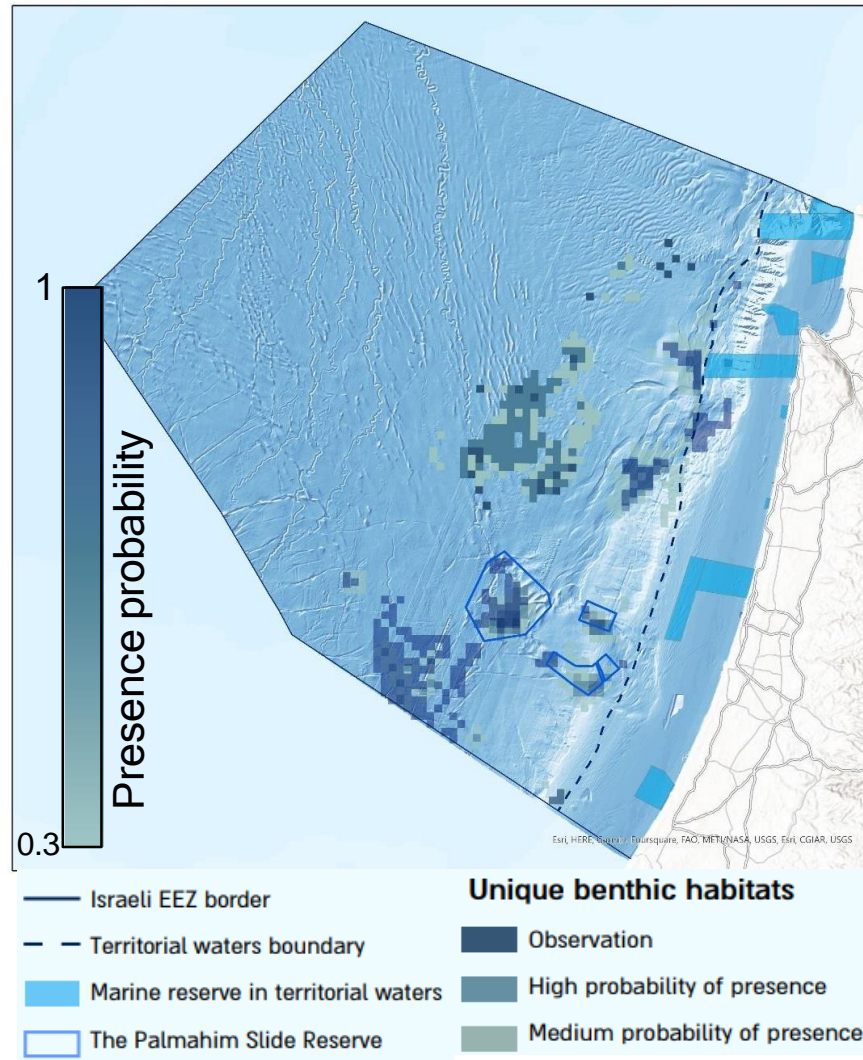
Updating the plan

- New information on habitat distribution based on recent studies and surveys
- Updates about the implementation of socioeconomic activities in the EEZ area

Unique Benthic Habitats

Observed or have high probability of presence in **6%** of the EEZ

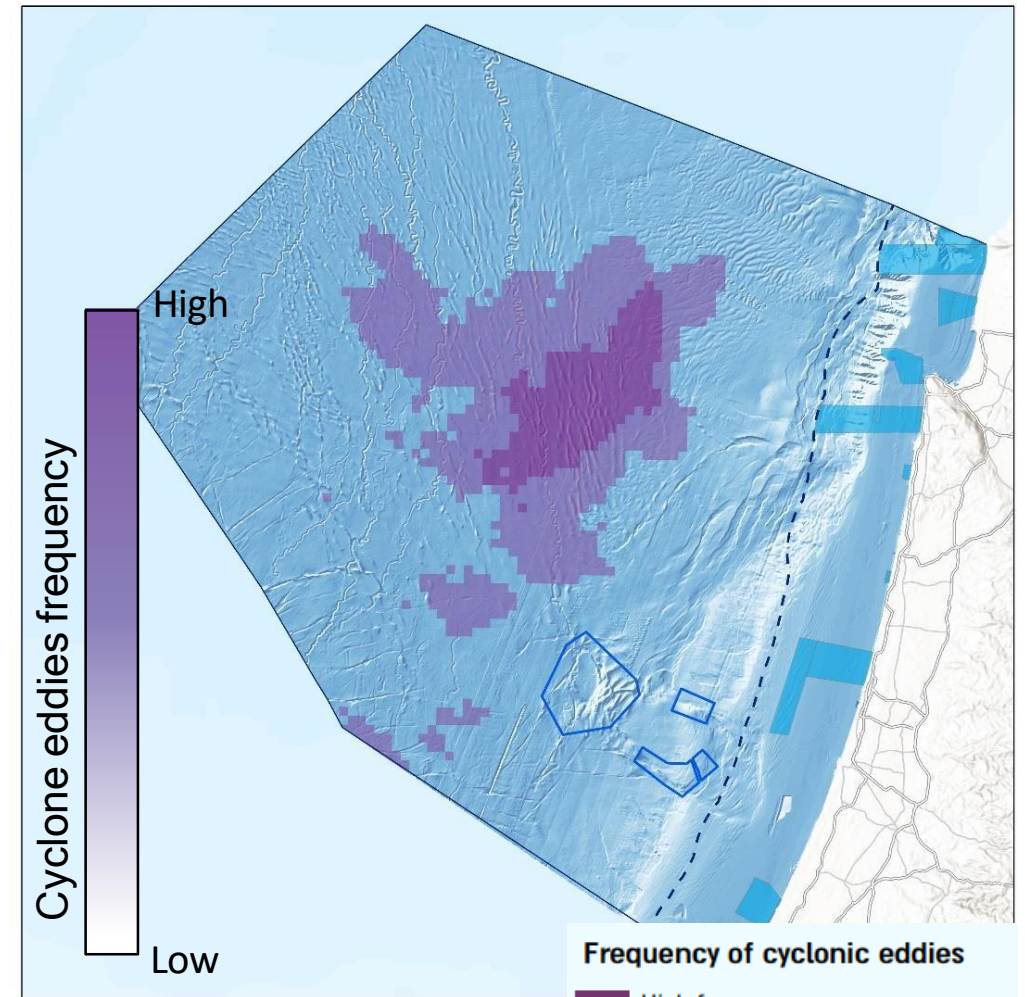
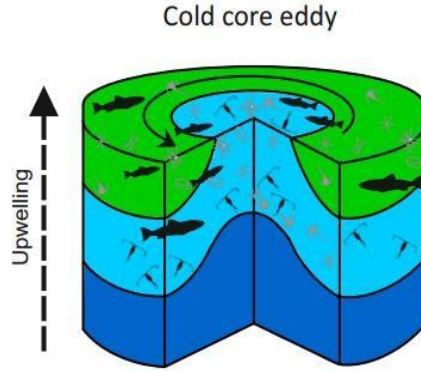
Deep-sea coral gardens | Soft sediment sponge aggregations | Chemosynthetic systems, and Carbonate rocks formed around cold gas (methane) seeps
Where identified either through observation or a high probability of presence predicted by the model



Special Pelagic Areas

High frequencies in
5% of the EEZ area

High frequency of cyclonic eddies that are characterized by high levels of primary productivity and zooplankton biomass and are therefore targeted for conservation



Pelagic productivity hotspots

Frequency of cyclonic eddies

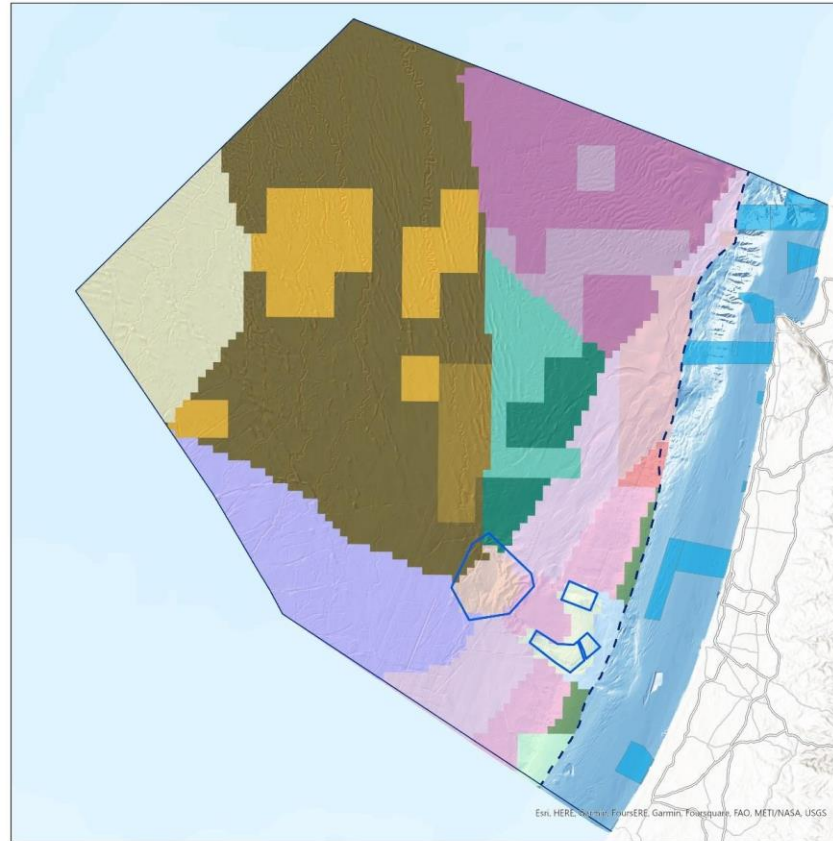
- High frequency
- Medium frequency

- Israeli EEZ border
- Territorial waters boundary
- Marine reserve in territorial waters
- The Palmahim Slide Reserve

Benthic representative ecological units

18

Units which differ in geomorphology | sediment | biology



- Israeli EEZ border
- - Territorial waters boundary
- Marine reserve in territorial waters
- The Palmahim Slide Reserve

Benthic ecological units

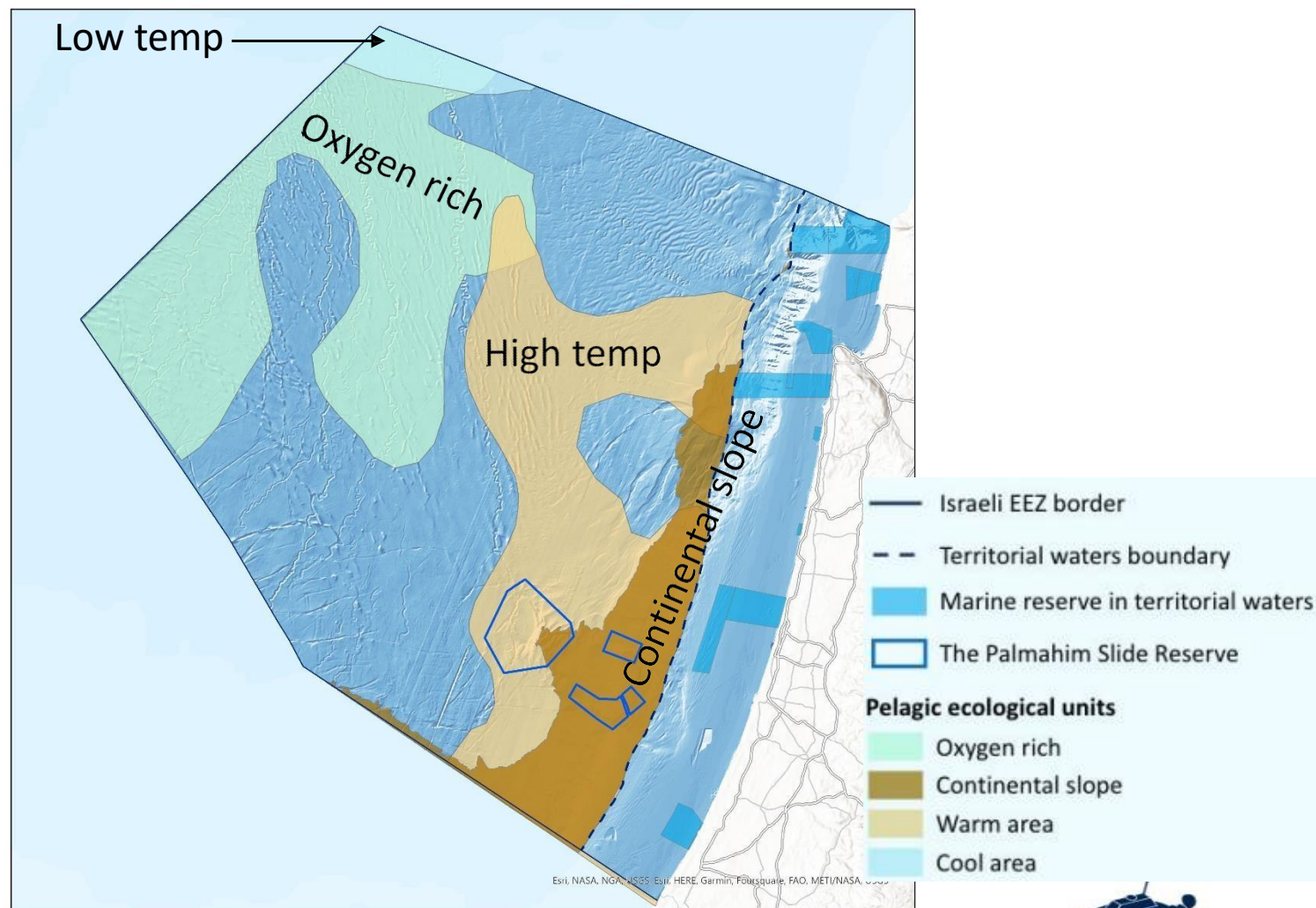
- Northern slope- Lower slope
- Palmahim A
- Palmahim B
- Palmahim C
- Southern slope
- Lower slope
- Upper slope
- Northern slope – base slope
- Bathyal plain – Deep sea fan
- Foraminiferous assemblage
- Sponge ground – Deep sea fan
- Sponge ground – Sediment waves
- Sponge ground – Deep plain
- Base slope
- Main deep sea fan
- Sediment waves
- Southern deep sea fan
- Deep plain



Pelagic ecological units

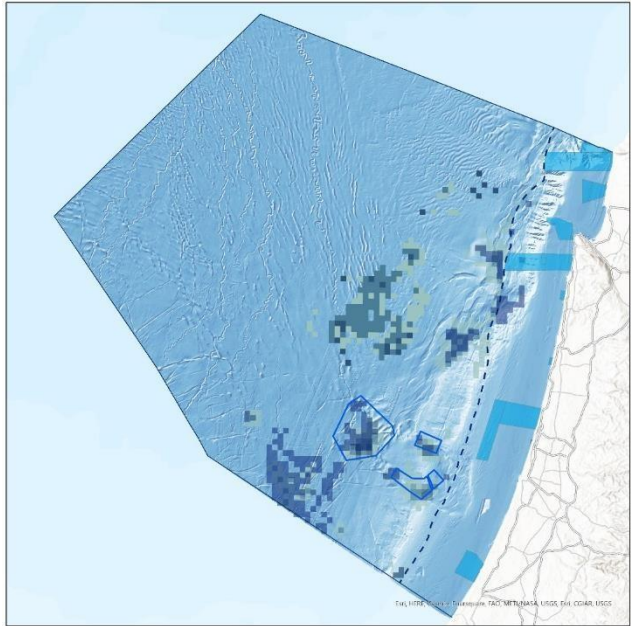
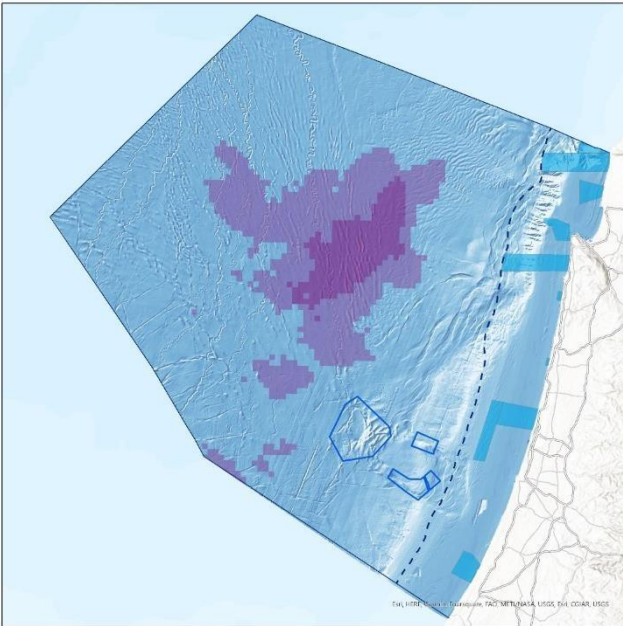
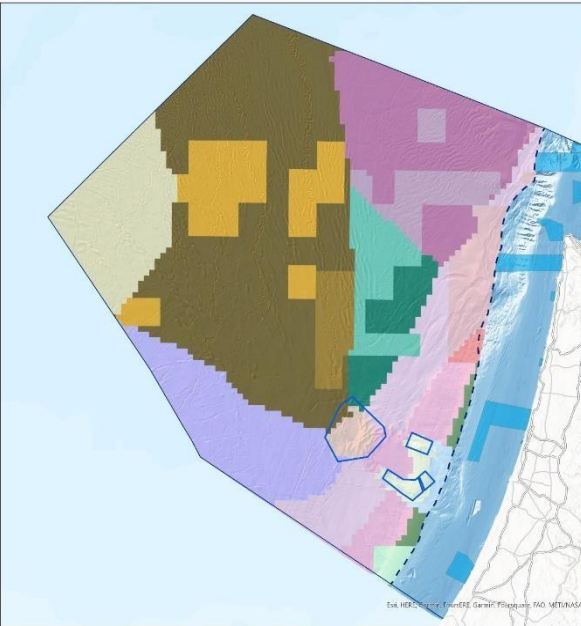
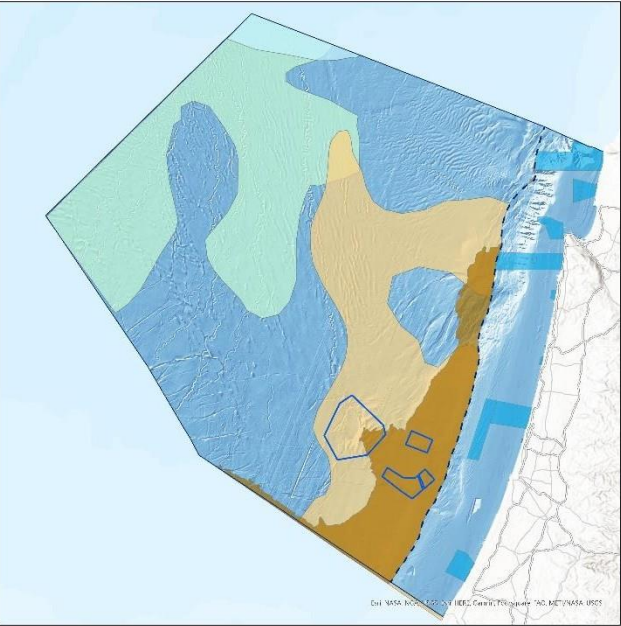
4

Units which differ in abiotic variables



Conservation targets

Targets set by the scientific committee for each habitat and unit



Pelagic ecological units

Benthic ecological units

Eddies: Pelagic productivity hotspots

Unique benthic habitats



Conservation goals for 36 ecological units and habitats

Conservation Target	Conservation feature	Percentage of the EEZ area	Conservation goal (%)	Low-priority conservation goal (%)
Unique benthic habitats	Soft bottom sponge ground (prob. 0.7-1)	0.38	100	100
	Soft bottom sponge ground (prob. 0.3-0.6)	1.6	60	60
	Soft bottom sponge ground (prob.<0.3)	11.2	30	20
	Coral garden (prob. 0.7-1)	0.1	100	100
	Coral garden (prob. <0.7)	2.2	70	70
	Sea pen field	0.1	100	100
	Cold seeps (prob. 0.7-1)	0.2	100	100
	Cold seeps (prob. <0.7)	1.6	70	70
	VME indicator habitat (rock and pockmarks-0.7-1)	1.2	100	100
	Rock and pockmarks (prob. 0.4-0.7)	1.8	50	30
	Rock and pockmarks (prob. <0.4)	10	30	20
	Levant channel*	3.3	20	10
	Pelagic representative ecological units	Pelagic slope	11.5	20
Pelagic warm		28.7	20	10
Pelagic cold		4.8	20	10
Pelagic high Oxygen		28.8	20	10
Unique Pelagic area	Cyclone presence (0.7-1)	4	100	70
	Cyclone presence (0.4-0.7)	23	50	30

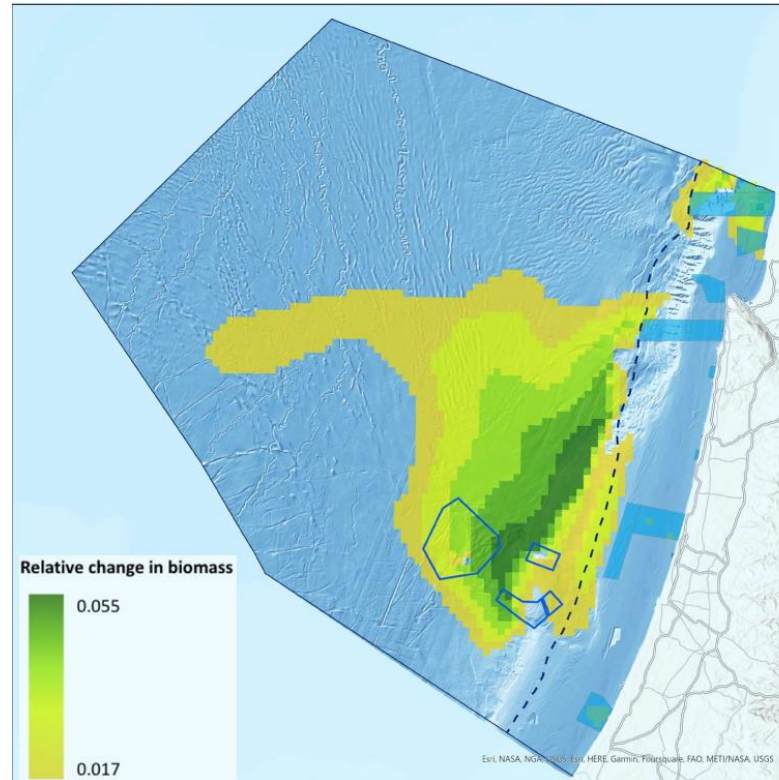
Food-web model - Recommended areas for climatic refuge for native species

460 species: 325 deep sea (84 fish species)

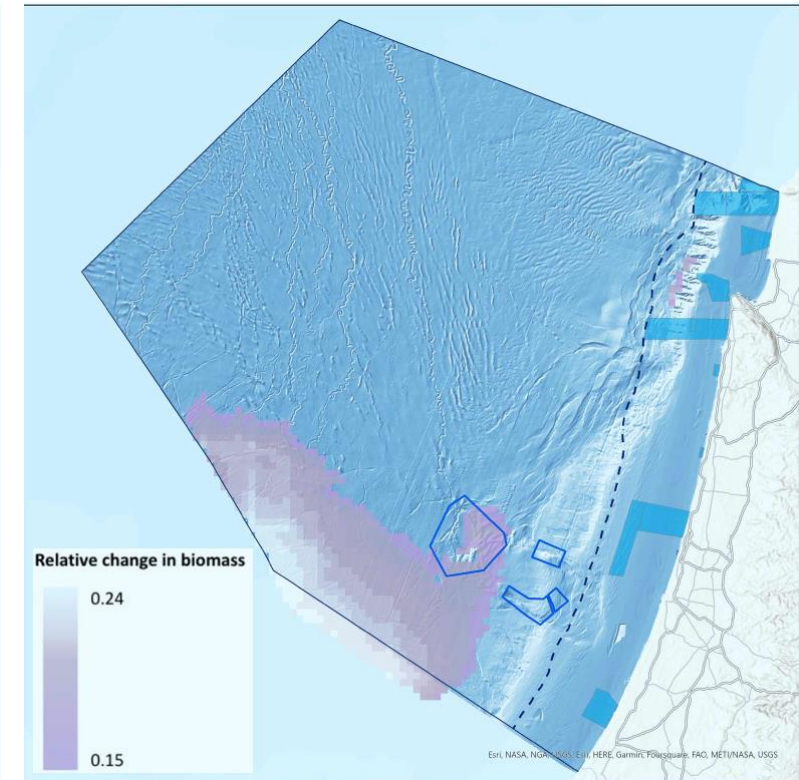
Using the (EwE) food web model revealed a possible movement of local species to deeper and colder areas due to a rise in water temperatures, under the global warming scenario (RCP 8.5).

Two sites were identified as potential climate refuge areas.

Accordingly, the scientific committee recommended that also this area should be prioritized for conservation



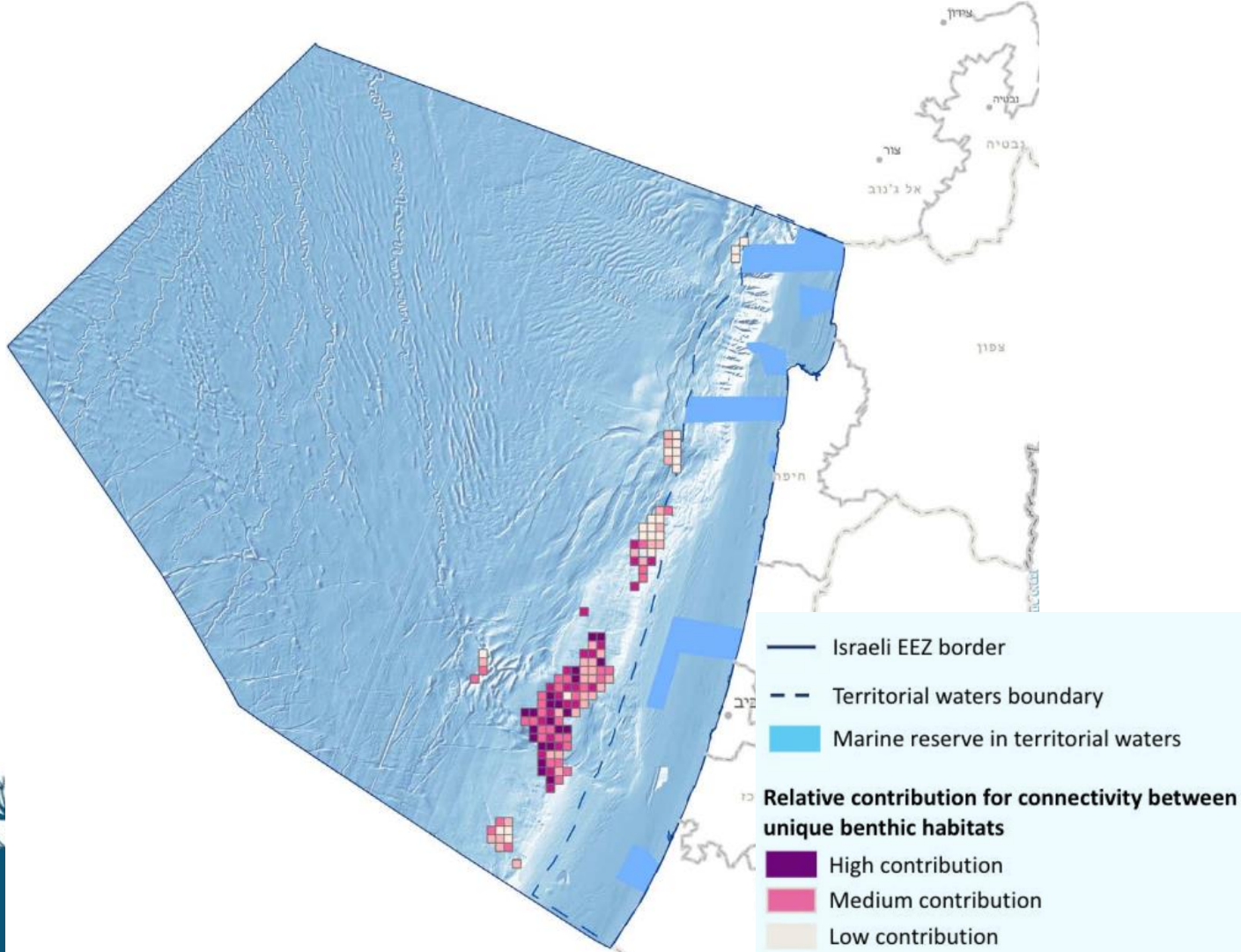
RCP 8.5 global warming scenario and the protection of 30% of the area



global warming scenario (RCP 8.5)

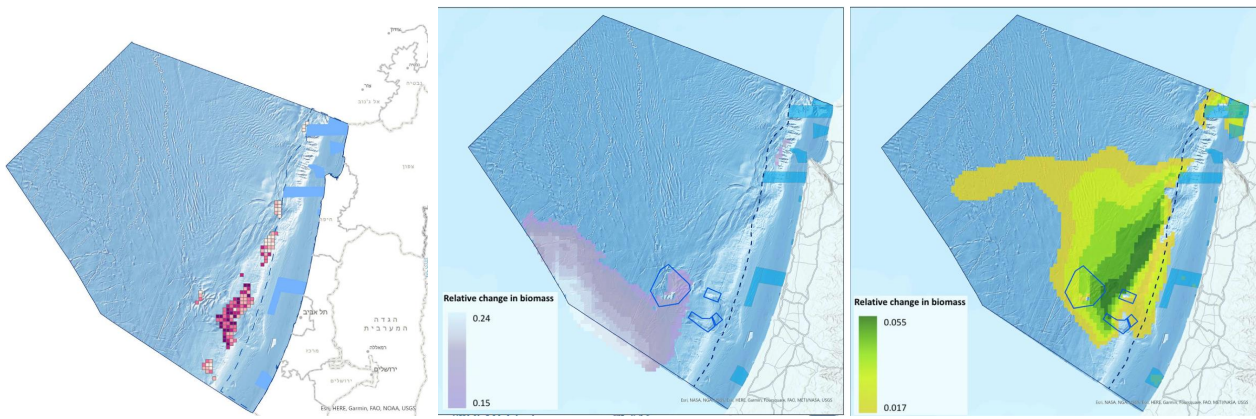
Connectivity modeling

Modeling unique benthic habitat (Cold seeps habitat) connectivity revealed relatively poor connectivity between distant sites compared to a high degree of connectivity within sites. The scientific conclusion derived from this model is the need to protect all of the unique benthic habitats

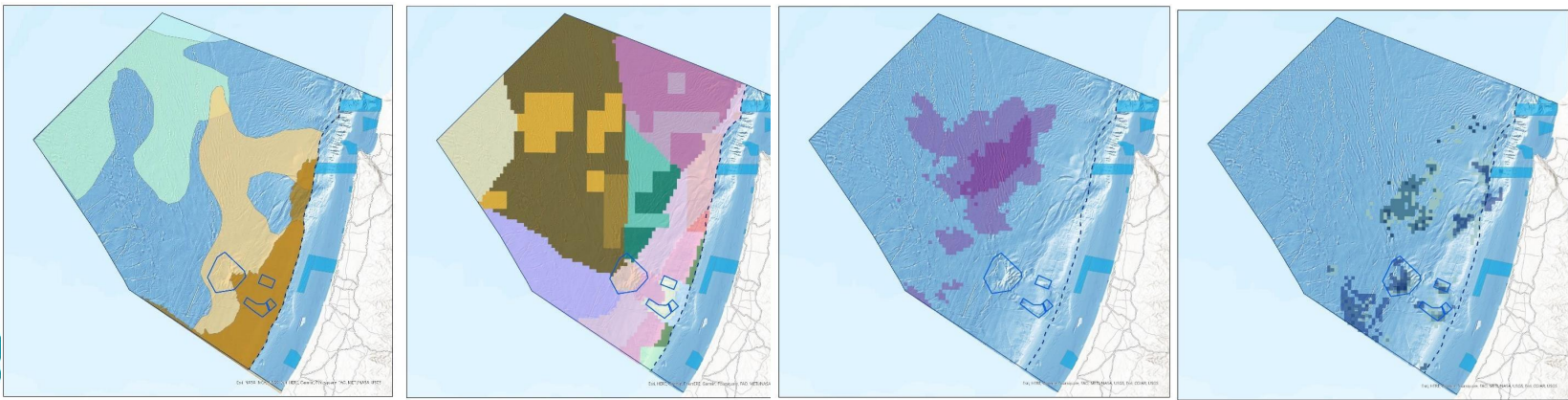


The planning process

Conservation Target	Conservation feature	Percentage of the EEZ area	Conservation goal (%)	Low-priority conservation goal (%)
Unique benthic habitats	Soft bottom sponge ground (prob. 0.7-1)	0.38	100	100
	Soft bottom sponge ground (prob. 0.3-0.6)	1.6	60	60
	Soft bottom sponge ground (prob. <0.3)	11.2	30	20
	Coral garden (prob. 0.7-1)	0.1	100	100
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	Sea pen field	0.1	100	100
	Cold seeps (prob. 0.7-1)	0.2	100	100
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	VME indicator habitat (rock and pockmarks 0.7-1)	1.2	100	100
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	Pelagic warm	28.7	20	10
	Pelagic cold	4.8	20	10
	Pelagic high Oxygen	28.8	20	10
	Unique Pelagic area	Cyclone presence (0.7-1)	4	100
Cyclone presence (0.4-0.7)	23	50	30	



Spatial MPAs Plan



The planning process

01 Formulating the Spatial Basis

Spatial data | Marxan + update



02 Zoning

Eco-spatial principles for planning marine nature reserves:

- a. A comprehensive area of nature reserves extending over 30% of the EEZ, as specified in the goals of the Convention on Biological Diversity and the Barcelona Convention, including adequate representation of habitats and maximum protection of rich and unique habitats.
- b. Preference for highly functional marine reserves in a minimal continuous 100 Km².
- c. Three-dimensional protection.
- d. Connectivity—Preferably over a maximum distance of 50-100 Km between the reserves.
- e. Preference for simple, regulated polygonal shapes, which can be easily defined, marked on navigation maps, maintained and supervised.
- f. Adaptability to climate change – preference for nature reserves that encompass a variety of depths and habitats, as the variety is an indication of potential future optimal functioning of the reserve (resilience and resistance), should climate changes cause changes to species distribution.
- g. Preserve the potential for future expansion of the area to encompass transboundary marine protected areas.
- h. Adaptation to human activities and uses in the sea while preventing destructive uses of the reserve areas.
- i. Reserves' spatial overlap with gas exploration and production activity should be allowed only if compatible with conservation goals.
- j. Reserves can overlap with existing and future infrastructure pipes and lines, but overlap with gas pipelines and their accompanying lines should be avoided as much as possible.
- k. Overlap with shipping lanes should be avoided as much as possible, although it is not absolutely prohibited.
- l. Adaptation to future trends and goals of the sectors currently operating in the maritime space.
- m. Maintain planning flexibility, to accommodate new ecological and socioeconomic information.

Eliminating conflicts
and accommodating
human uses and
activities in the EEZ



Spatial analysis
rendering a hierarchy
of conservation
importance

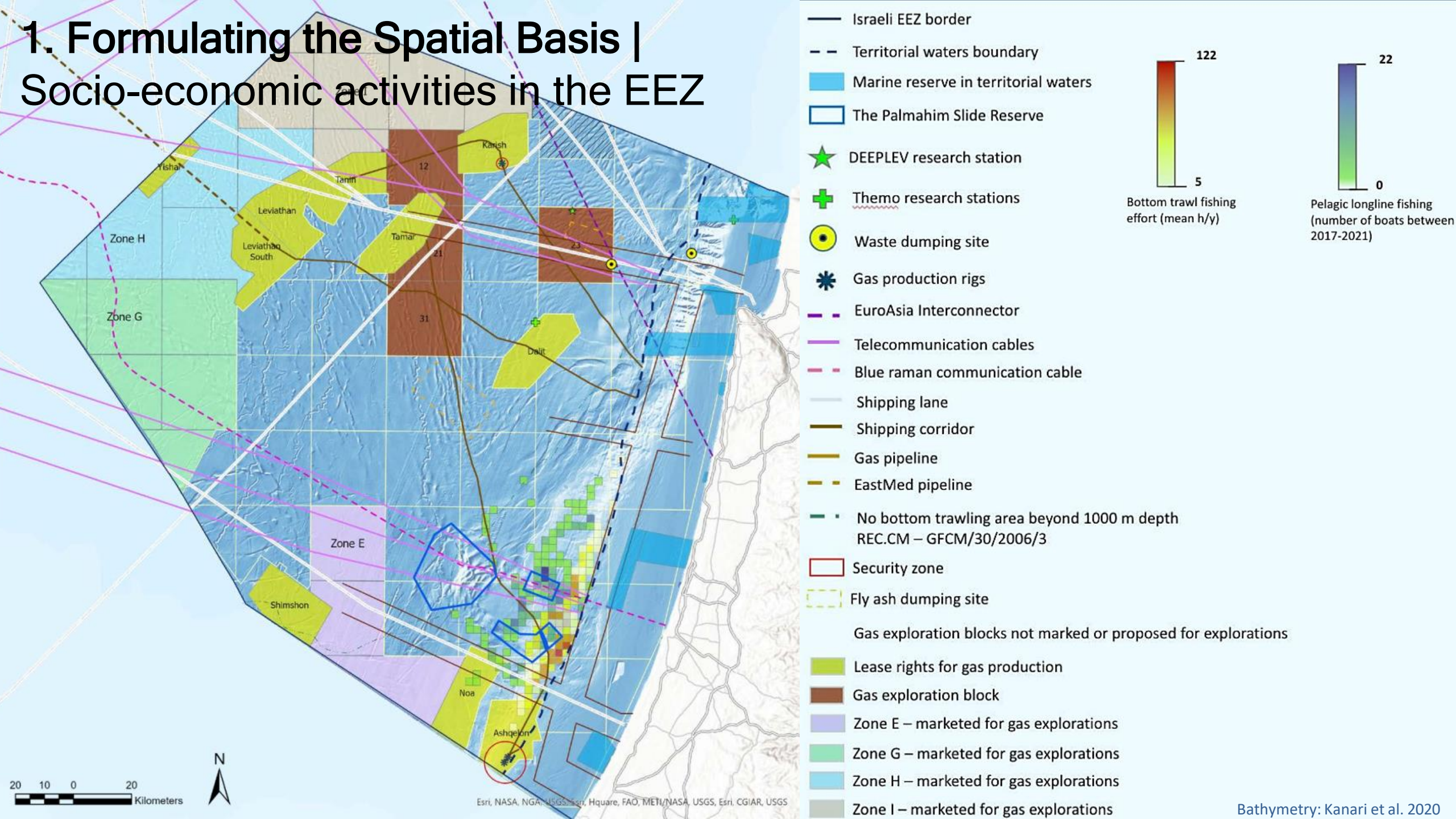


03 Critical Review of the Resulting Marine Spatial Plan

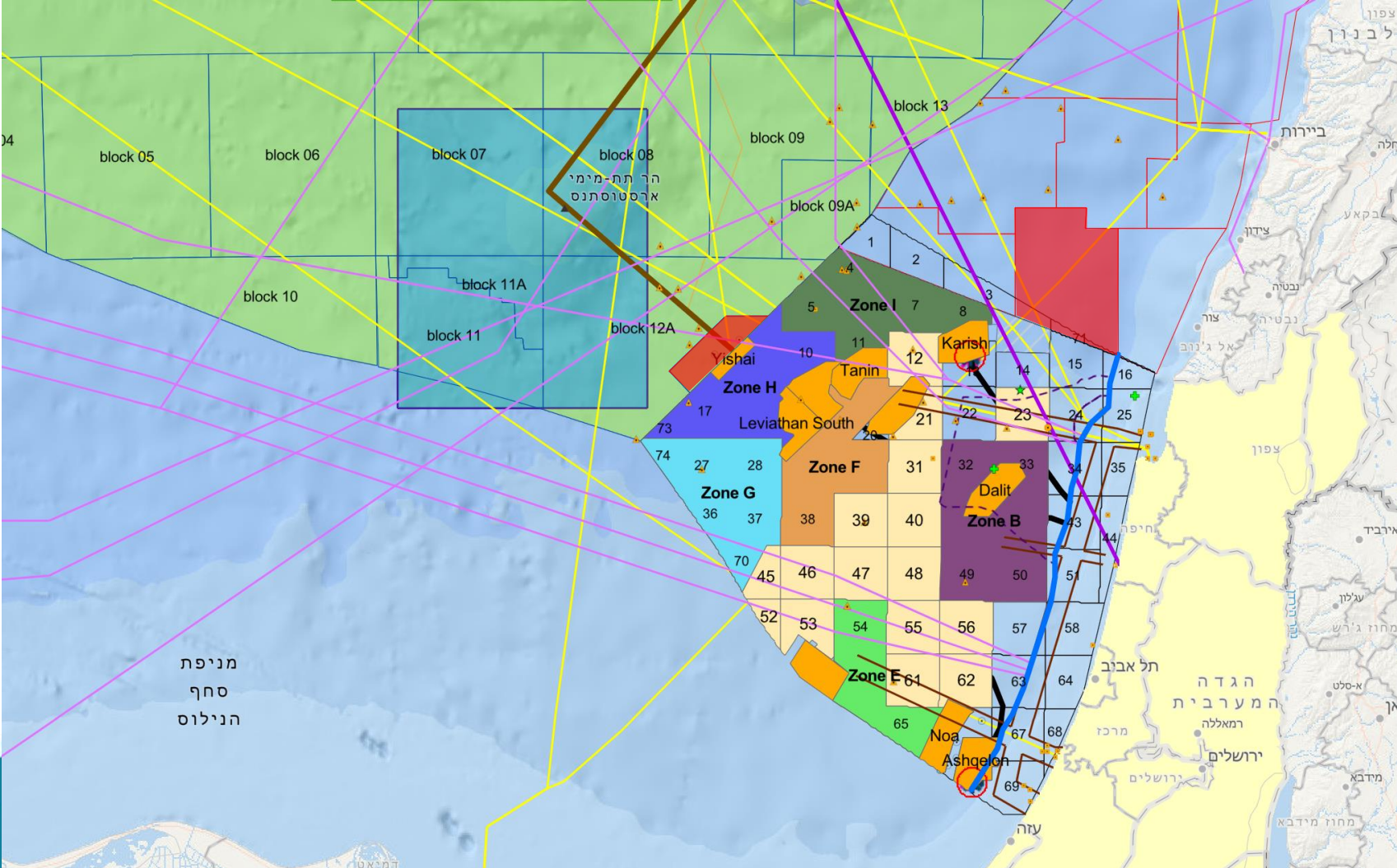
Spatial Analysis

- The habitat conservation goals
- The intended size of the reserves and the distances between them
- The existing and planned human activities in the EEZ

1. Formulating the Spatial Basis | Socio-economic activities in the EEZ



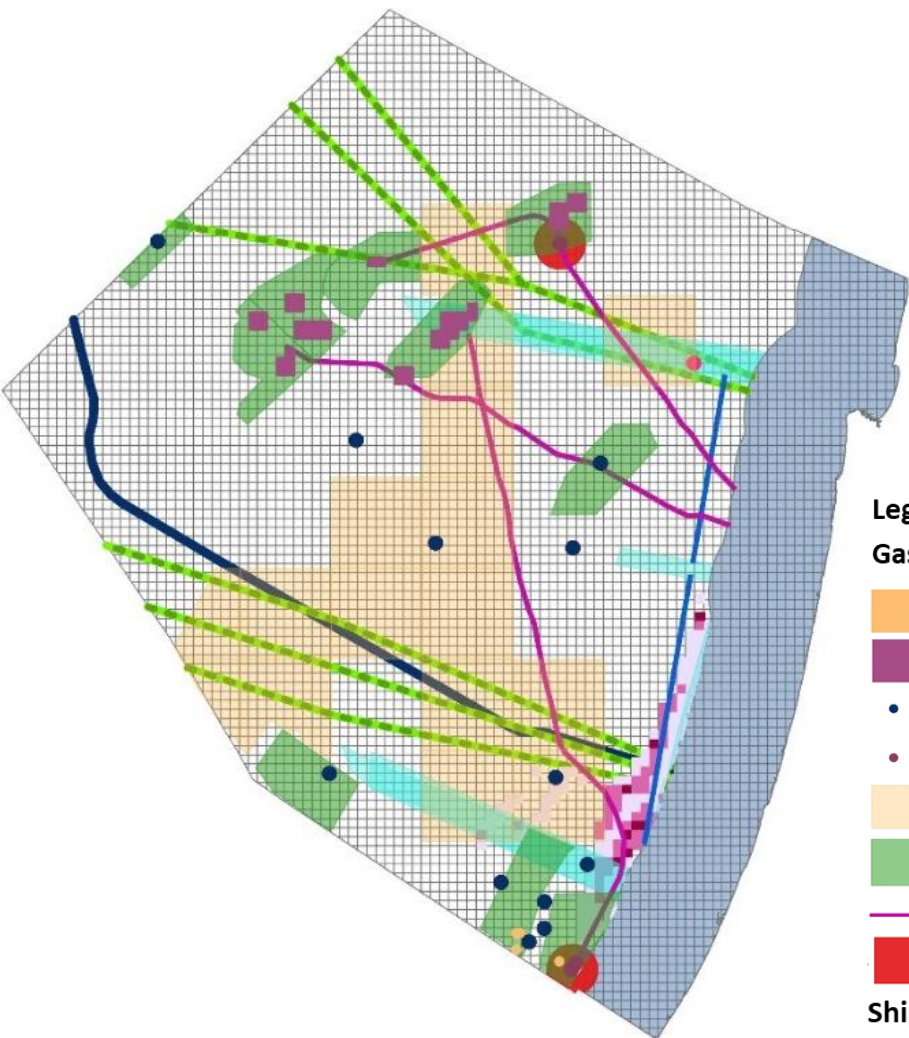
1. Formulating the Spatial Basis | Socioeconomic activities in the EEZ



Israeli EEZ MPAs masterplan

תכנית אב לשמורות טבע באזור הכלכלי הבלעדי של ישראל

1. Formulating the Spatial Basis | Marksan analysis



Legend

Gas exploration

- Non-active well systems
- Active well systems
- Past exploration drilling
- Treatment and production rigs
- Exploration licenses
- Lease rights
- Natural gas pipeline
- Restricted security zones

Shipping and trade

- Alternative shipping lanes
- Shipping lanes

Infrastructure

- Existing telecom cables
- Communication cables

Fisheries: trawl effort

- 0-20 hours per year
- 21-70 hours per year
- 71-123 hours per year

Pollution

- Waste dumping sites

Background maps

- 4x4 km grid
- Territorial waters

- Where ?
- Is it compatible with MPA ?
- What is the Economic importance ?
- Defining lock-in and lock-out areas

Sectors :

1. Natural Gas
2. Shipping
3. Communication
4. Fishing
5. Research
6. Infrastructure

1. Formulating the Spatial Basis | Marksan analysis

Sector	Existing activity	Future activity	Socioeconomic importance	Coincides with conservation goals	Assessed cost—composite value
Hydrocarbon production	Inactive wells		1	No	locked out
	Active wells		6	No	locked out
	Past experimental drillings		1	Yes	Low
	Rigs for treatment and production		6	No	locked out
	Exploration licenses		5	Yes	Medium
	Lease rights		6	Yes	High
	Natural gas pipeline		6	Yes	High
		Fourth bid for gas explorations—Phase 1	4	Yes	Future activity – not uploaded
		Fourth bid for gas explorations – Phase 2	3	Yes	Future activity – not uploaded
		Exploration Blocks	2	Yes	Future activity – not uploaded
	EastMed pipeline	6	Yes	Future activity – not uploaded	

Sectors :

- Natural Gas
- Shipping
- Communication
- Fishing
- Research
- Infrastructures

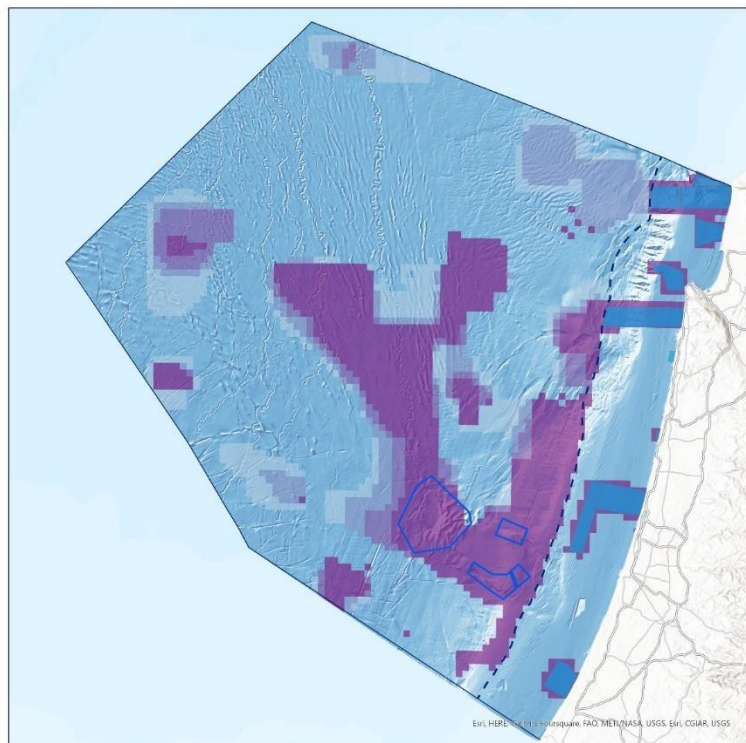


1. Formulating the Spatial Basis | Marksan analysis

Human activities

Conservation targets

Ecological layers



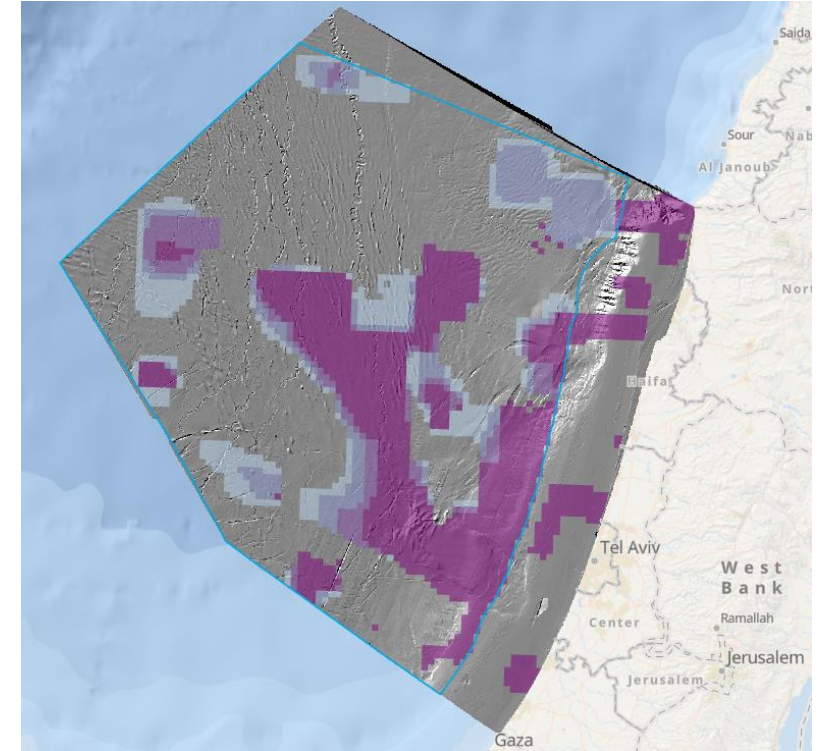
- Cells selected in 80-100% of runs
- Cells selected in 40-80% of runs
- Cells selected in 10-40% of runs

Over 800 runs | 8 scenarios

2. Zoning | Eco-spatial principles for planning MPAs

Implementing the ecological analysis in spatial planning:

1. A Priority for the high frequencies of marxan analysis
2. Compatibility with the conservation goals of each habitat
3. conservation priority analysis
4. Adaptation to the food web model and initial results of the connectivity model



2. Zoning | Eco-spatial principles for planning MPAs

Implementing the ecological analysis in spatial planning:

1. A Priority for the high frequencies of marxan analysis
2. Compatibility with the conservation targets of each habitat
3. conservation priority analysis
4. Adaptation to the food web model and initial results of the connectivity model

Conservation goals per ecological unit and habitat

Conservation Target	Conservation feature	Percentage of the EEZ area	Conservation goal (%)	Low-priority conservation goal (%)
Unique benthic habitats	Soft bottom sponge ground (prob. 0.7-1)	0.38	100	100
	Soft bottom sponge ground (prob. 0.3-0.6)	1.6	60	60
	Soft bottom sponge ground (prob.<0.3)	11.2	30	20
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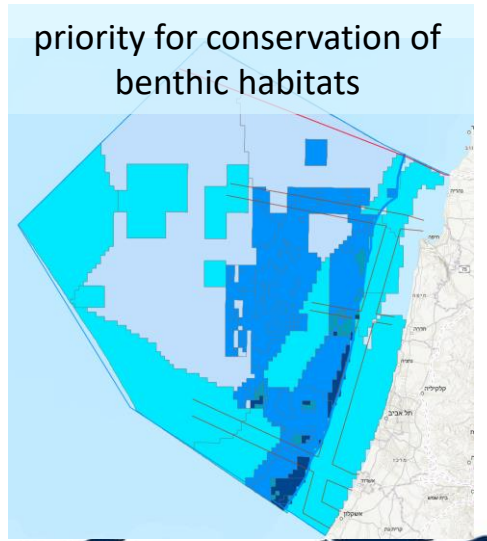
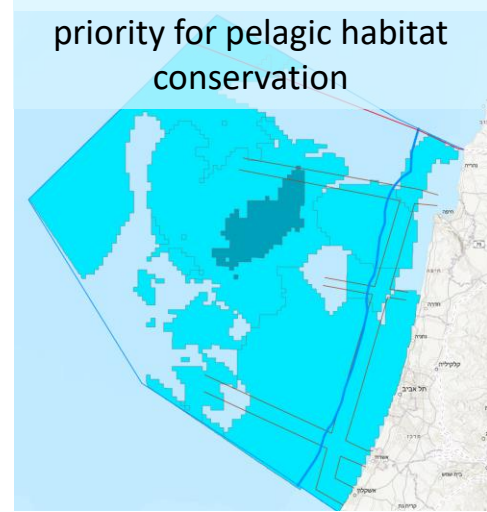
2. Zoning | Eco-spatial principles for planning MPAs

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Conservation targets

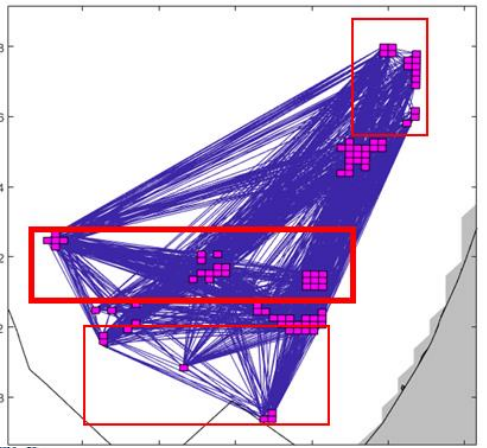
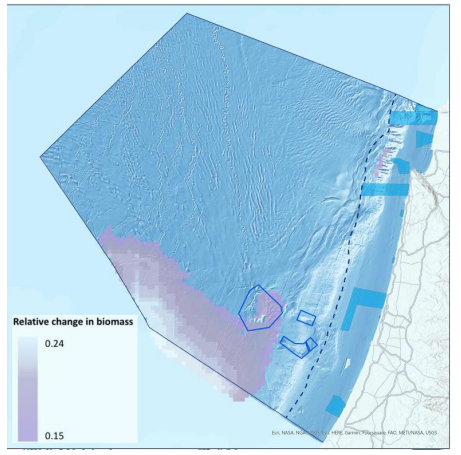
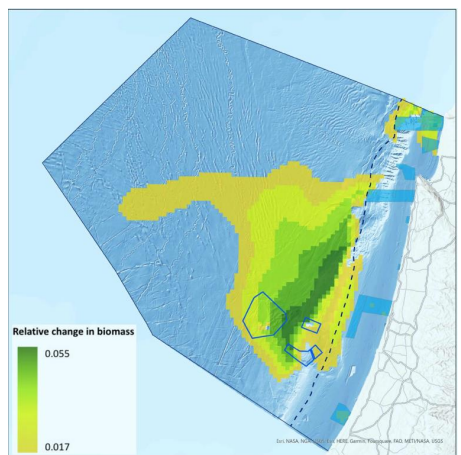
Feature type	Conservation feature	% EEZ	Total % of EEZ	Conservation target %	Lower target %
Representative benthic habitats	Bathyal plain - Deep-Sea Fan	7.0	7	30	20
	Foraminiferous assemblage	8.4	15.4	30	20
	Northern Slope - Base Slope	3.3	18.7	50	50
	Northern slope- Lower Slope	0.4	19.1	100	100
	Palmahim A	0.9	20	100	100
	Palmahim B	1.0	21	100	100
	Palmahim C	0.7	21.7	100	100
	Southern Slope	0.7	22.4	100	100
	Sponge ground - Deep Sea Fan	2.3	24.7	50	30
	Sponge ground - Sediment Waves	3.4	28.1	50	30
	Sponge ground- Deep plain	3.7	31.8	50	30
	Unknown - Base Slope	7.2	39	30	20
	Unknown - Lower Slope	4.3	43.3	50	30
	Unknown - Main Deep-Sea Fan	31	74.3	20	10
	Unknown - Sediment Waves	12.4	86.7	20	10
Unknown - Southern Deep-Sea Fan	9.24	96.1	30	20	



2. Zoning | Eco-spatial principles for planning MPAs

Implementing the ecological analysis in spatial planning:

- 1. A Priority for the high frequencies of marxan analysis
- 2. Compatibility with the conservation targets of each habitat
- 3. conservation priority analysis
- 4. Adaptation to the food web model and initial results of the connectivity model

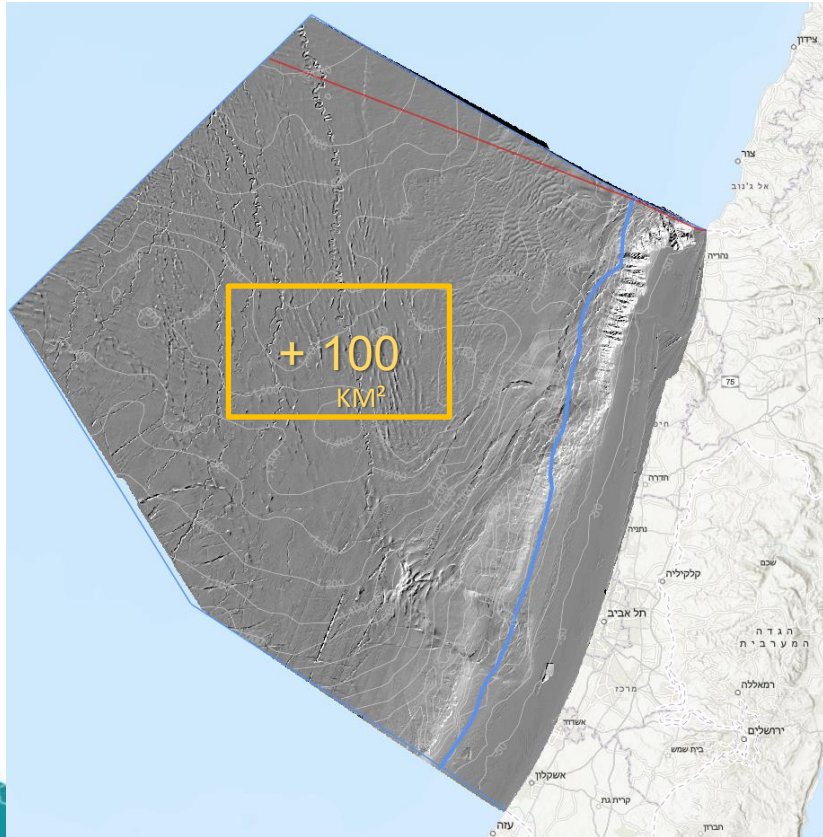


2. Zoning | Spatial zoning principles for MPAs



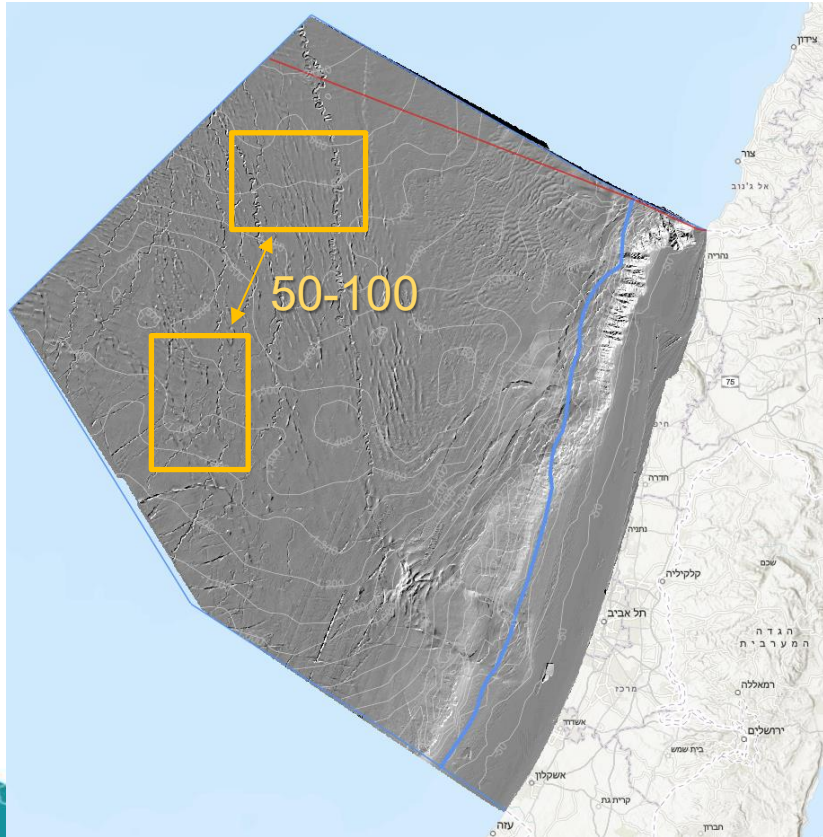
Nature Reserves extending over **30% of the EEZ**, compatible with the Convention targets of Biological Diversity and the Barcelona Convention, including adequate representation of habitats and maximum protection of rich and unique habitats

2. Zoning | Spatial zoning principles for MPAs



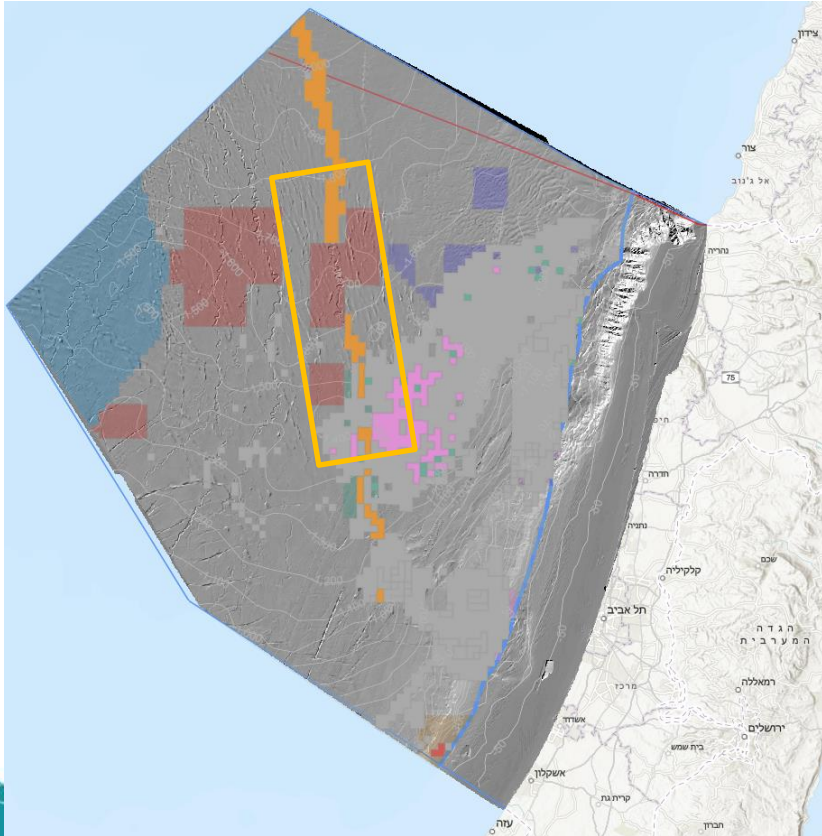
- Preference for highly functional marine reserves in a minimal continuous 100 Km².
- Three-dimensional protection

2. Zoning | Spatial zoning principles for MPAs



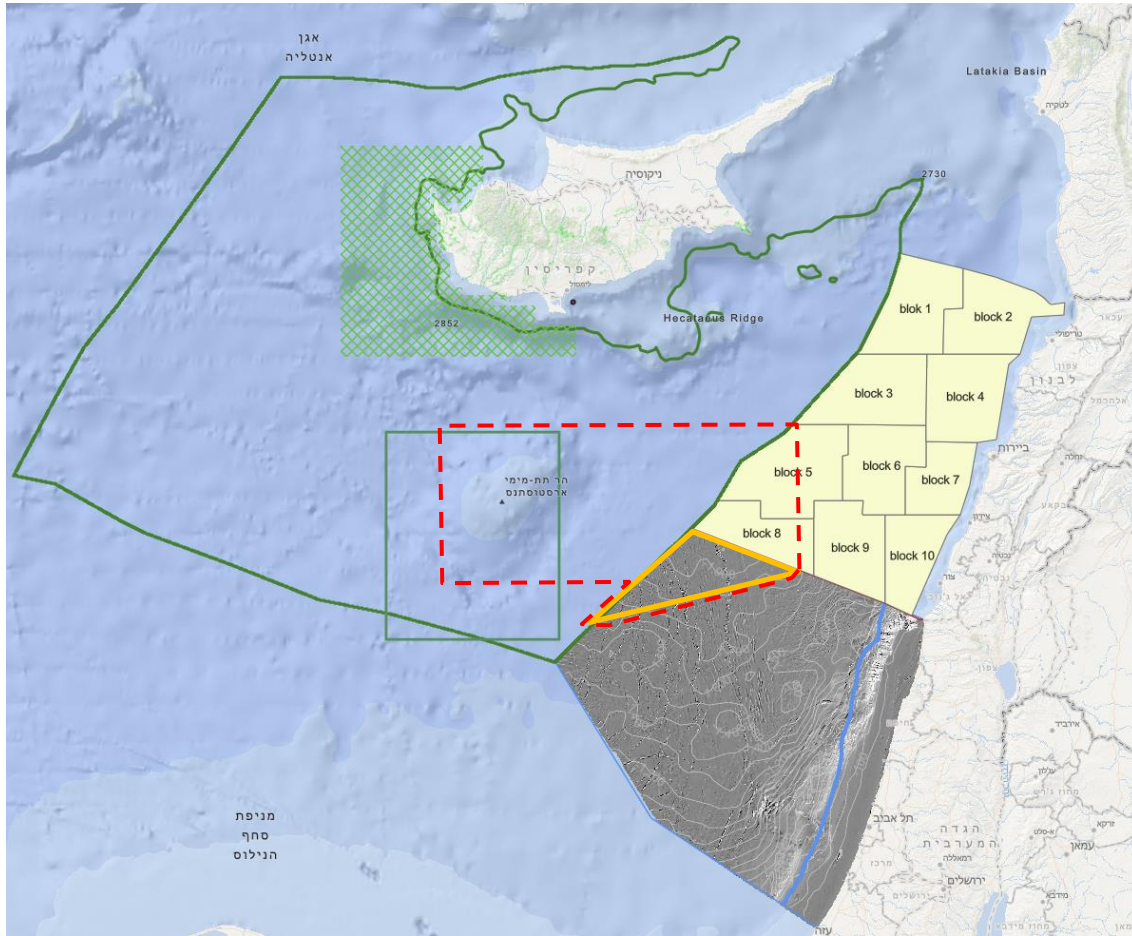
Connectivity — Preferably a maximum distance of 50-100 Km between reserves

2. Zoning | Spatial zoning principles for MPAs



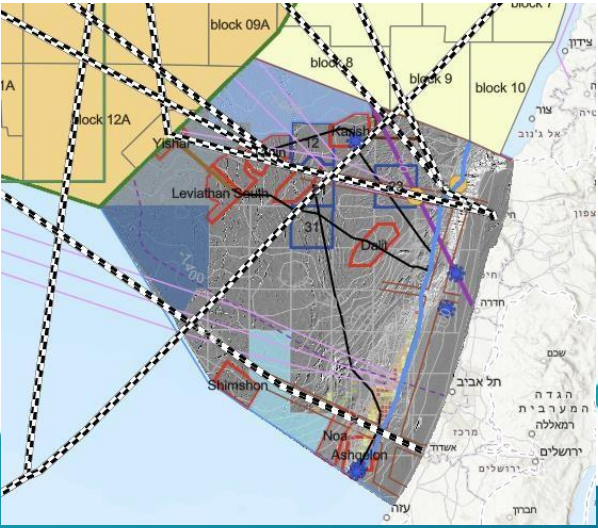
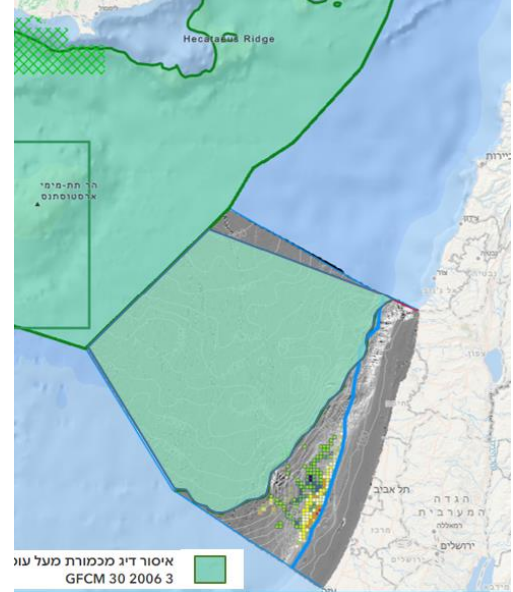
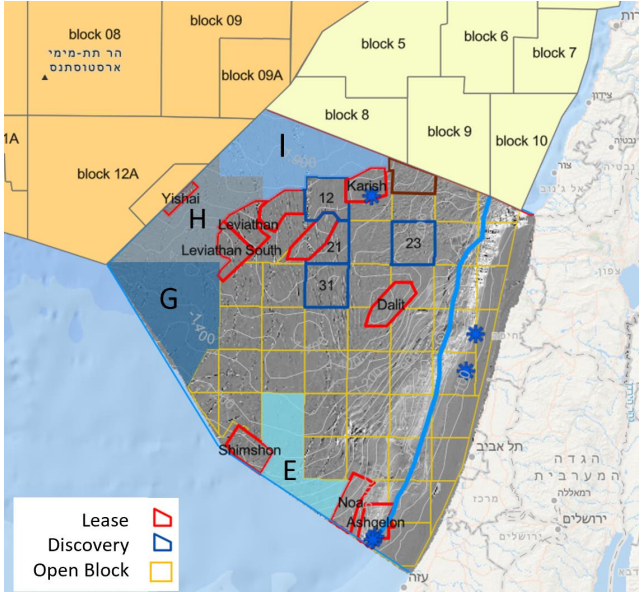
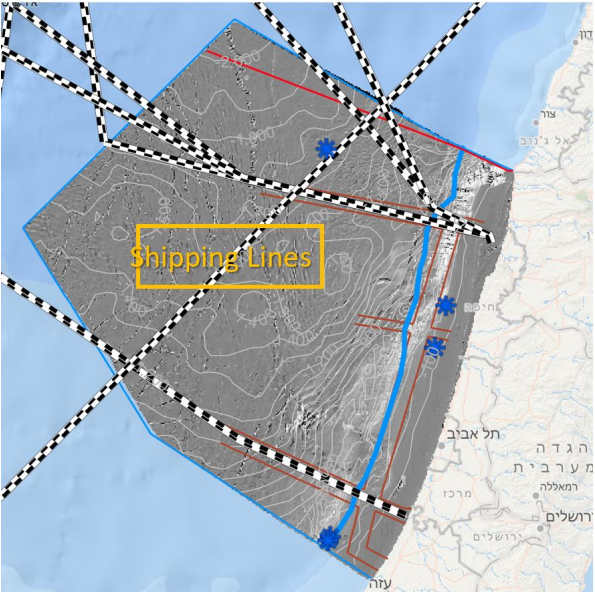
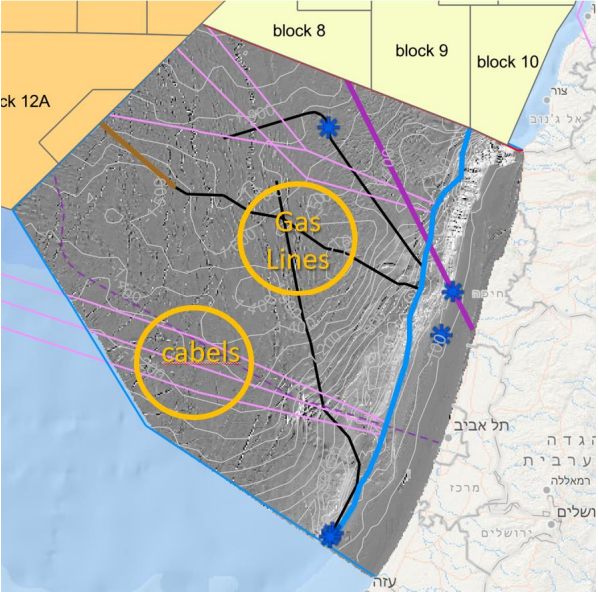
Adaptability to climate change – preference for nature reserves that encompass a **variety of depths and habitats**, should climate changes cause changes to species distribution

2. Zoning | Spatial zoning principles for MPAs



Preserve the potential for future **cross-border MPAs**

2. Zoning | Spatial zoning principles for MPAs

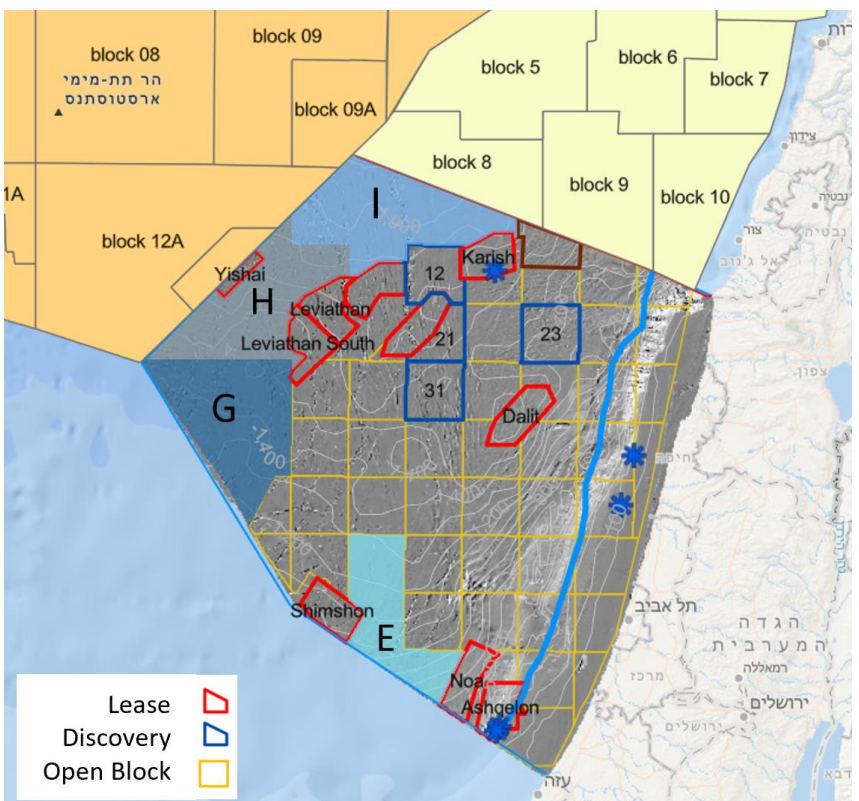


Minimizing conflicts with human activities and uses while preventing disruptive uses in MPAs



2. Zoning | Spatial zoning principles for MPAs

Minimizing conflicts with human activities and uses while preventing disruptive uses in MPAs | **Hydrocarbon Sector**



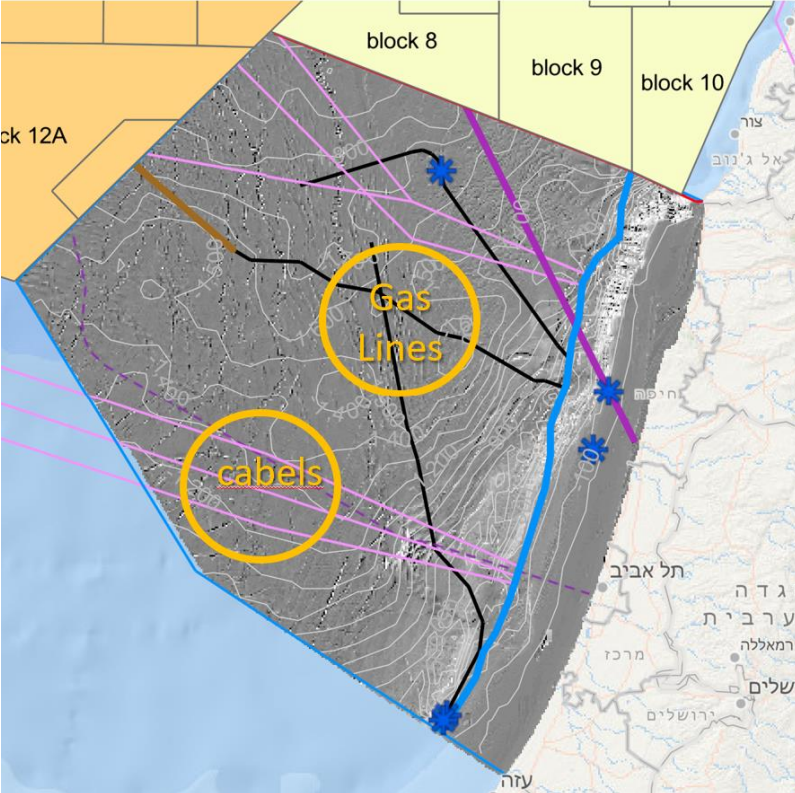
MPA's spatial overlap with natural gas exploration and production activity:

1. Fourth tender - priority for defining MPAs in alternative locations, which do not overlap with the fourth tender areas for natural gas exploration
2. Avoiding overlap with natural gas lease and production activity. It will be possible consider MPAs where production has been completed
3. Avoiding overlap with licenses with recent discoveries and are expected to start production



2. Zoning | Spatial zoning principles for MPAs

Minimizing conflicts with human activities and uses while preventing disruptive uses in MPAs | **Infrastructure Lines**



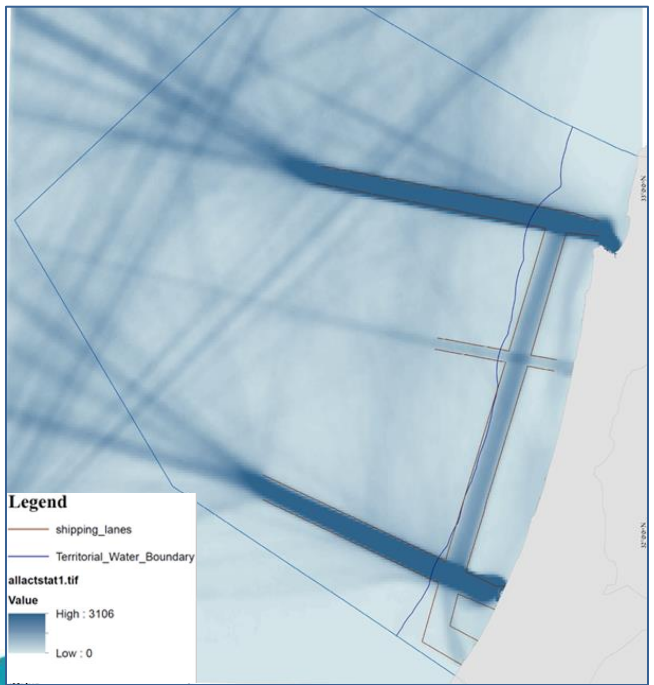
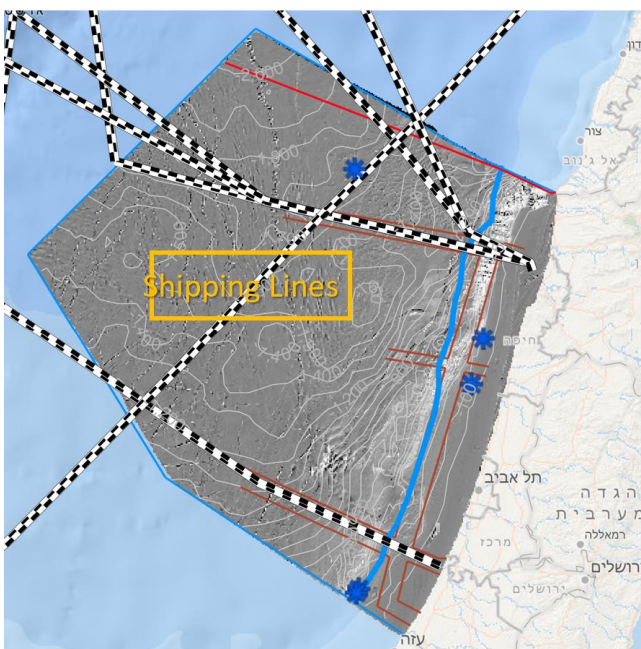
MPA's spatial overlap with Marine lines:

Spatial definition of MPAs that overlap with existing and future infrastructure lines is acceptable, but **it is preferable to avoid overlapping with gas lines** and their accompanying lines



2. Zoning | Spatial zoning principles for MPAs

Minimizing conflicts with human activities and uses while preventing disruptive uses in MPAs | **Shipping lines**



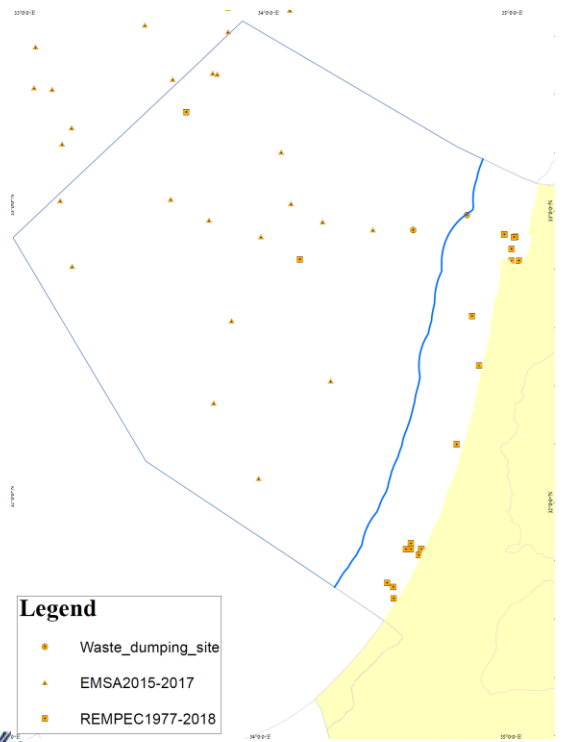
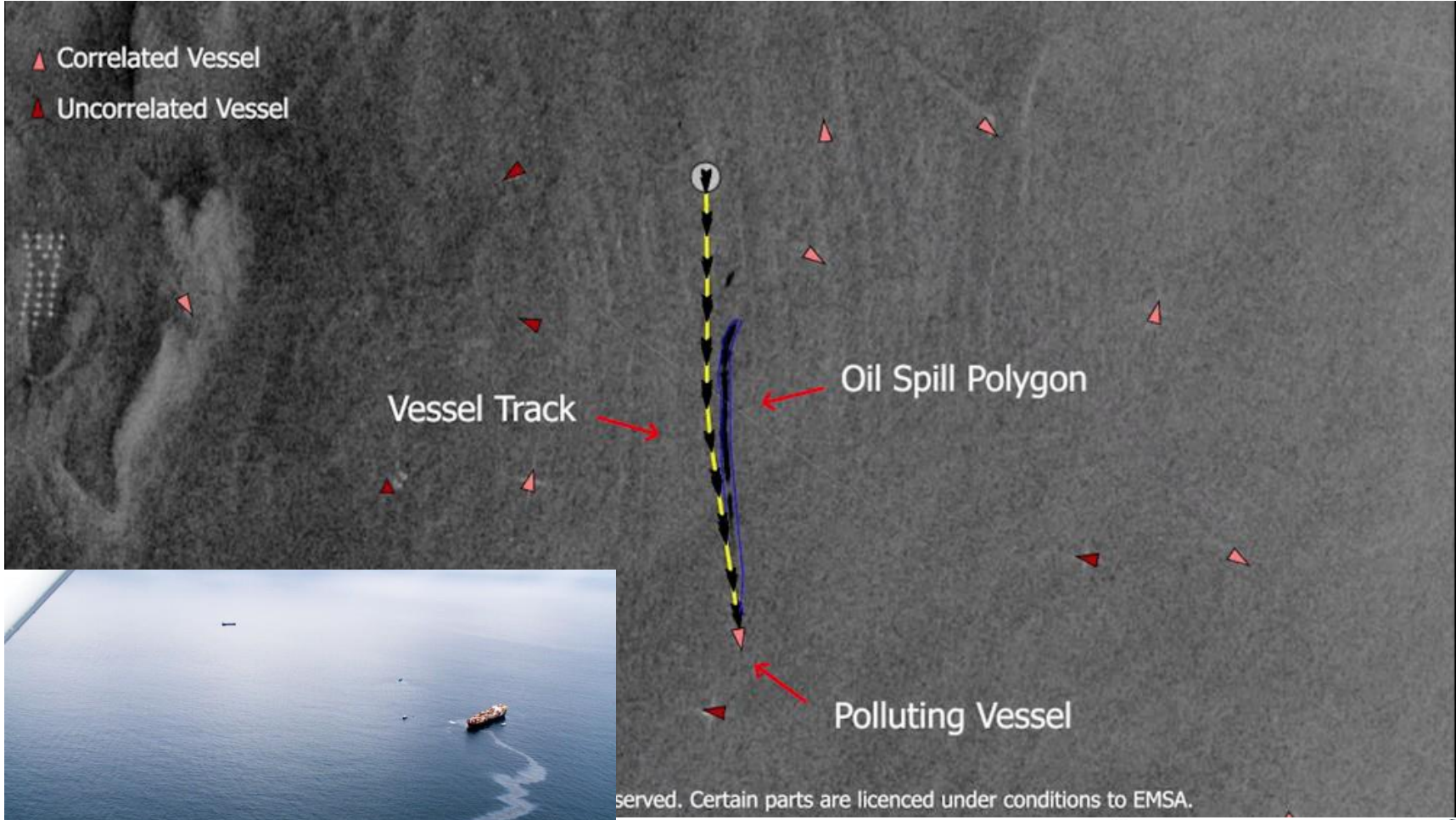
MPA's spatial overlap with Shipping lines:

Overlap with shipping lanes **should be avoided as much as possible**, although it is not prohibited.

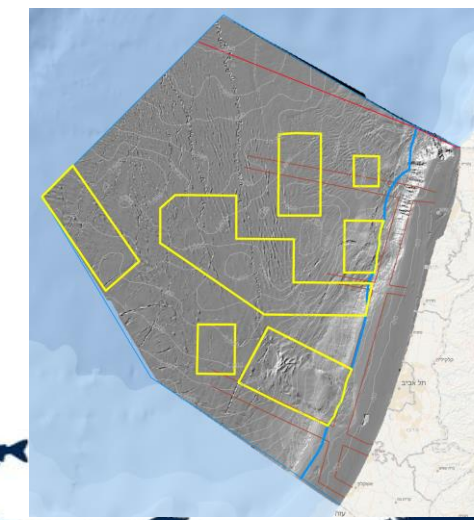
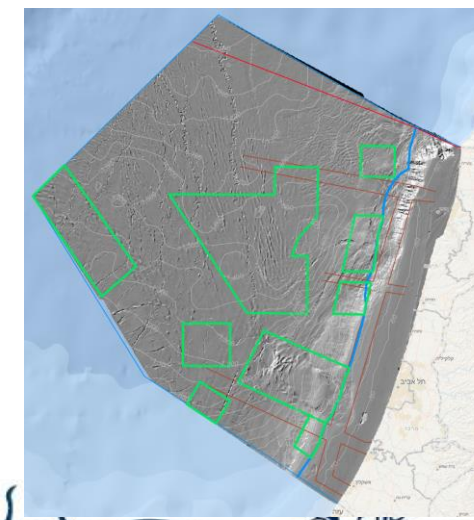
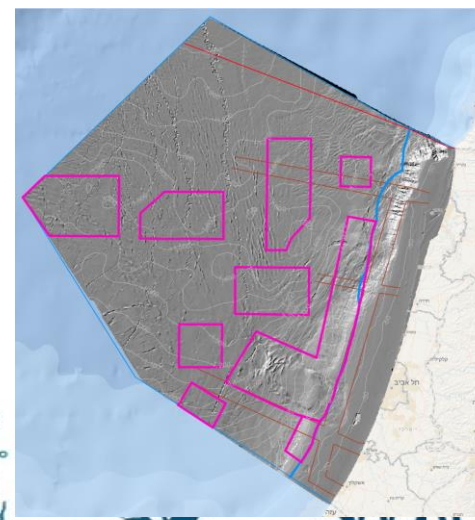
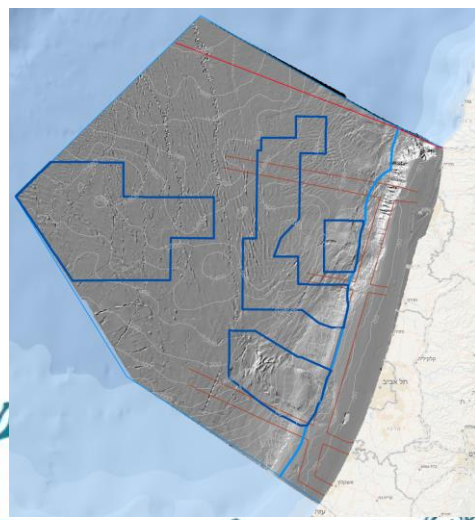
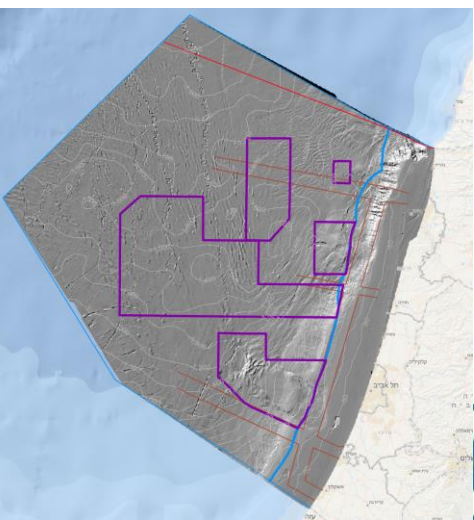
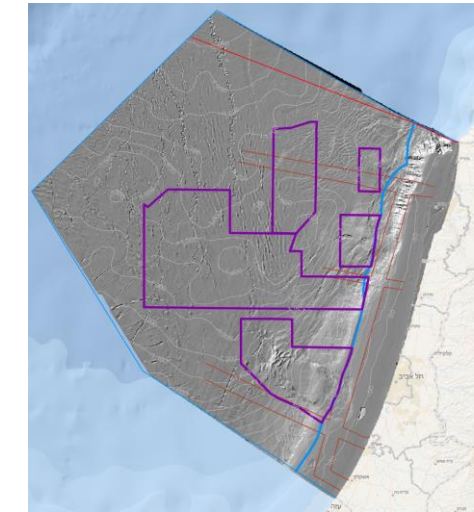
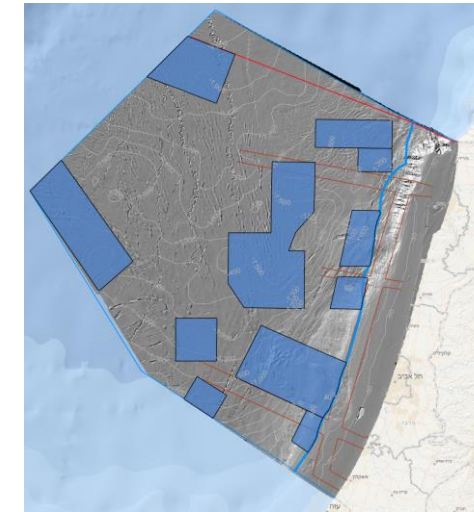
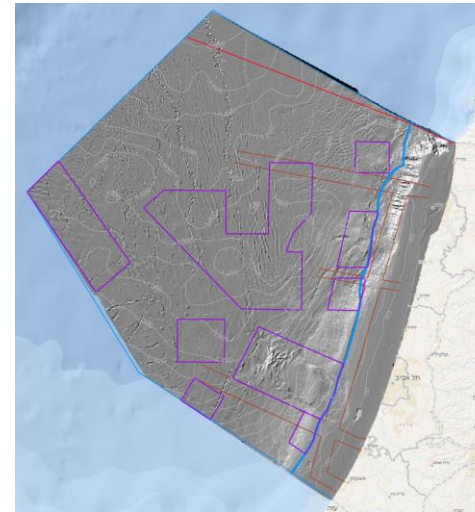
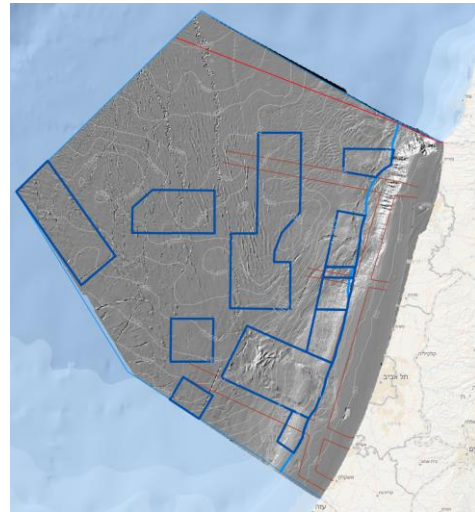
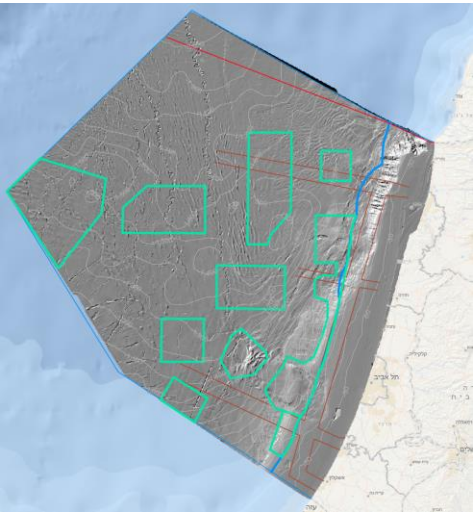


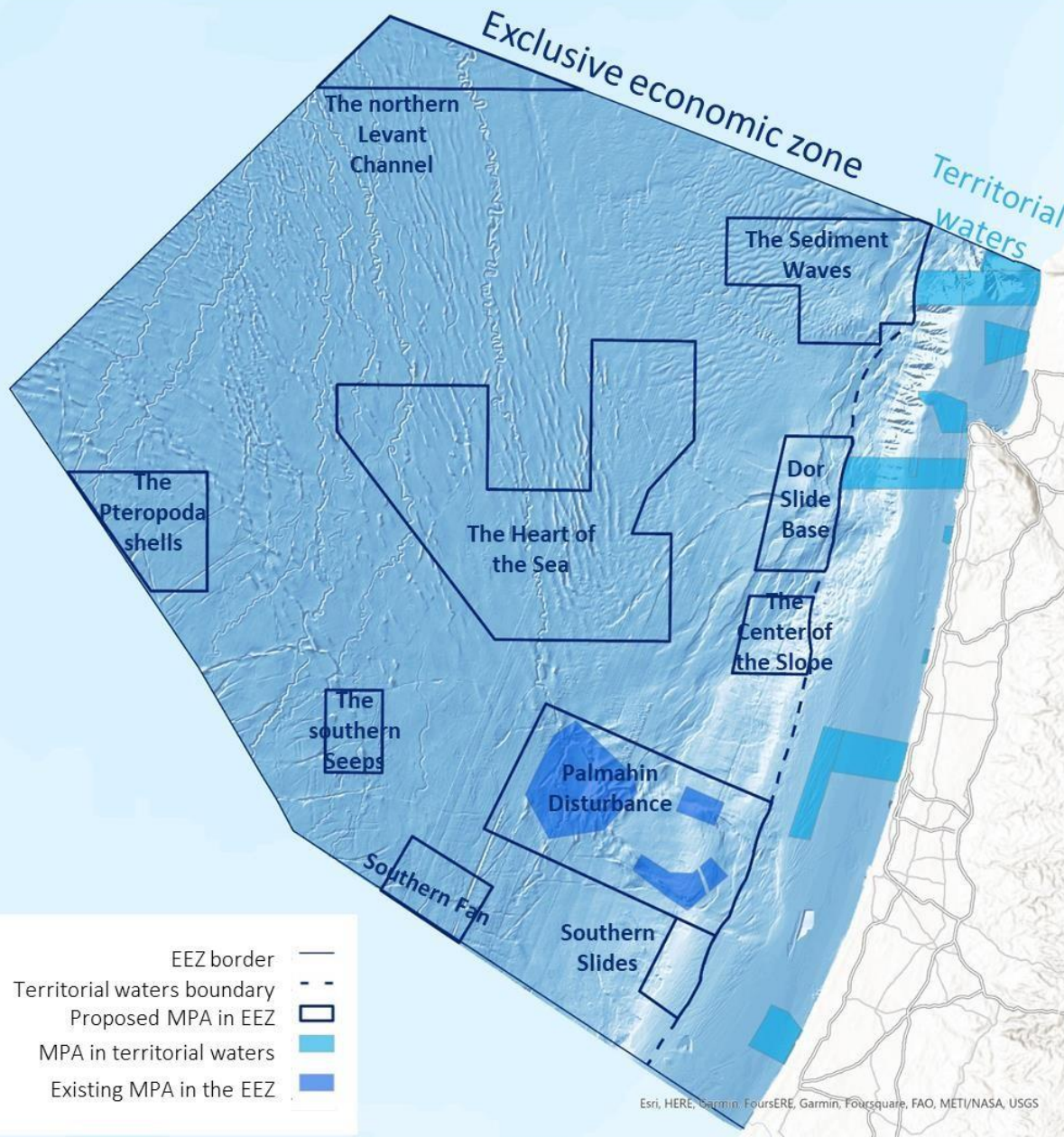
2. Zoning | Spatial zoning principles for MPAs

Minimizing conflicts with human activities | **Shipping lines**



2. Zoning | Planning Alternatives





A Master Plan
for Marine Nature Reserves in Israel's Exclusive Economic Zone
 in the Mediterranean Sea

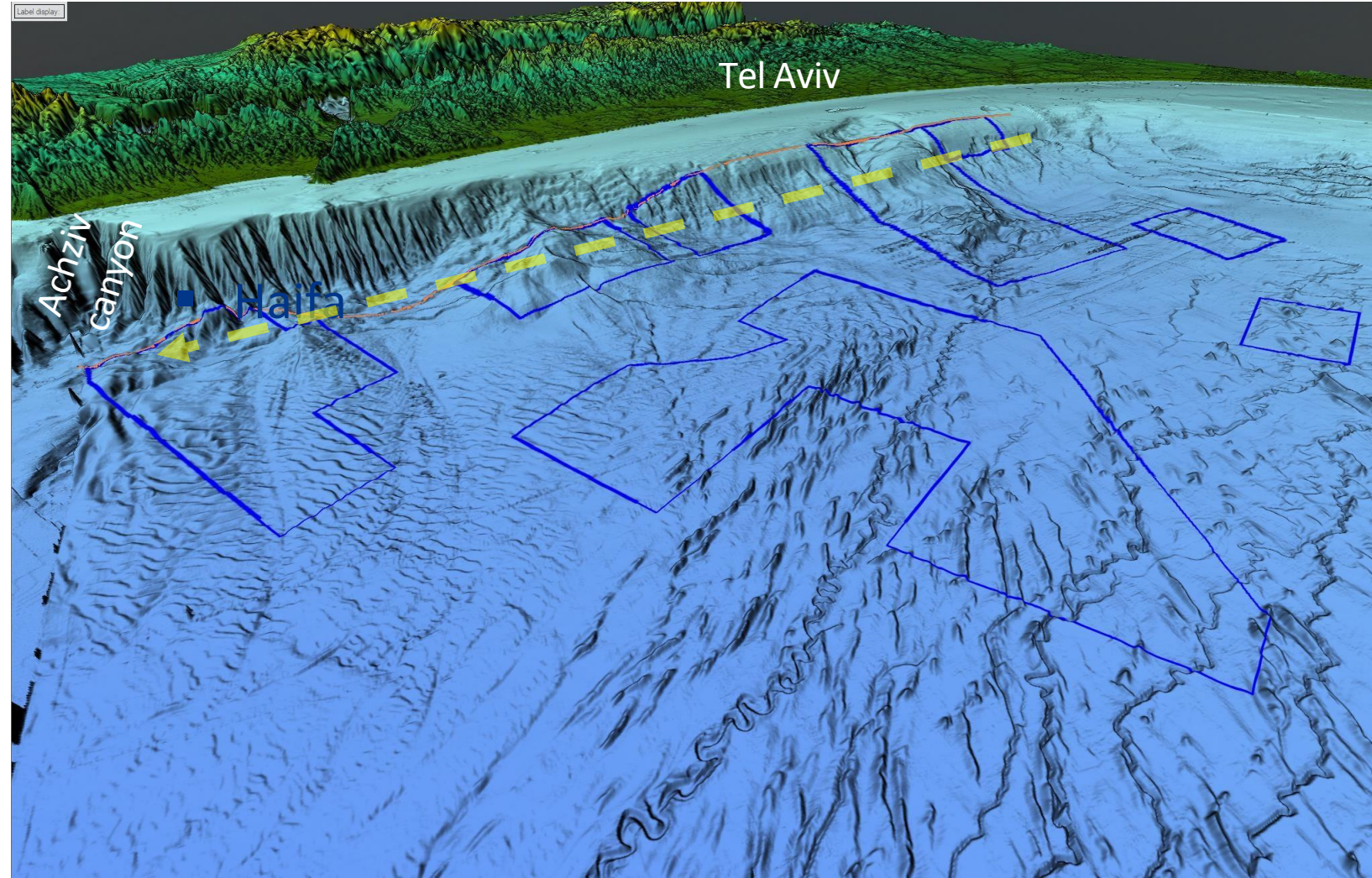
May 2023



3. Review of the Spatial Plan

5 MPAs along the continental slope

- Unique benthic habitats
- High species diversity and biomass in water column
- Nutrients transit to deep sea
- Diverse depths and habitats in relatively narrow area
- Climatic refugia

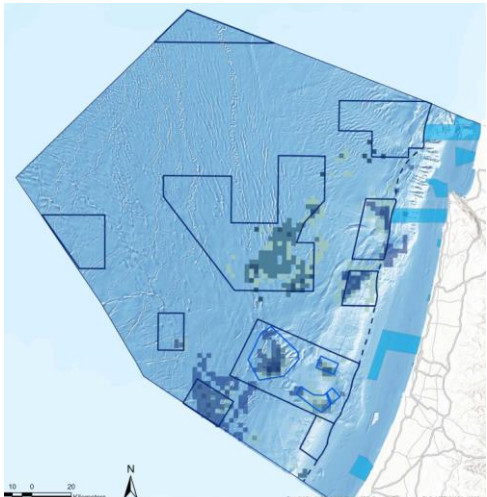
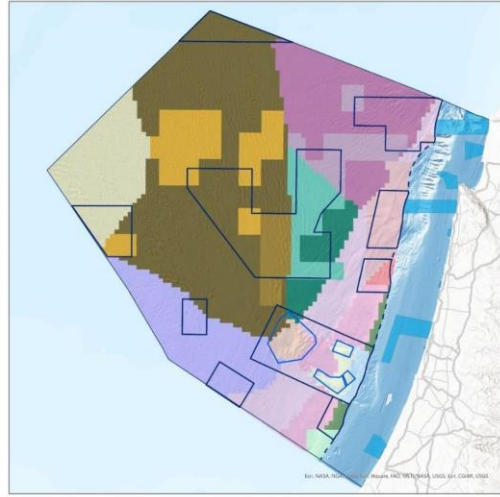


3. Review of the Spatial Plan | Meeting spatial and ecological targets

Protecting benthic habitats

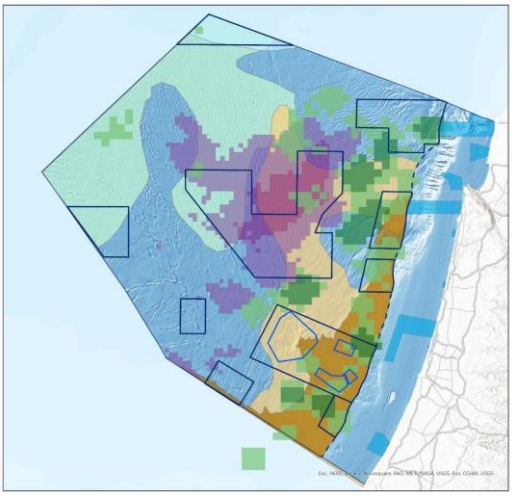
89% conservation target met for ecological units

80% protection over unique habitats

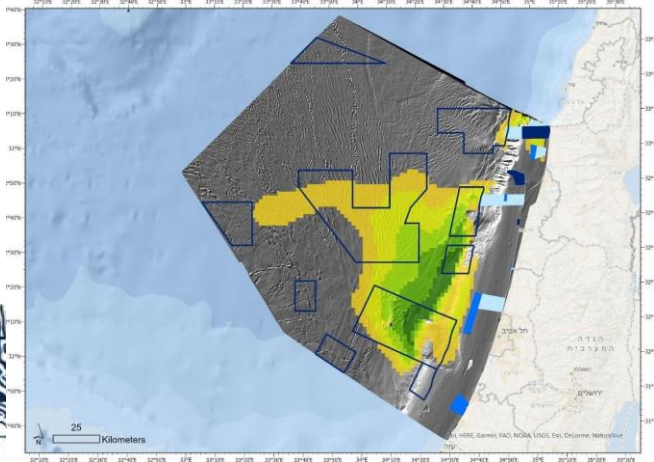
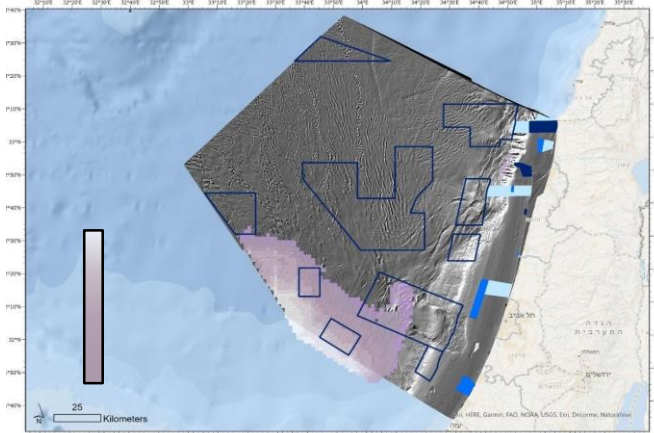


Protecting pelagic habitats

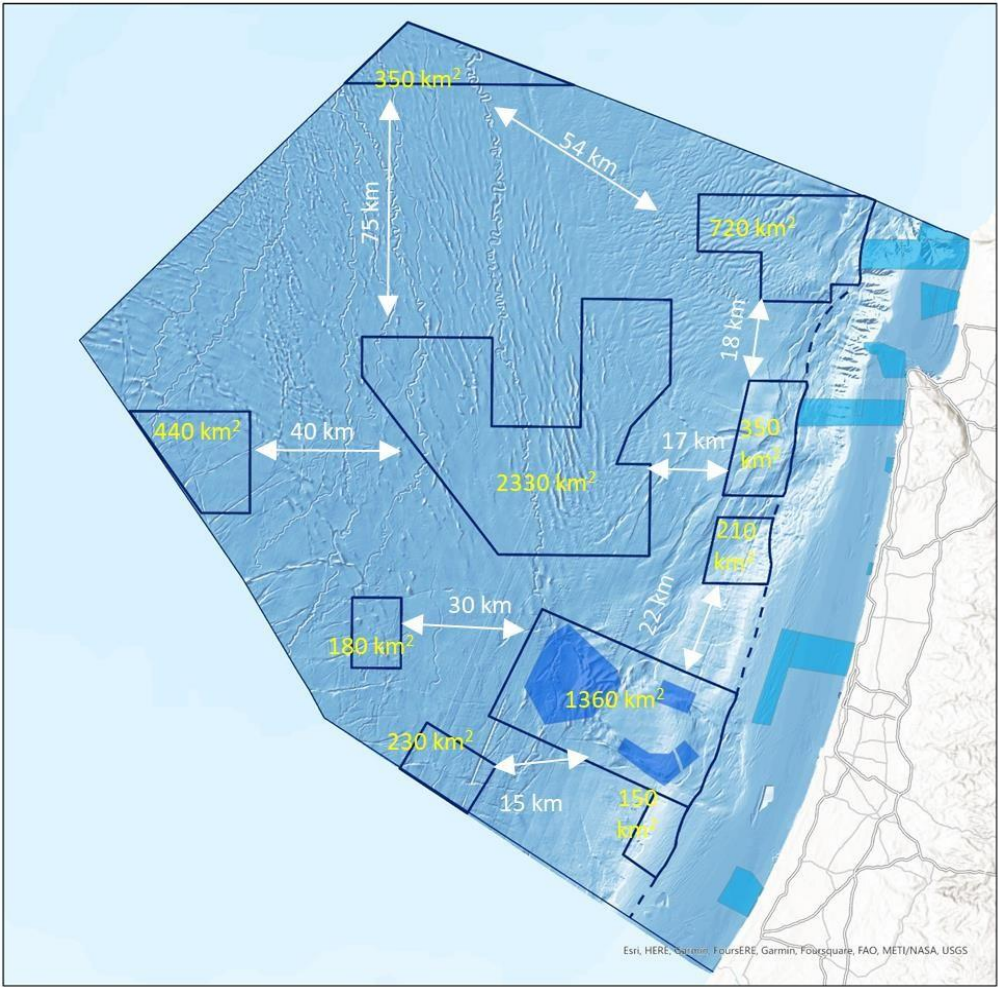
Protecting 50% of cyclone eddies-frequent areas
Meeting 100% of pelagic units conservation targets



Protecting potential climatic refugia



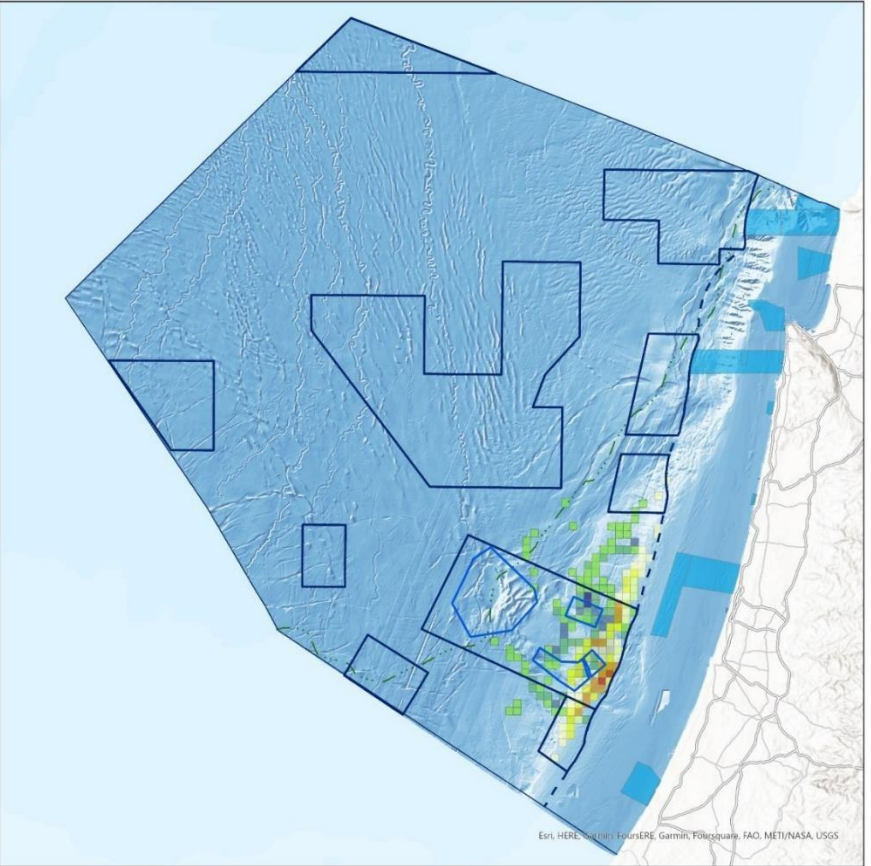
3. Review of the Spatial Plan | Meeting spatial and ecological targets



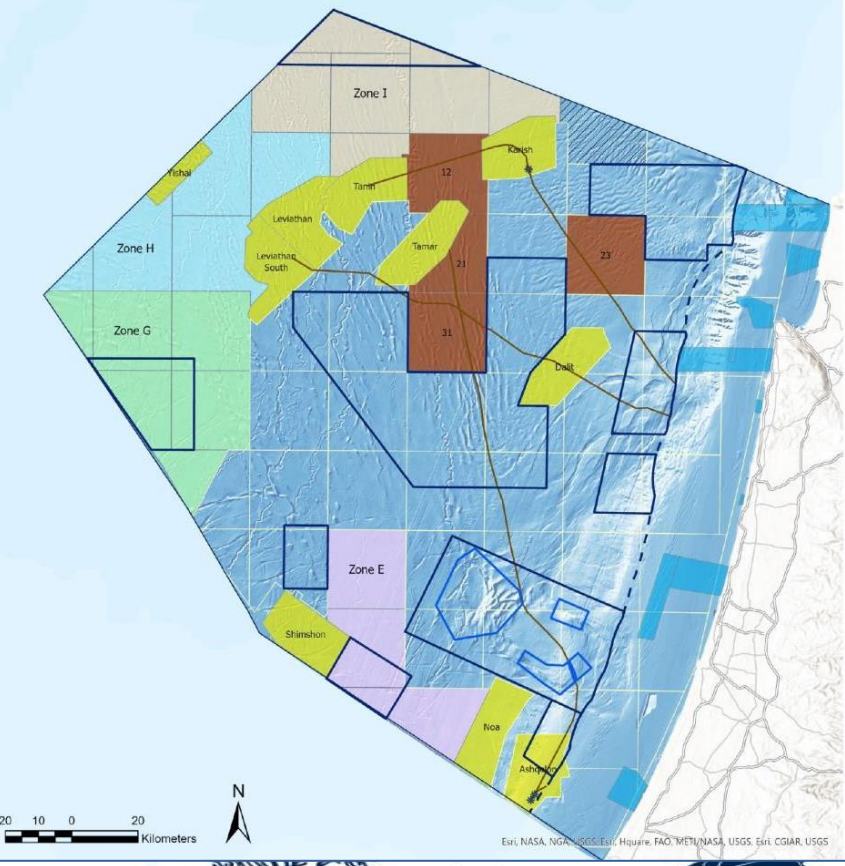
The sizes of the proposed MPAs and the distances between them

3. Review of the Spatial Plan | Minimizing conflicts with human activities

Fishing



Hydrocarbon sector

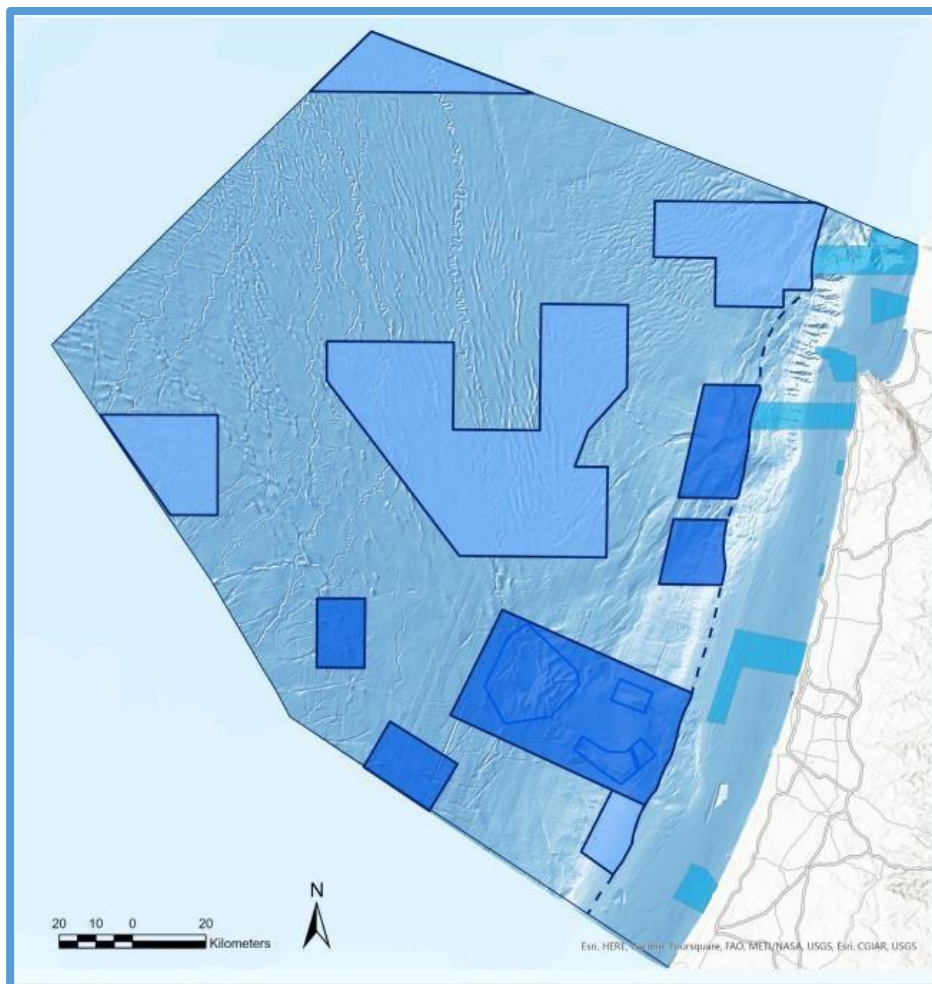


Priorities

Direct research efforts

First priority

Second priority



What's next ?

- Promoting legislation
- Promoting MPA for the EEZ
- Capacity building for management
- Promoting spatial protection for specific habitats
- Promoting designated surveys

By 2030.....

