# The Utilization Of Resources And Regulation Along With Company's Strategies In Managing Oil And Natural Gas Industry In Indonesia

Sigit Rahardjo, Sucherly, Ernie Tisnawati Sule

**ABSTRACT**: Oil and gas production in Indonesia has been declined since 1995 up to now, the effort to increase the production has been done but it does not result yet. In contrast, day by day the investment is getting increased and huge; on the other hands, it becomes a problem and a challenge for Indonesia to meet oil needs as raw material for refined fuel oil either for transportation or industries. Day by day the needs of refined fuel oil is getting increased and huge as it is correlated to the increasing of the number of motorcycles either two-wheeled or four-wheeled as well as the increasing of oil and gas or non-oil and gas industries. Oil and natural industry (Resource Base) has specific characteristics those are internal factor that uses resource such as high technology, huge investment/ cost, as well as competent human resources. Besides, the external factor those are good regulations either in the central and regional levels as well as the sector which is very important toward the production performance and the of company management's strategies to manage this industry. This paper attempts to figure out the impact of internal factor in the form of resources and external factor in the form of regulation as well as the effect of production performance toward petroleum companies of upstream sectors in Indonesia and management's role, especially, petroleum industrialists in managing the company. The wane of oil production and the increasing of refined fuel oil need in Indonesia as well as the increasing of oil production cost then it will affect the industrialists' strategies in managing the companies. The resources consist of human resource, oil reserve as well as petroleum technologies. While, regulation consists of law, central and regional government regulations and rules in oil and gas sector. Whereas, the company's strategies are explained by production volume and selling volume of oil. Company's performance which sets to work in upstream sector is influenced by various factors which are interconnected and it impacts on the companies at the same time. In addition, for the moment, the companies which engage in upstream oil and gas sectors in Indonesia are quite a lot either domestic (National Oil Company) or International Oil Company (IOC). Currently, companies in Indonesia are in the form of Production Sharing Contractor, Joint Operating Body and Cooperation Operation (KSO), and currently upstream sector companies specifically which are producing are more than 50 companies.

**Keywords:** upstream oil and gas industrial activities, oil and gas resources, regulation, management strategies, production performance.

## INTRODUCTION

### Background Research

oil and gas upstream business activity is a business which has the quality of huge capital (intensive capital and failure element), long-terms business up to 15-30 years, high risk (economic, technical, fiscal, politic, and finance), there are gambling element, global, depends on high technology, unrenewable hydrocarbon resource condition and postoperation activities (Ong HL, 2001) In general, cooperation paterns through partnership is devided into two large groups those are concession system and cooperation contract. On concession system, government only issues the concession and earns the income from the royalty and taxes, while contract system is divided into two large groups; those are, service agreement and production sharing contracts. On production sharing contracts, the government earns income from government's share and taxes. While on contractor service contract, the government earns its share in form of investment cost and production wages done (Johnston D, 1994).


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Currently, the oil condition which is produced by Cooperation contract contractors decline on average of 10-12 % per year (Special Task Force for Upstream Oil and Gas Management) from the whole potential working territories which are managed in Indonesia, even though there are small increasing of oil production in some potential working territories. Whilst, domestic consumption level of refined fuel oil continues to increase at around 8% peryear (Directorate General of Oil and Gas Managemen, 2009) so there is production shortage which has to be met by producing from available resources in potential working territories.

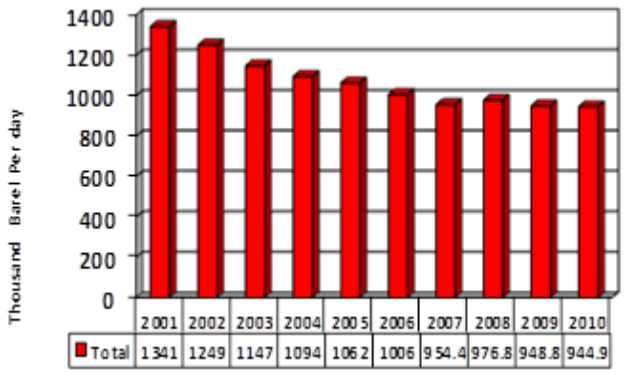


***Figure 1.1.:*** *Production of Oil vs Consumption*

The current condition of cooperation contract contractors are parts of fields found in 1960-1975, so the companies can meet neither the target production nor lifting for both oil and gas in Indonesia. Hence, the effort to increase the production of cooperation contract contractors is needed in order to achieve the target production nationally that is

about 1 million barrels oil a day, since the data show the tendency of declining oil production, as the figure shows the declining production if there is not new exploration and exploitation efforts (Directorate General of Oil and Gas Management and The Executive Agency for Upstream Oil and Gas Business Report, 2011).

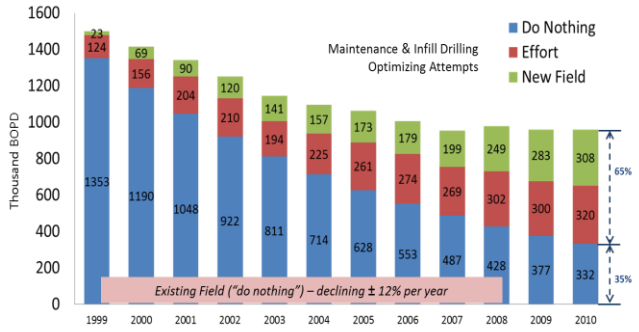


***Figure 1.2.:*** *The Declining of Production and Importance of Exploration Activity*

Pricewaterhouse Cooper (2005) conducted a research on Indonesia's rank of competitiveness in cooperation contract contractors (Indonesia's investment competitiveness rank), it mentions that geological prospective gives adequate competitive value and regulatory framework (induded central government regulation, regional government and mining environmental regulation) gives average value which means it needs the improvement. In general, the development of potential working teritorry can be explained (Directorate General of Oil and gas and The Executive Agency for Upstream Oil and Gas Business, 2011) that the development and the management of potential working territories are divided into two groups in the connection with the increasing of oil and gas productions those are maintenance production groups and increasing production groups. The most influencial external factor is regulation conditions at the central level such as taxation, overlapping area, and at regional level such as regional regulations in relation to the increasing of locally-generated revenue. The dominance of internal factor such as potential natural resources which are manifested by the availability of natural oil and gas resources at whole potential working territories, yet the occurance of the natural resources have not been developed optimally. The phenomena that will be observed is the indication of the cooperation contract contractors in producing oil tends to decline on the managing potential working territories which mean that the production performance of cooperation contract contractors has not optimized yet.

## LITERATURE REVIEW

To run oil and gas upstream business, it is necesseray to make strategic decision in order to achieve company's performance which accords with the company's vision and mission. It is also explained by Wheelen T.L & Hunger J.D., (2012) that the strategic decision making process is started by evaluating current performance, then observing both internal environment and external environment. To choose the appropriate management strategy according to Day G.S, (1999) that oil and gas company undertakes situation assessement by observing the fast changing condition then the selection of management strategy at oil and gas upstream business needs to observe the dominant internal environment such as calculating ability of oil and gas resources and the impact of the dominant external environment such as regulation, it will influence the company's management strategy which is selected and the company production performance resulted. On the other hand, according to David F.R. (2003) that oil and gas model of comprehensive management process is started by establishing the vision and mission of the company. Considering the internal and external environment evaluations then determining long-term goal, continued with selecting appropriate strategy and undertaking company's performance evaluation. Furthermore, by observing the background and existing identification problem, the support of basic theory will be explained, especially, in relation to the management strategy and research paradigm so the hypothesis is proposed as the temporary answer of key issue of the research. *Grand theory* is a management strategy of oil and gas upstream business management resources. While, middle range theory is a corporation management, especially, business management, and applied theory is a formulation theory, especially, for implementation strategy. According to Pricewaterhouse Coopers (2005) that the geological prospect in Indonesia is still drawing investors' interest but the declining searching activities of new oil and gas resources by cooperation contract contractors is assumed causing the declining of oil and gas productions in Indonesia. According to OPEC (2002) and see Johnston D. (1994) that management strategy is production sharing contract. There is the most important subject matter from the economic standpoint those are government take, contractors' responsibility in form of total investment like *abandonment costs*, *operation costs*, *development costs*, and *exploration costs.* According to MMS (2004) that the three subject matters on concession systemd are royalty, fiscal cost, and tax. The connection of management strategy in the oil and gas resources management framework is aimed at improving the production performance of cooperation contract contractors that is by competitive advantage in searching oil and gas resources and producing oil and gas. Hooley G, Saunders J. and Piercy N (2004) at Figure 2.5 state that the focus of cooperation strategy is to increase production performance that can be conducted in two ways; those are productivity and increasing lifting.

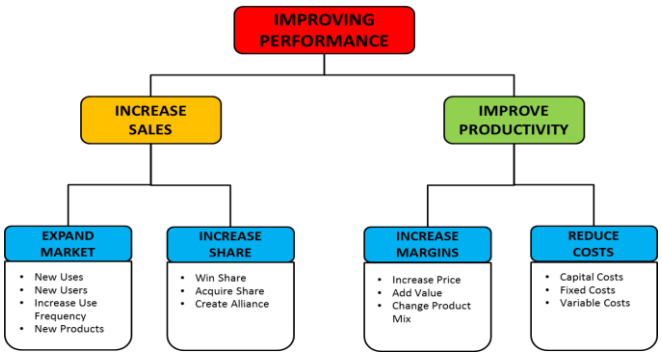


***Figure 1.3:*** *Strategic Focus (Hooley G, Saunders J & Piercy N., 2004)*

The outcome of a business activity which is driven by right supporter can also be used to measure the production performance so it can bring optimal result, as it is illustrated as following figure.

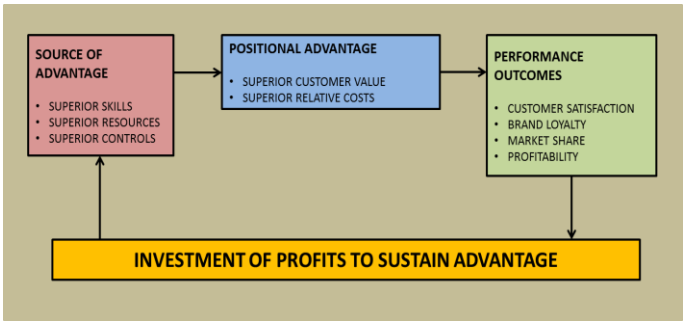


***Figure 1.4:*** *The Elements of Competitive Advantage*

The frame of reference concept above is taken and developed from the explaination and modified by Harper W. B jr and Walker O.C see Cravens D.W, (1996) that factors that influencing business implementation is explained, that the production performance of cooperate contract contractors are influenced by the strategy and company'd policies, in which the company's strategy in the connection with cooperation is influenced by external environment that is regional regulations and internal environment that is oil and gas resources. On the other hands, A.A. Thompson, J.E. Gamble and A.J. Strickland (2004) state that to get business model and the best business cooperation strategy, it is depends on strategic visions of the company and the selection of company's strategy which are also influenced by either external and internal environments.

## RESEARCH OBJECTIVES

The research aims at formulating a theoretical framework or a model of increasing production performance of cooperation contract contractors through cooperation agreement management which is supported by potential natural resources and working territory regulations, to increase production capability and oil and gas lifting volume nationally.

## HYPOTHESIS

Verificative hypothesis then will be empirically proved by utilizing software with available data, to figure out the connection among variables as it is stated in oil and gas business equation modeling structure. While, the analysis of inference average vectors and software are utilized for descriptive hypothesis.

## METHOD

The research aims to test the hypothesis emirically, whether it is empirically supported or not. Based on the purpose of the research, it is an explanatory survey. It also explaines a casuality, thus the research is causality. Sampling is not used for this research because the numbers of analysis unit are relatively small compared to the total population. If it is viewed from the available population coverage, this data collection method is called census. Census method is used because the data population is relatively small and the population' characteristic units are various (Hermawan A, 2009). The method is used because there are only 50 cooperation contract contractors are producing, the rest are exploration cooperation contract contractors and PoD cooperation contract contractors. They are relatively smalle compared to active cooperation contract contractor companies. Besides, the conditions of analysis units of those 50 cooperation contract contractors are varied. It is also shown by the variation of production of each cooperation contract contactors which depends on each researve volume that is available in oil and gas resources.

### *Data sources and determination of data method*

Refering to formulation of research problems and proposed-hypothesis so the data used is primary data that is the perception of cooperation contract contractors company for development and management of oil and gas resources and the secondary data are reports from Directorate General of oil and gas business, the executive agency for upstream oil and gas business activities and cooperation contractor contracts.

### *Data collection technique*

Data and information needed are collected through following processes: (1) questionnaires are sent to cooperation contract contractors by fax, email, and explaination of items and instruction documents to fill the questionnaires are also attached, (2) then, the surveyors visit cooperation contract contractors' sites to conduct direct interview or verification with the head of cooperation contractor contracts.

## DISCUSSION

Reliability involves the consistency or precisison of measurement instrument (Bollen, 1985). The measurement instrument is said to have particular reliability level if it is used several times to an object with the same conditions, so the result is expected to be relatively the same. Validity of the measurement instrument relates to a question about: "Do the indicator items measure a concept or contruct that will be measured?" so, the validity involves the accuracy of the measurement instrument. Calculation of reliability and validity is for every latent variable. There are four latent variables for the research; those are, potential oil and gas resources (1), regulation of upstream oil and gas business activity (2), management strategy ($\eta 1$), and the performance of cooperation contract contractors ($\eta 2$). The connection among those latent variables and those indicators are stated in CFA line diagram model (measurement model) as it is seen in the figure 3.1, because each latent variable has three indicator variables. Reliability for indicator variable is formulated as followed (Jỏreskog & Sỏrbom, 1996):

$$R^2 = 1 - \frac{\sigma^2(\varepsilon)}{\sigma^2(y)} \qquad (3.1)$$

Formulation 3.1 is correlation square and the value is above 0.50, it can be said that the indicator reliability is fulfilled.

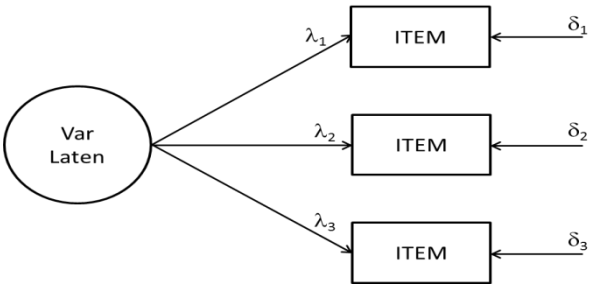


***Figure 1.5:*** *Measurement model of Latent Variable*

Reliability for latent variables or particular contructs is calculated by following formulation:

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum \sigma^2(\varepsilon_i)} \qquad (3.2)$$

In this case, each of $\lambda_i$ and $\sigma^2$ ($\varepsilon_i$) state the estimation of $\lambda$ and the estimation error variance measurement. The limit value of CR is good if the value is above 0.50 (Hair et al., 1992). According to Bollen (1985) that coefficient $\lambda$ is the magnitude of validity coefficient

***Tabel 1:*** *The number of Items from Questionnaire Indicators*

| Variable | Indicator | Number of item |
|---|---|---|
| Resource/ reserve | Reserve | 4 |
| | Technology | 4 |
| | Expert | 4 |
| Working territory regulation | Cental government regulation | 8 |
| | Regional government regulation | 4 |
| | Sector Regulation | 4 |
| Company strategy | Economic | 2 |
| | investment | 2 |
| Company's performance | Selling volume | 2 |
| | Production Volume | 2 |

Further, it is elaborated based on the data obtained which is presented then be used to explaine those four variables, those are, oil and gas resource variable, working territory regulation, management strategy, and production performance of cooperation contract contractors as follows:

**3.5.1. Potential oil and gas resource**

The reliability coefficient for the concept on table 3.5 is calculated based on equation 3.2, for instance the magnitude of potential oil and gas resources:

$$CR = \frac{(.78 + .90 + .94)^2}{(.78 + .90 + .94)^2 + (.38 + .19 + .12)^2}$$

= 0.935

By utilizing the same reliability coefficient other concepts can be calculated. The CR calculation by using validity coefficient (*completely standardized solution*) and estimation error variance measurement (see THETA DELTA for *completely standardized solution*).

**3.5.2. Working Territory Regulation**

Based on the presentation of respondent data toward central government regulation in relation to the process of termination of contract, process of preliminary contract, the process of transferring interest, fast settlement and all requirements are fulfilled. Regional government regulation toward the regional government support, the involvement of regional-owned cooperation, speed of regional government bureaucracy, and land acquisition means how much support from the regional government toward cooperation contract contractors and to understand the upstream oil and gas business which has high risk. How the influence of oil and gas mining environmental regulation toward level of success in implementing the regulation, the success of social responsibility of cooperation contractor contracts, society development program, environmental management program, effectiveness of the usage of Indonesian workers. How big success in fulfilling social responsibility for cooperation contract contractors toward the local people. How big the responsibility to fulfill community development, to improve social welfare and postoperation in fulfilling its responsibility toward the local people.

**3.5.3 Management Strategy**

The connection between investment capital toward investment planning level and investment realization means how much the cooperation contract contractors prepare the investment in order to support the increasing of oil and gas production. The indicators for cooperation in managing oil and gas resource for management strategy which runs today is to measure how the available management strategy and investment commitment by cooperation contract contractors in terms of carrying out the investment commitement in Indonesia. While, production sharing result side is viewed from cooperation contract contractors' revenue as it is regulated in the contract and the conformity level of cooperation contract contractors' sharing is quite good and no complaints.

**3.5.4. Production performance of cooperation contract contractors**

How much production which is produced by cooperation contract contractors attempt to increase its market share lifting. While, at the level of cooperation contract contractors' satisfaction, and there is a question about satisfaction level in managing oil and gas resource, as well as future expectation, stakeholder support, and respondent whether it is medium to high in managing oil and gas resources. Given the research has a hypothesis which states that the oil and gas reserve in Indonesia is still available. The empiric test can be conducted by inference average vectors (Johnson & Wichern, 1992). This inference is known by Hotelling Test. For instance, we have oil and gas reserve at different time with each notation is $\chi 1$ and $\chi 2$ which describe oil (gas) reserve at different time which has oil (gas) reserve average is $\mu 1$ and $\mu 2$. Statistic hypothesis is formulated as follow:

$H_0: \begin{pmatrix} \mu_1 \\ \mu_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$, there is not oil (gas) reserve

$H_0: \left(\frac{\mu_1}{\mu_2}\right) = \left(\frac{0}{0}\right)$, there is oil (gas) reserve

Criterion test, refuse zero hypotheses (H0) if it is applicable:

$$T^2 = n\bar{x}'5^{-1}\bar{x} \geq \frac{(n-1)}{(n-p)}F\alpha \qquad \ldots(1)$$

In this case,

$\bar{x} = \left(\frac{\bar{x}_1}{\bar{x}_2}\right)$, is the example of average vector, $\bar{x}'$ is the sample of transpose average vector, $5^{-1}$ reverse matrix from sample of covariance matrix, $F_\alpha$ is value obtained from distribution table F with significant level of $\alpha$, n, and p each of them shows sample size and number of variable.

## PROBLEM SOLVING DESIGN

Based on research paradigm and hypothesis test model, then the model structure is created to explain the connection of internal factor consisting of potential natural oil and gas resource and external factor toward the upstream oil and gas business management strategy and production performance of cooperation contract contractors, and it will explain every sub-structure of variable relation with other variables and will analyse every variable's role to explain the relation and impact of a variable on other variables. The model structure is based on the research paradigm is as following figure. Circle notations or elips show latent variable, and the square shows indicator variable. Symbol of $\xi$ (KSI) is a notation for exogen latent variable, and its indicator variable is noted by $\delta$ (DELTA). Symbol of $\eta$ (ETA) is endogen latent variable, and the indicator variable is stated by y, and the error measurement is stated by $\varepsilon$ (EPSILON). The description of latent variables and indicators are explained on Table 3.9 and 3.10. Symbol of $\phi_{12}$ shows the correlation of exogen latent variable. The structural equation model consists of two equations: (1) measurement equation, and (2) structural equation. Measurement equation shows the connection between indicator variables and latent variable, and structural equation shows the connection between exigont and endogen latent variables.

***Tabel 2:*** *The Description of Latent Variable Notations*

| Notation | Description | Latent Variable |
|---|---|---|
| $\xi_1$ | Potential Reserve/ Resource | Exogen |
| $\xi_2$ | Oil and Gas Regulation in Working Territory | Exogen |
| $\eta_1$ | Management Strategy | Endogen |
| $\eta_2$ | Production performance of Cooperation Contract Contractors | Endogen |

In general, the measurement equation for indicator variable x is:

$$x = \lambda_x \xi + \delta \qquad \ldots (3.3)$$

If it is connected to the model on Figure 3.2, then the measurement equation is:

$$x_1 = \lambda_1 \xi_1 + \delta_1$$
$$x_2 = \lambda_2 \xi_1 + \delta_2$$
$$x_3 = \lambda_3 \xi_1 + \delta_3$$
$$x_4 = \lambda_4 \xi_1 + \delta_4$$
$$x_5 = \lambda_5 \xi_1 + \delta_5$$
$$x_6 = \lambda_6 \xi_1 + \delta_6$$

Measurement Equation of indicator variable y is:

$$y_1 = \lambda_7 \eta_1 + \varepsilon_1$$
$$y_2 = \lambda_8 \eta_1 + \varepsilon_2$$
$$y_3 = \lambda_9 \eta_1 + \varepsilon_3$$
$$y_4 = \lambda_{10} \eta_2 + \varepsilon_4$$
$$y_5 = \lambda_{11} \eta_2 + \varepsilon_5$$
$$y_6 = \lambda_{12} \eta_2 + \varepsilon_6$$

In general, the equations of measurement for indicator variables are formulated by:

$$y = \lambda_y \eta + \varepsilon \qquad \ldots.(3.4)$$

***Tabel 3:*** *Description of Indicator Sariables Notations in Figure 3.2*

| Notation | Description | Indicator Variable | Notation | Description | Indicator Variable |
|---|---|---|---|---|---|
| $x_1$ | oil and gas reserve | Exogen | $y_1$ | Capital/Investment | Endogen |
| $x_2$ | Technology | Exogen | $y_2$ | Cooperation Agreement | Endogen |
| $x_3$ | Expert | Exogen | $y_3$ | IRR | Endogen |
| $x_4$ | Cental Government Regulation | Exogen | $y_4$ | Selling Volume | Endogen |
| $x_5$ | Regional Government Regulation | Exogen | $y_5$ | Market Share | Endogen |
| $x_6$ | Oil and Gas Mining Environmental Regulation | Exogen | $y_6$ | Stakeholder Satisfaction | Endogen |

Structural equation on Figure 3.2 is given by:

$$\eta_1 = \gamma_1 \xi_1 + \gamma_2 \xi_2 + \zeta_1$$

$$\eta_2 = \beta \eta_1 + \gamma_3 \xi_1 + \gamma_4 \xi_2 + \zeta_2$$

In general, structural equation is:

$$\eta = \Gamma \xi + B\eta + \zeta \qquad \ldots(3.5)$$

The basic question whether the model on Figure 3.2 is in accordence with the data or fits the data. There are various statistic measurements to evaluate whether the model fits the data, which are generally stated in form of index; that is fit index. Followings are index frequently used to evaluate LISREL model (Bachrudin, 2008)

***Table 4:*** *Fitting indeks in LISREL*

| Index | Criterion* |
|---|---|
| Goodness of Fit Index (GFI) | >0.90 |
| Adjusted GFI (AGFI) | >0.90 |
| Root Mean Square of Approximation (RMSEA) | <0.08 |
| Root Mean of Residual (RMR) | <0.08 |

## CONCLUSSIONS

1. Resource variable consists of oil and gas reserves, human recources/ experts and technology which are influenced by availability level of oil and gas reseves, the availability of experts who are needed as well as the conformity of the technology applied.
2. Regulation variable consists of central government regulation, regional government regulation and oil and gas minings environmental regulation are influenced by the level of conformity of central government regulation toward the management of working teritorry (such as incentivication, concluding/ prolongation of contract, operational cost rate, transfer of interest, and tax law), the conformity level of regional government regulation on the management of working teritorry (such as regional-owned cooperation, and regional government policies) and the level of conformity of mining environmental regulation on the management of working teritorry (such as public participation, community development liability/ CSR, and the postoperation liability activities).
3. Production performance and lifting contractor cooperation contract variable consists of the rate of oil and gas production volume, the rate of lifting oil and gas is influenced by the rate of production in working teritorries of oil and gas, and the number of lifting (selling) of oil and gas.
4. Cooperation contract contractors' management strategy variable consists of return of investment (IRR) and the investment level is influenced by the level of the return of investment capital to produce and the level of investment.

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