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Offshore Oil and Gas Exploration and Production Strategic Environmental Assessment (SEA)



Prepared for:



**Ministry of National Infrastructure,
Energy and Water Resources**
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Natural Resources Administration

Summary
After Public Remarks

This Strategic Environmental Assessment (SEA) was prepared by a Geo-prospect Ltd. With collaboration with Israel Oceanographic and Limnologic Research (IOLR).

The planning team of Geo-prospect Ltd. prepared and coordinated the preparation of the SEA methodology, international review, public participation, economic considerations regarding development of offshore oil and gas sources, in case of an accidental oil spill event, description of current regulation, policy alternatives and recommendations. Some environmental issues also written by the planning team of Geo-prospect Ltd.

The team of IOLR prepared and coordinated the ecological aspects of the SEA - collecting and analyzing available environmental data, development of a methodology for habitats mapping, environmental vulnerability analysis and mapping, evaluation of a GIS and recommendations for environment and ecology.

The planning team of Geo-prospect Ltd. coordinated the preparation of the SEA.



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Abstract

The Petroleum Unit (PU) headed by the Petroleum Commissioner (PC) at the Natural Resources Administration (NRA) of the Ministry of National Infrastructure, Energy and Water Resources, is the regulator for onshore and offshore Oil and Gas exploration and production. Following recent offshore gas discoveries, Israel has become capable of providing a significant part of its domestic energy demand. These discoveries are also prompting further oil and gas exploration offshore Israel.

In 2012 the Minister of Energy adopted the recommendation of the Petroleum Council to stop granting new exploration licenses in the offshore area of Israel. This temporary hold-up was intended to allow assessing the new gas finds, to update the Ministry's gas policy and to improve its regulatory system and technical capabilities. As Part of this measure the NRA launched in 2014, a Strategic Environmental Assessment (SEA) for the E&P activity offshore. The SEA was designed to cover all the marine area of Israel in the Mediterranean Sea (i.e. territorial waters and exclusive economic zone), taking into consideration active licenses or leases at the time of the study; and as a standard recommended by the EC/42/2001 directive, to support sustainable resource development policies. Additionally, the SEA is intended to provide information and recommendations to improve decision making processes regarding resource development, taking into account a comprehensive view of the environment as well as economic and social aspects. The SEA preparation has been accompanied by a steering committee, comprise representatives of government ministries, public sector, NGO's, industry sector and other relevant stakeholders.

Following an open bid procedure Geo-prospect Ltd. was selected to prepare the SEA, through a multidisciplinary professional team, including international consultants. The Israel Oceanographic & Limnologic Research (IOLR) took a significant role in this project, collaborating with Geo-prospect Ltd; and conducted an extensive background survey of the offshore area, as a base study for the SEA. The consultant work has been

carried out under the guidance and instructions of the Ministry of National Infrastructure, Energy and Water Resources, the steering committee and a working committee.

The implementation of the SEA is a work in progress and frequent and regular updates are expected as a result of control and monitoring of environmental impacts, assessment of findings and the implementation of the recommendations and decision making processes.

According to an established methodology for preparation of SEA, such document addresses wide range of issues on the present state of activities and provides adequate recommendations.

The SEA is intended, to display an overall picture and to create the needed database for decision making by the PC; this is in contrast to more focused environmental assessment studies and surveys, which are conducted as part of the Ministry requirements, for specific projects at given locations.

Scope of Work

The guidelines for the performance of the SEA and the maritime area of study and its contents, have been defined by the Ministry of National Infrastructure, Energy and Water Resources, following consultation with various relevant stakeholders.

Accordingly, eight stages were defined:

1. Review of existing international SEA's for offshore Oil and Gas exploration and production.
2. Establishment of an on-line website for the SEA, real-time updating of progress, and approval the methodology of public involvement and transparency.
3. Collection and analysis of existing environmental data and information.
4. Economic evaluation of the Mediterranean "ecosystem services".
5. Defining Alternatives to address environmental concerns, which should be considered during decision making to insure sustainable development of offshore Oil and Gas resources.
6. Preparation of a draft document to be published for public comments.

7. Consulting and sharing information with the public, including an invitation for the public to provide comments to the draft document.
8. Publication of the Final SEA document.

International review

Due to the fact that a SEA was not previously conducted in Israel, an international review was required as a first and significant stage, taking advantage of the experience acquired in other similar projects. The review covered SEA's and similar studies in six different countries, as stated in the Work Document: UK, Norway, The Netherlands, Canada, USA and Australia.

These countries have been chosen due to their leading position in offshore oil and gas exploration and production, high assessments standards, and excellent case studies. In addition some of these countries possess characteristic similar to those of Israel, e.g. population size (The Netherlands, Norway). Notwithstanding that, the differences between the countries with regard to emphases given and attitude, allow insight into different approaches to analyzing environmental issues within the context of offshore oil and gas exploration and production.

The review presents the SEA's in the selected countries according to their similar characteristics; a comparison of the different SEA's is then presented by the following criteria: the goals of the document, the SEA's size, the topics, the initiator and leading organization, approval procedure, alternatives, extent of constraints imposed and time frame for preparation. The bibliography of the review includes EC directives, SEA's performed in the selected countries, statutory documents, legislation, UNESCO documents and governmental policy documents. The results were used by the consulting team and the supervising committee during the preparation of the SEA.

Main insights

The review has revealed that the SEA (or similar documents) in most of the reviewed countries, is an effective tool, and its recommendations are successfully implemented and influence the management of oil and gas resources. The SEA's structure and stages, as defined for Israel, match the EC directive as well as practices in different countries, regarding its extent, data gathering and analysis procedures, document publication and procedures regarding public involvement. It was found that defining

alternatives and examination of economic aspects of the “ecosystem services”, although not common, were taken into consideration in some few of the reviewed countries.

The review reveals that for an effective feasibility evaluation of the implementation of SEA's aims, establishment of quantitative indicators is recommended. Additionally, identifying data and knowledge gaps is part of any SEA process. For all reviewed case studies, despite the existing of data and knowledge gaps, it was recommended to continue the development of oil and gas resources, while in some countries it was recommended to carry out additional actions to decrease these gaps.

Public involvement

The public involvement should be an integral part of the overall planning process, independent of the planning process itself. Transparency and active updating the public by various means should be part of the SEA. This includes providing data and relevant material regarding the progress of the SEA, to both specific relevant stakeholders and to the public, and implementation their commentary within the SEA as required. The program for public involvement that was approved by the steering committee addresses the following: "interested parties", i.e. the general public, and "specific stakeholders", i.e. NGO's, professional organizations, institutions, industry, and other "specific interested stakeholders" with relevance to the issue.

During the mapping process, the public involvement was maintained according to the working program according to the SEA's various stages. Three meetings dealing with specific issues were carried out during the working period (February 2015, December 2015 and February 2016). On 29.6.16 the Sea was published for public remarks until 31.7.16. During that, time an additional meeting was cried out, whereby the SEA draft was presented to the public by the SEA team. The resulting feedback was collected in documents and addressed by the SEA team, while updating the document where necessary.

Environment

The major aim regarding the environment, is conservation of the biotic stability of all habitats within Israel territorial waters and EEZ, alongside with oil and gas exploration and production.

Accordingly, data on habitats has been gathered, offshore oil and gas exploration and production environmental impacts have been analyzed, and ecological vulnerability of the various habitats have been specified. Determining the ecological vulnerability of the habitats allowed definition of policy in order to achieve the defined goals.

Data gathering and habitat definition

At first, data has been gathered on the biodiversity of Israel territorial waters and the EEZ, as well as abiotic environmental data, to obtain, as much as possible, the current environmental conditions of this area.

This information will enable an educated characterization of the natural environment and its conditions, will contribute to assess environmental vulnerability, and will enable a comparison to future research and monitoring the oil and gas industry activities and whose goal is to examine the success of its environmental policies.

Data collection and presentation were carried out by IOLR and the Geological Survey of Israel (GSI), by means of GIS.

Two main habitat definition approaches were used by the IOLR and GSI team: the biotic approach, i.e. habitat definition according to its biodiversity, and the abiotic approach, i.e. habitat characterization according to its physical characteristics. The biotic approach was mainly implemented for soft benthic habitats. The abiotic approach was implemented for areas with no sufficient biotic data, i.e. mainly hard seabed habitats and pelagic habitats (of the water column). The two approaches have led to the definition of over 60 benthic habitats within Israel territorial waters and the EEZ; whereas the pelagal has been divided into five three dimensional and layered habitats.

Analysis of environmental impact related to offshore oil and gas exploration and production activities

Subsequently, the overall potential impacts of technical and engineering activities, the potential for accidents, environmental impact of installation activities, routine operation, and decommissioning of the various facilities were reviewed.

The environmental impact analysis has revealed the following points:

1. The major threat to marine fauna (mainly turtles and marine mammals) during the exploration stage derives from acoustic disturbances originating from seismic surveys (2D, 3D or 4D).
2. Physical activities, e.g. drilling of all kinds, pipeline installation, structure or vessel anchoring to sea bottom, piling of drilling cuttings, significant disturbance to benthic rock habitats and/or hard biogenic benthic habitats, might cause irreversible physical damage to unique biota and to biogenic origin seabed.
3. Impacts of treated produced water discharge (according to the Ministry of Environment Protection Standards) to the open sea are expected to be limited to a range of few hundred meters from the source.
4. Oil and gas industry activities in a marine environment can potentially lead to transferring of invasive species.
5. Major accidental oil spills are considered one of the main threats involving the oil and gas industry, possibly leading to large-scale injury to a wide range of biota.
6. A potential combination of a number of the above factors at a given site should be taken into consideration prior to any decision making regarding any action.

Habitat Vulnerability to effects of the various activities

At the third stage, different vulnerability levels were defined for the various habitats. This addresses certain given habitats, relatively homogenous concerning biotic and morphological characteristics; the basic assumption is that a uniform environmental policy can be applied to the given habitat.

The habitat vulnerability level is dependent on the environmental disturbance, and there is no general vulnerability level for a given habitat. Therefore, four disturbance categories were defined as typical to oil and gas industry:

1. Physical disturbances, i.e. removal and covering of sea floor, soft sediment and rocky or hard seabed.
2. Noise pollution due to seismic activity, and operations related to construction of marine facilities.
3. Light pollution due to lighting from temporary or permanent marine facilities.
4. Chemical effects of materials used at various stages of oil and gas industry activities.

Habitat vulnerability indexes were determined for each of the four disturbance categories, and four vulnerability levels were accordingly defined: (1) – low vulnerability; (2) moderate vulnerability; (3) high vulnerability; (4) very high vulnerability (unique species). The graphic display of the vulnerability levels weights the highest level defined for each habitat, out of all appointed criteria.

Information gaps

Information gaps regarding the biota, e.g. incomplete knowledge of the habitat biodiversity, and/or partial data on species interactions, both within the habitat and between different habitats, hinder prediction capacities of habitat renewal potential, and require stricter safety margins for anthropogenic activities. These information gaps do not actually influence the vulnerability *per se*, however they do reduce our ability to determine it. Following extended discussions on this issue, it was decided not to include the information gap into the vulnerability index, but to display it alongside the sensitivity level. According to the acquired insights, information gaps were specified, as well as ways to overcome them, and are specified in the SEA's recommendations.

Economic considerations regarding development of offshore oil and gas sources, in case of an accidental oil spill event

A comprehensive database covering a wide range of interconnected issues, is required to evaluate and to analyses the economic implications of offshore oil and gas drilling

and production. That includes: description of all operations involved in the exploration and production processes, a review of the main activities along the Mediterranean sea and along the coast of Israel, both offshore and onshore, analysis of potential damage to the marine and littoral environment as a result of the above activities, a description of the various potential scenarios resulting from an accidental oil spill reaching the Mediterranean littoral area, and analysis of the environmental impact resulting from exploration and production activities.

Marine uses affected by oil and gas operations

These marine uses include marine facilities and marine infrastructure: ports, marinas, power stations and cooling water pools, desalinization facilities, subsea communication cables, aquaculture, fishing, Marine transportation, security issues (facilities and areas), tourism and leisure activities, marine sports, national parks and nature reserves, archaeological and heritage sites.

Analysis of potential impact affecting the various marine uses, addresses damages resulting from the worst-case-scenario, i.e. accident or malfunction, which are often occurrences beyond control. The extent of potential impact was estimated for each of the marine uses; in this context, a distinction was made between marine uses that would be paralyzed, and those requiring repair and rehabilitation. As to military security operations to be affected by the above scenario, a serious impact can be assumed, however not leading to a total ceasing of operations.

Risks

The potential risks resulting from oil and gas operations, and their implications (rate of advance, quantity of spilled material etc.), were evaluated according to the worst-case-scenario, i.e. an oil spill reaching the Mediterranean shore, for risk analysis and establishment of a methods dealing with possible damage to various marine uses and to the ecological system. Extreme scenarios were tested by means of three test cases regarding three approved case studies within the Israel territorial waters and EEZ.

An offshore oil spill event (i.e. the worst-case-scenario) may occur as a result of potential risks present during ongoing drilling operations, and can be further augmented by chemical spill, and condensate and gas leakage.

Processes likely to occur as a result of spill events were described for a risk analysis; this solely included accident or malfunction events, i.e. worst-case-scenarios, whose outcome included as well effects of routine operation malfunctions. The resulting sea pollution can be divided into open sea damage and damage to the sea shore.

Oil spill treatment

As in other countries, a National Oil Spill Contingency Plan -"National Plan for Prevention of Oil Spills at Sea - NPPOSS" has already set in Israel, whereby methods of dealing with such events are specified. The overall responsibility for that plan is under the "Marine Environment Protection Division" at the Ministry of Environmental Protection, as well as relevant local authorities having local oil spill contingency plan and rehabilitation plan for affected areas. At the same time, similar plans are compulsory for bodies with a potential for such spills. The methods for dealing with oil spills at sea include preliminary planning, early prevention of such events, and preparation of contingency plans to handle with the event in case it occurs.

A quantitative evaluation of various contamination sources

The risk analysis for the quantitative evaluation of a potential spill event based on three different well locations, for which models were run, in consultation with the Ministry of Environmental Protection. These well locations address three different scenarios, regarding distance from shore and oil and condensate amounts released to the sea. These scenarios are presented below:

- *Yam 3* - oil exploration well (by "*Shemen*"), at 15 km distance from shore, with an assumed spill of 800 oil barrels/day;
- *Gabriela* - oil exploration well (by "*Adira*"), at 18 km from shore, with an assumed spill of 2,000 oil barrels/day;
- *Tamar* - gas production wells (by "*Noble Energy Mediterranean Ltd.*"), at 90km from shore, with an assumed spill of 714 condensate barrels/day.

The three scenarios that were analyzed describe three potential cases of accidents during drilling at sea, at their worst-case-scenarios; severe basic assumptions were laid at the base of each scenario, e.g.: oil spill time scale – one month, continuously; oil spill timing – winter time, at dates specified by the Ministry of Environmental Protection, etc. Additionally, it was assumed that no damage mitigation actions were

performed (it is normally assumed that an efficient treatment of a marine oil spill may reduce the spill volume by ca 10-15%), and there is no evaporation, i.e. the whole original spill volume remains within the marine environment.

The scenarios did not include statistical calculations, assuming instead that the event had already occurred.

The scenarios were analyzed by means of a MED-SLIK model, performing a state vs. time integration, and addressing oil spill extent and direction, according to known factors such as sea currents and wind directions.

Following are the model run results:

Yam 3 ("Shemen"): Only one run out of three pointed at the oil spill reaching the Israeli shore (between the city of Netanya to north of the town of Atlit), with values of 19-55m³/km.

Gabriela ("Adira"): Three runs out of four that were performed, pointed out at the oil spill reaching the Israeli shore; one of them yielded very low values.

Tamar ("Noble Energy Mediterranean Ltd."): the analyses were performed by two different studies:

1. Report performed by "Noble Energy Mediterranean Ltd.", as part of an environmental impact document for a drilling permit for "Tamar" field. The study pointed to high values (i.e. ca 80m³/km).
2. Paper by Goldman *et al* (2014) with the title: *Oil spill contamination probability in the southeastern Levantine basin*. The paper pointed to no oil reaching the Israeli shore.

Conclusions and Recommendations

- a. Not every oil or condensate spill will reach the shore.
- b. Oil spills reaching the shore within a few days would allow the time for needed perpetration to contain the spill and to mitigate damage, according to NPPOSS instructions.
- c. Information gaps should be improved regarding two main issues:
 - Generating a database for updated risk surveys of potential spills, which will concentrate background information for the whole area.

- Updating of data, procedures and standards – updating the oil or condensate amounts to be dealt with, for proper preparation for a spill event, improve economic evaluations, adoptions of procedures and standards for hazardous materials treatment and for safety.

Economic considerations for development of offshore oil sources

The SEA's economic analysis attempts to evaluate, by various methods, the cost vs. profit factor of offshore oil and gas exploration, development and production operations, in the context of all services the sea provides: ecosystem services, public uses, and production and consumption services. The analysis framework addresses, among other things, risks concerning accidental spill events. Accordingly, the following points are henceforth presented:

1. Evaluation of the magnitude of potential changes to measurable sea related financial assets (e.g. seashore hoteliery, desalination plants). That applies in case the calculated changes are related to defined situations, whereby a sea-related economic activity was denied normal use of the sea.
2. Evaluation of the benefits derived from the sea being a public asset, and evaluation of the scale of potential changes to these benefits.
3. Reference model formulation for accidental spills, occurring during offshore oil and gas exploration, development and production activities.
4. Calculation of expected costs derived from a spill event hindering normal use of the sea, causing negative changes (e.g. reductions) to the benefits derived from the sea, as detailed in the previous section.
5. Presentation of a cost-benefit analysis addressing the operation dealt with, taking into account spill related risks: the anticipated costs derived from spills, estimations of the net profit value (i.e. prior to the cost of accidental events) of these projects.

The sea as a public asset – In order to evaluate the potential damage to the sea resulting from offshore oil and gas exploration and production, the sea was considered a public asset. Accordingly, the "factor share" was calculated, i.e. the "sea value" relative proportion within the overall value of the residential units nearby the coast.

It has been assumed that the financial evaluation of a public asset using the "Hedonic" model proposed here expresses all sea related aspects as perceived by the public, including benefits derived from the ecosystem services and various uses of the marine environment. The economic value of the ecosystem services is currently being directly assessed by various detailed surveys. It may be assumed that the changes in these economic value of the ecosystem services as presented in the direct assesse evaluation has a role in the public perception of the sea as a public asset. In any case, changes resulting from a direct and detailed approach are "miniscule" in relation to the measurement error range of the public asset value. It has to be noted, that additional methods for the evaluation of the sea as a public asset do exist. Those methods also reviewed in the report, with their benefits and drawbacks.

Relating to risks - Due to a lack of records of oil spill events in Israel, a virtual reference model was prepared based on a 47-year record of oil spills in the USA. This model addresses offshore spill events fitting the scale of the exploration, development and production activities (existing and predicted) in Israel. Based on this model, an evaluation system has been subsequently established, dealing with reductions in benefits, caused by random spill events from offshore oil and gas facilities; in this context, the virtual model serves as reference scenario to the random events. A separate consideration taken to oil operations risks and gas operations risks.

Cost-benefit analysis – Cost-benefit balances for oil and gas were calculated according to the above data.

Gas sector – At the current stage, a benefit value of 145 billion (NIS) (at current values) has been calculated, resulting from supply to the domestic market. This amount represents net benefits, after subtracting costs, not including the required premium for extreme oil spill events risk. The above estimation has been taken from Bank of Israel publications.

We have no estimation of our own of these premium in the field of gas , however, we do have an estimation regarding virtual oil sector, with equivalent energy

magnitude of Israel gas supply for domestic needs. The current premium values for extreme events are estimated at 2.85 billion NIS per year; a benefit vs. risk cost ratio of 50:1 is thus inferred.

Moreover, the risks in the gas sector are moderate compared to those in the oil sector. It can be shown, that only a small or medium scale event anticipated by the virtual model, are relevant to the gas sector. In this case, the benefit will stand at hundreds of billions of NIS (at current value) vs. the current premium value, i.e. hundreds of millions of NIS only.

When only a small scale or medium scale event is taken into account, the above order of magnitude difference in favor of the benefits is expected also for future development of gas deposits.

Oil sector - Due to lack of data regarding the overall size of expected oil reservoirs, there is currently no practical way to determine the general benefit vs. cost ratio in the oil sector, only to individually assess it for each specific reservoir following its discovery.

Regulation and policy alternatives

Description of current regulation

An examination of relevant current and past policies of granting exploration rights is required, for definition and examination of policy alternatives regarding implementation of environmental aspects. Accordingly, legislation regarding onshore and offshore oil and gas exploration and production issues has been examined, with an emphasis on the "Petroleum Law" and its accompanying regulation.

According to the legislation concerning oil and gas exploration and production, the authorities concerned are the Minister of National Infrastructure, Energy and Water Recourses (referred to henceforth as "the Minister"), the Petroleum Commissioner, appointed by the Minister (referred to henceforth as "PC"), and a "Petroleum Council" (an advisory council, according to Clause 3 of the Petroleum Law; referred to henceforth as "the council") whose members are appointed by the Minister, most of them from the public. The PC and the Petroleum Unit (PU) at the Natural Resources

Administration (NRA) of the Ministry of National Infrastructure, Energy and Water Resources, deals with licensing and inspection of oil and gas ventures.

Granting exploration rights procedures and the ministry requirements regarding environmental issues were reviewed, prior to 2012 (i.e. preceding the decision of the decision to stop granting new oil and gas exploration licenses in the offshore area of Israel), as well as after this year.

The review revealed that environmental issues are currently given a special emphasis, as part of granting offshore oil and gas exploration and production rights. That includes, for example, new (i.e. post-2012) requirements regarding submission of environmental documents, background survey, oil spill contingency plans, guarantees and risk insurance policies, anchored in the working plans of the exploration stage, in the leases, or in operation permits issued prior to production.

Notwithstanding the importance of these measures, there are still gaps to be filled, due in part to a lack of environmental data regarding habitat distribution and vulnerability. The current requirements are determined and adapted to any given activity, by the PC, as needed.

Definition of policy alternatives

The SEA aims to be a working tool for policy making regarding integration of environmental considerations within the sustainable development of Israel offshore oil and gas resources. Therefore examination of alternatives in the SEA related to policy alternatives and decision making in future projects.

As this is the first SEA performed in Israel, it is essential to review the methods and approaches in similar assessments in other countries. Out of six countries reviewed, an examination of policy alternatives has been carried out only in two assessments, in the USA and the UK, representing two essentially different approaches regarding the definition of the alternatives.

Eight alternatives for physical areas before development, out of all areas included in an approved five-year plan (NEPA) were evaluated in the American SEA.. This approach is irrelevant in our case, as we are dealing with policy alternatives and not physical alternatives.

Three policy alternatives were set in the UK SEA:

1. No licensing at all.
2. Granting licenses with no limitations.
3. Granting licenses with restrictions and limitations.

Option #3 in the British SEA (i.e. limitations on concession area and/or time frame) was favored. It was decided that in certain cases certain devices are to be removed from the license area, while means of prevention, mitigation, or compensation for potential negative effects to the marine environment and/or its uses, should be compulsory.

A working scheme defining policy alternatives, based on the British SEA document, has been proposed as part of the current work. However, an examination of that approach proposal, after consultation with the various committees accompanying the SEA, as well as other experts including the overseas consultants, has aroused doubts regarding the benefits of implementing this alternative approach for the current SEA. Therefore, the recommended *modus operandi* should specify the current state of affairs ("alternative 0"), i.e. granting new exploration licenses without environmental aspects, as was prior to 2012, when the decision to stop granting new exploration licenses was taken ; should point the gaps between the pre 2012 status and the desired conditions , and to create tools and formulate recommendations based on detailed existing environmental information. These tools will be used by the decision makers prior to providing the new licenses. Publication of the these rules to the public will allow maximal transparency, while the resulting requirements (obviously, dependent on the conditions at the specific area) will thus be known at any given time, facilitating decision making and proper planning.

Recommendations

At the final stage of the SEA, recommendations were drawn up based on insights and information gaps identified during prior stages covering various fields: concessions' timing and locations, ecology, risks, economical and technological aspects of exploration and production activities. Additional monitoring recommendations following implementation of these recommendations including: monitoring the marine environment, drawing of conclusions, and recommendations for future SEA's.

Timing and location of new licenses

An analysis by the SEA of the marine environment, justifies a different approach to the near-shore environment vs. the open sea environment. Therefore, it is currently recommended that licenses should be provided according to the Petroleum Law addressing the open sea environment. As an exception, in case of a specific limited location within the nearshore the license shall be provided according to SEA's principles and findings regarding this location, and in coordination with the "Steering Committee" and the Planning Administration.

Within habitats of vulnerability level 4 in the open sea, it is recommended to restrict drilling activities or pipelines, as well as related infrastructure and facilities, while limiting the drilling operations to at least 1 km distance from these vulnerable areas. Regarding habitats of vulnerability level 3, it is recommended to restrict activities in a way similar vulnerability level 4, until further data or information is available for policy updating.

In areas with habitats high vulnerability to noise disturbances, it is recommended not to carry out seismic surveys.

It is also suggested that new licenses should be preferably provided for areas with low vulnerability, as part of the PC's overall considerations.

Ecological recommendations

The main aim of this field is enabling gas and oil exploration and production, while also maintaining normal and sustainable functioning of the ecological marine environment with minimum interference, disturbances and damage.

The main ecological recommendations are:

1. Defining constraints and guidelines to anthropogenic activities regarding habitats and their vulnerability levels, which will stand at the base of environmental policy implementation at any given instant. It is recommended that the PC, at the time of providing licenses, survey permits, drilling permits, as well as permits for marine infrastructure facilities (under his authority) , shall inform the receivers of the above documents, of the habitats' vulnerability within the permit area, existing data gaps, possible influence on

the development of the site, as well as required measures and restrictions intended for preserving the habitats.

2. Recommended methods for overcoming existing data gaps: monitoring (by the contractor or by the state), research, data gathering and analysis. These are meant to retroactively examine the policy's success, as well as to achieve a higher prediction level, enabling policy and restriction changes according to necessity. From this suggestions were formulated, ensuring continuous monitoring.
3. Generating interconnected data bases, setting routine methods of data gathering and storage, providing accessibility to the data to the public by storing it on an internet site, including links to other relevant sites.
4. Examination of the environmental due-diligence of the license appliers, as well as a requirement to report and published any major technical failure, accident or sea pollution event.

Recommendations regarding risks

1. Recommendations ensuring implement of safety measures for risk mitigation, e.g. preparation of surveys and studies prior to license approval.
2. Recommendations regarding risk survey performance levels, enabling smart decision-making regarding offshore oil and gas licensing and leases, as part of a better preparation to treat and contain possible damages.

Economic recommendations

1. An examination of the economic outcome of requirements not customary in oil and gas producing countries, OECD member countries, with significant impact on the market, i.e. environmental benefits vs. economic benefits.
2. Updating data required for an estimation of oil and gas operations benefits vs. potential resulting damages. That may include, for example, expanding the database required for an economic analysis of the sea value as a public asset, and properly calculating the economical value provided by the marine ecosystem services.

Technological recommendations

Recommendations for implementation of technologies due to reduction of the environmental impact of offshore oil and gas activities, including those resulting from seismic surveys, due using air guns known to induce damage to marine mammals, drilling mud use, treatment and discharge of cuttings etc.

Additional recommendation were formulated regarding monitoring following implementation of the SEA recommendations, as well as drawing conclusions and guidelines for the future SEA:

1. Data collection of activities of exploration and production performed following previous SEA, ecosystem updates, monitoring, improving data and information gaps within the report. The report shall be conducted by the Environment Division at the Natural Resources Administration of the Ministry of National Infrastructure, Energy and Water Resources once in every two years, and will be submitted to the members of the supervising committee of the current SEA.
2. Preparation of an additional SEA within five years of the completion of the current SEA, according to development demands and environmental data gathered during the monitoring activities.
3. Recommendations updating according to the overall policy as formulated by the National Planning and Building Board.
4. Recommendations regarding next SEA's contents, and editing guidelines.