



**UNIVERSITY OF PETROȘANI
DOCTORAL SCHOOL**

DOCTORAL THESIS

Abstract

**GEO-TECHNOLOGICAL AND STRATEGIC SECURITY OF ENERGY-
MINERAL RESOURCES EXPLOITATION IN ROMANIA: THE CASE OF
BLACK SEA HYDROCARBONS**

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The doctoral thesis addresses the issue of geo-technological security and the strategic side of the exploitation of energy and mineral resources in Romania.

It examines the case of offshore hydrocarbons in the Black Sea which is currently characterized (2021) by an unjustified conceptual, legislative, technological, and operational deadlock in terms of exploration and exploitation.

The results of the doctoral dissertation are useful in formalizing an updated, proactive Strategy and a Tactical Plan with concrete measures and reunited objectives, aggregated for the operationalization of offshore projects in the Black Sea.

The doctoral thesis is a report document on technical, technological, realistic and logical basis, of real, pragmatic, efficient, and scientifically grounded knowledge of the importance and requirement of speedy commissioning of the exploration-exploitation of Black Sea hydrocarbons.

The logical structure of the Doctoral Thesis has the elaboration scheme:

- Description of the situation of hydrocarbon resources on national and international level, of the offshore systems and of the technical-technological issues in the exploration-extraction blocks in the Romanian coastal area of the Black Sea;
- Identifying the geo-technological complexity in the researched area;
- Description of critical situations, obstacles and non-compliances regarding offshore investments in the researched area;
- Examining offshore strategic security and flexibility and the multitude of concrete investment tactics in the Black Sea;
- Proposals for solutions, variants and alternatives for investment, technical, technological and regulatory unblocking in the area by introducing co-development;
- Defining the outlook model for offshore investments in the Black Sea.

The aspects related to the hydrocarbon potential in the area of the Romanian continental shelf, in the Western Black Sea Basin, in the deep, adjacent waters, to which are added problems regarding the polluting technologies of hydrocarbon exploration and extraction are aggravated by the conceptual blockage, legislative obstacles offshore, technological and operational difficulties in exploring and extracting crude oil and natural gas.

Specifically, the infrastructure necessary for exploration-exploitation and the pipeline network to collect and direct these resources in the continental area is not provided from domestic financing, in order to reach the National Transport System - NTS of offshore hydrocarbons.

The doctoral dissertation uses the characteristics of offshore systems and the technical-technological complexity of the exploration-extraction blocks in the Romanian coastal area of the Black Sea.

Mainly, the proposed new approach refers to the systematization of the causes for the offshore investment blockage in the researched area and the definition of a new conception of work, through co-development.

This approach has a case study application for the design of the development of hydrocarbon exploration-extraction in the Black Sea.

The co-development, proposed by the author in this exemplary case, in the offshore area, was conceived by putting / placing in the matrix the elements of decisional, technical, technological and managerial invoice that are the basis for the elaboration of a Model Proposal Document. development for offshore investment and exploration-exploitation projects in the Romanian coastal area of the Black Sea.

An objective of the doctoral thesis, with a general character, is the research of complex offshore systems that generate the context in which it is possible to obtain improved investment regimes, with predictable profit, which ensure sustainable development. from many large companies, - transnational.

Through the doctoral thesis, starting from the scientific investigations in the researched area, the orientations and measures are considered to promote in the Romanian energy field the new solutions of Geo-technological and strategic security in Romania, on the way to achieving the country's energy independence.

CHAPTER I is entitled RESOURCES, EXPLORATION, DEVELOPMENT AND TRANSPORT OF HYDROCARBONS GLOBALLY AND IN THE BLACK SEA and deals with the issue of hydrocarbon reserves internationally, globally being systematized elements of history and current affairs of the national oil sector.

Hydrocarbons in the multitude of other energy sources qualify the Black Sea, through the general data and the current basic situations in the Romanian offshore sector as an area of mining / oil industrial interest, an area with influences in regional and global geopolitical and geostrategic developments.

The territoriality of the Black Sea oil fields is examined and technical and legal situations for offshore strategic and tactical practices are described.

The preliminary conclusions in this chapter are:

- The general investment strategic antecedents, applied for the offshore exploitation of hydrocarbons in the Black Sea, in the Romanian industrial-economic environment, are generated in a European regional area, through similarities and synchronisms, and have influenced / influence the conception of exploitation-exploitation.

- It is considered that in any variant / perspective of offshore investments one can identify a Romanian productive-economic tradition in terms of hydrocarbons and natural energy resources, both onshore and offshore.

- Even if it has not been / is not a leader in the European investment system (transatlantic, global), we certainly say that it is contributory, aligned with the general process of international investment competition, since the times when the consolidation of the mining industry was processed, energy, of the Romanian economy.

- The chapter states that there are strategic and tactical practices related to the offshore exploitation of Romanian hydrocarbon deposits in the Black Sea and, therefore, the launch of tenders for exploration and exploitation have always shown regulatory interest in them in the context of competition for access to the type of complex and significantly profitable business.

- It is found that tactical practices are prohibited when they seek to promote corrupt concepts or ideas of evasion, or when the presumption is observed that it would disturb, endanger the industrial and economic security, especially energy of the country.

- However, there are also elements of legitimacy, related to the industrial-economic and legal symmetry, when the law criminalizes the abusive use of the marine

environment with the exploitation of crude oil and natural gas, by generating anthropogenic effects, pollution, disturbing biodiversity.

CHAPTER II is called OFFSHORE TECHNOLOGICAL COMPLEXITY.

The offshore technologies and the complexity of the investment project are articulated for knowledge with the effective premises regarding the exploitation of hydrocarbons in the Black Sea.

The dimensions of offshore projects and their investment characteristics influence offshore activities in the Romanian economy.

In this Chapter, the offshore strategy is considered an “integrating matrix” / “connection matrix” and the tactics, especially under official regulatory influences, are those that can cause strategic stagnation or, on the contrary, the “transfer” of offshore strategy with positive effects.

In this framework, the idea of resorting to offshore investment in Romania is launched.

It mainly results in:

- The chapter deals for the first time, the interrelationships between strategies and tactics for offshore exploitation in the Black Sea and 1) their reflection in the official strategy / assumed as a superstructure with determinants of investment surcharge, 2) stagnation or transfer of strategy, 3) strategic, 4) the scientific vision and 5) the technocratic legal legitimacy of the project.

- It is reported for the first time in the literature the assertion regarding the assimilation of the Strategy for offshore exploitation in the Black Sea as a simple quasi-closed cycle in its tangible form, associated with a complex open finite cycle (its repercussions of investment, technical-technological and .a. on the marine area put up for auction for exploration-exploitation).

- A basic conclusion in the chapter, characterized by personal contributory novelty, is that the self-creation of the strategic reality confirms the correctness of the assertion of deductive and inductive strategic knowledge.

In fact, in the Black Sea area, strategic stagnation is excluded, as the priority of the Strategy for offshore exploitation is applied on a dynamic societal - social body (Romania's economy), in continuous objective change.

- Also as a personal contribution, the chapter describes the thesis of strategic disincarnation in Romania, which allows increasing the capacity to meet specific investment requirements, on this basis increasing the multilateralism of tactics, interest in more rational management of soil / subsoil (marine) of the country.

CHAPTER III is called CRITICAL TECHNOLOGICAL AND TACTICAL SITUATIONS IN OFFSHORE EXPLOITATION IN THE ROMANIAN COASTAL AREA OF THE BLACK SEA and presents results with reference to compatibility between offshore technologies and geo-physical-atmospheric situations in the researched area.

At the same time, the synthesis of offshore operations in the Romanian maritime sector is presented, aspects from current evaluations and about critical technical, technological, economic, legal / regulatory situations are reported.

It concludes, in essence, as follows:

- The compatibility between offshore technologies and geo-physical-atmospheric aspects influences the extraction performance from the wells, of the horizontal drillings from a perimeter / field / block with hydrocarbons.
- The lack of legislative, fiscal and geotectonic predictability, to which are added the arbitrary offshore operational interruptions, influence the profitability of offshore projects.
- In offshore practices approx. 75% of drilling costs are subject to changes, adjustments, updates over time and influence the increase in the duration of the offshore project.
- It is shown that it is necessary to restore the Offshore Law so that the new provisions stimulate offshore investments, not to disadvantage the national economic interest, to reach mutual benefit (profit) between investors and local partners.
- It is necessary to amend some provisions of Law no. 256/2018, to define, in fact, competitive fiscal conditions, clearer stability clauses, more liberalized market conditions.
- Due to local legislative inadequacies, the operation in question could start as early as 2025-2026.
- We consider that in the Black Sea area the next horizon of interest for investments (2035-2040) will be found in the field of methane hydrates.

CHAPTER IV is entitled SECURITY AND FLEXIBILITY IN OFFSHORE OPERATION IN THE ROMANIAN AREA OF THE BLACK SEA.

It begins with a description of aspects related to flexibility in the offshore exploitation process.

The bases of flexibility, performance and flexibility are capitalized in a composite proposal advanced by the author in iterative / iterative regime of fiscal system for the offshore system, this being contributing to the definition of energy security.

It mainly follows that:

- Flexibility in the offshore exploitation process represents a techno-eco-legal “post-finality”, in fact, with an acceptance of industrial-economic variability (mining / oil) allowed, including in the offshore field.
- The literature is not sufficiently relevant in terms of procedures, modes, modalities, techniques, methods of measuring flexibility.
- Different operation of flexibility can affect the costs, the quality of an offshore investment project.
- In the Chapter is made a proposal composed in iterative regime, reiterative of fiscal system for the offshore regime in Romania.
- In this context, it is proposed to operate with certain adjustment coefficients on the alignments of difficulties on the part of offshore investors.
- It is proposed to use the flexibility of the taxation system in the domestic hydrocarbon industry, mainly by reducing the costs of tax administration.
- By applying offshore projects, Romania can strengthen its internal resilience capacities, it can face the global challenges that affect the Romanian business.
- Romania must be an active part of the EU to shape the single energy market, by reducing the region's energy dependence on other oil areas in the world.
- The offshore strategy for the exploitation and capitalization of hydrocarbon deposits / resources in the Black Sea can be assimilated with a system of conceptualization of "strategic intelligence".

- The Chapter proposes a circuit for the application of "smart competitiveness" in the offshore exploitation of energy and mineral resources in Romania.

CHAPTER V is called OFFSHORE OPERATING SOLUTIONS THROUGH CO-DEVELOPMENT.

Mainly, the author's proposal for the Co-development formula is presented, respectively the concept and formalization for offshore.

Offshore Co-development is recommended by assuming the technical, technological, deliberative engineering reality and the relationship between offshore strategy and tactical Co-development practices is examined.

Also, are presented Variants / solutions proposed for the operationalization of offshore projects in the Black Sea and a synthesis of the results for proposals (Variant 4) of Offshore Co-development in the Romanian maritime sector.

Considering the primacy in the literature of personal contribution by formalizing a model of tangible and intangible conditionality found in the relationships between the requirements of the tender specifications, tactics and the Strategy for offshore exploitation of hydrocarbon resources in the Black Sea, in the chapter to identify the relationships between conditionality, strategy and operational practice in the area, in conditions of pluralism and quasi-infinity of forms of manifestation of tactical practices, to reach maximum profit.

In essence, the following main, conclusive lines in the field are highlighted:

- The structure of a strategic industrial-economic (mining / oil) practice is always seemingly hidden.

- We find that a strategic practice is an image-orientation, respectively an image-guide in the arsenal of expressions of interest for offshore investments in the Black Sea area by multi-, transnational companies.

- In conclusion, strategic practice is not an objective, but rather, it is a formula for achieving power situations in the system of offshore exploration-exploitation of hydrocarbons.

- As no type of (at least quasi-certain) strategic prediction formula is invented or assumed, a Strategy (such as the Strategy for the offshore exploitation of hydrocarbon resources in the Black Sea) algorithmically complements the investment course of companies between sequential sustainability limits applied.

- It is confirmed, based on our deductions and conceptual findings, through this chapter, that in Romania, the tactical industrial-economic practices (mining) and the Strategy, considered normative / indicative arsenal, of orientation, are found in the meeting in an industrial model -economically open.

- Strategic self-closure in the opening is a concept that we launch for the first time through the present lines in the idea of acceptance / recognition in the Black Sea area of subliminal strategic sustainability.

- We consider that there are no trends in the autonomy of offshore exploration-exploitation tactics, but on the contrary, they are subject to strategic normative incidences.

- A significant conclusion in the chapter refers to the fact that the offshore exploration-exploitation tactics, in our opinion, are sequentially modeled in the Romanian industrial-economic environment and we can advance the observation that, in context, the Strategy for offshore exploitation does not have / is not " modeling function "of tactics.

- Rather, the Strategy is a "field insurance function" for the framework and tactical practices of offshore exploration-exploitation".

CHAPTER VI is entitled STRATEGIC INNOVATION AND MODELING OF OFFSHORE OPERATION THROUGH CO-DEVELOPMENT.

It presents the model of perspectives for offshore investments in the Black Sea, offshore technological logic and tactical practices, strategic order and offshore tactical practices.

The premises for offshore strategic innovation are exemplified with a modular constructive-functional proposal of a complex offshore structure in the Romanian maritime coastal area.

In conclusion, it follows that:

- Strategic offshore innovation in the Romanian Black Sea hydrocarbon extraction system means the acquisition of high resolution seismic data, the use of 3D geological models to increase the knowledge of geological deposits, dense drilling, double endowments, horizontal drilling wells, chemical protection of water.

- The Chapter presents operational interrelationships for oil and natural gas between Euro-Asian and North African areas with consequences for Romania.

- The offshore investment prospects and the destinations of hydrocarbons extracted from the Black Sea area are expressed through a symbolic mathematical model, valuing the terms of domestic consumption and export, liquefaction, refining and maximizing them in the national and European economic space.

- The development of explicit knowledge in the high-performance offshore technological system is associated with the traceability of methods and operations in each offshore investment infrastructure.

- Transforming / converting knowledge for innovation processes in offshore exploitation is linked to the proposal to adopt a new Strategy for the exploration, development and exploitation of offshore in the Black Sea.

- The Chapter presents a modular constructive-functional proposal of a complex offshore structure in the Romanian maritime coastal area and examines the plurality of technological / tactical practices, provided normatively, indicatively by strategic provisions, offering "plural development", multi-lateral mining activities / oil, offshore in the researched area.

CHAPTER VII is entitled FINAL CONCLUSIONS, PROPOSALS AND RECOMMENDATIONS, HIGHLIGHTS OF OWN, ORIGINAL CONTRIBUTIONS AND FUTURE RESEARCH DIRECTIONS.

In essence, the original proposal put forward by the author is presented, based on elements of a parametric model for the contractual balancing of investments with expressions of interest in the area, namely:

- capital expenditures (CAPEX), = 50% [of which foreign companies = 85% + Romanian companies = 15%];
- operational expenses (OPEX), = Romanian companies = 50% [of which foreign companies = 10% + Romanian companies = 90%],
in which, according to the methods and indicators of calculation on the international pan:
 - (CAPEX) = capital expenditures (based on parametric models);
 - (OPEX) = operational expenditure..

The doctoral thesis is written over 167 pages.

The conclusions, the synthesis of their own, original scientific contributions, the proposals and recommendations obtained from the research are found in final assertions, characterized by resolution and scientific topicality.

Theoretical and practical results in the doctoral thesis are found in total 94 graphic representations (diagrams, drawings, figures, images), of which 41 are original, developed by the author, 3 tables with new data and information, original, 9 relationships and mathematical formulas, for the first time in the specialized literature to which are added 35 own ideas, concepts and notions launched for the first time in the field, all included under the incidence of copy-right.

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The doctoral thesis, in its structural essence, has 7 chapters, a bibliography with 216 updated references from the country and abroad, as well as 41 personal bibliographical references.

The doctoral thesis presents preliminary conclusions related to the 6 chapters of extensive treatment of investigations according to the topic and the requirements of personal scientific contribution.

In the last chapter (VII) of the obtained results are found 17 final conclusions, 4 proposals and recommendations respectively own, original scientific contributions.

To these are added a number of 4 main research directions in the field, in the future.

The doctoral thesis is made available to local decision-makers, ministers and the Government, respectively to the specialized Commissions of the Romanian Parliament a Document-proposal with the obtained results, scientifically substantiated for regulations and updated action in the offshore field.

This approach for offshore investment and infrastructure development is useful for developers of updated national energy strategy, tactics, plans and programs in the field.