

STUDY OF ECONOMIC, ENVIRONMENTAL, AND SOCIAL INDICATORS ON THE SUSTAINABLE DEVELOPMENT APPROACH OF OIL AND GAS EPC COMPANIES

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ABSTRACT

Oil and Gas industry is a vital sector of the global economy. There are materials and energetic flow in the consumer economy, and they are both caused and determined by industrial applications. The industrial sector is universally acknowledged as essential to growth and economic generation, despite its negative connotations associated with ecological damage and depletion of resources. Included in the criteria are environmental effects, financial, and standards of ethics for Engineering, Procurement, and Construction (EPC) firms, which span the three pillars of sustainability (environment, economical, and socially). Only a few of Indian companies - including L&T, Reliance, Petrofac, Mc-Dermott, Saipem, Foster Wheeler, Aker Solutions, Punj Lloyd, operate in the Oil Engineering, Procurement, and Construction (EPC) industry. The methodology may be used by any sector, although more detailed indicators will need to be established on an individual basis. The architecture may be implemented into the system gradually using a modular strategy. By using the right criteria, the model also connects the dots between the micro and macro levels of sustainable development. So, it's a tool that businesses can use to evaluate how well they're doing in terms of the principles of sustainable development.

Keywords: *Engineering, Procurement, and Construction (EPC) companies, Sustainable Development, Indicators, Oil and Gas industry.*

1. INTRODUCTION

Over the last half-century, the mining and oil and gas sectors have been at the centre of public attention due to a number of environmental catastrophes and concerns about human rights. Businesses in the resource extraction are often under greater pressure from stakeholders than other businesses because to the emphasis on these sectors in discussions of environmental sustainability and social responsibility. Many businesses recognize the need of communicating their strong economic, environment, and social impacts as well as their contribution to environmental sustainability by publishing sustainability reports.

Indicators for measuring and reporting a company's progress in sustainable development are included in most reporting frameworks and recommendations. We demonstrate the breadth and consistency of indicators utilized in these reports by comparing them to a complete collection of social indicators obtained from the literature. The data-driven strategy we used included extracting information from the integrated reporting via qualitative research and then analyzing the timing of the emergence of indicators in order to compare reporting patterns across sectors. We next tested the hypothesis, using appropriate statistical procedures, that the variations we saw over time in the reporting was statistically meaningful. This study demonstrates that sustainability reporting practices in the

extractive industries are inconsistent over time and that internal issues (those related to a company's internal operational procedures or workers) are properly represented than global problems (those related to the company's connections with organizations and other stakeholders), in particular transportation and supplies chain issues. Similarly, greater attention is paid to related environmental problems than indirect ones. Direct environmental issues are those that are directly connected to the firm and its activities without engaging any other parties. Further, although there are common tendencies in how many sectors report on social and environmental indicators, there really are large discrepancies in how various sectors report on economic statistics, particularly technology. While both sectors have long-standing sustainability reporting standards, we find that emerging tendencies reveal which issues are receiving the most attention from firms and which may need more attention. We consider this as a first step in imagining how various sectors may evaluate sustainable development in a more scientific, consistent, and productive manner. Fig 1 illustrates the growth of oil and gas industry in the current market.

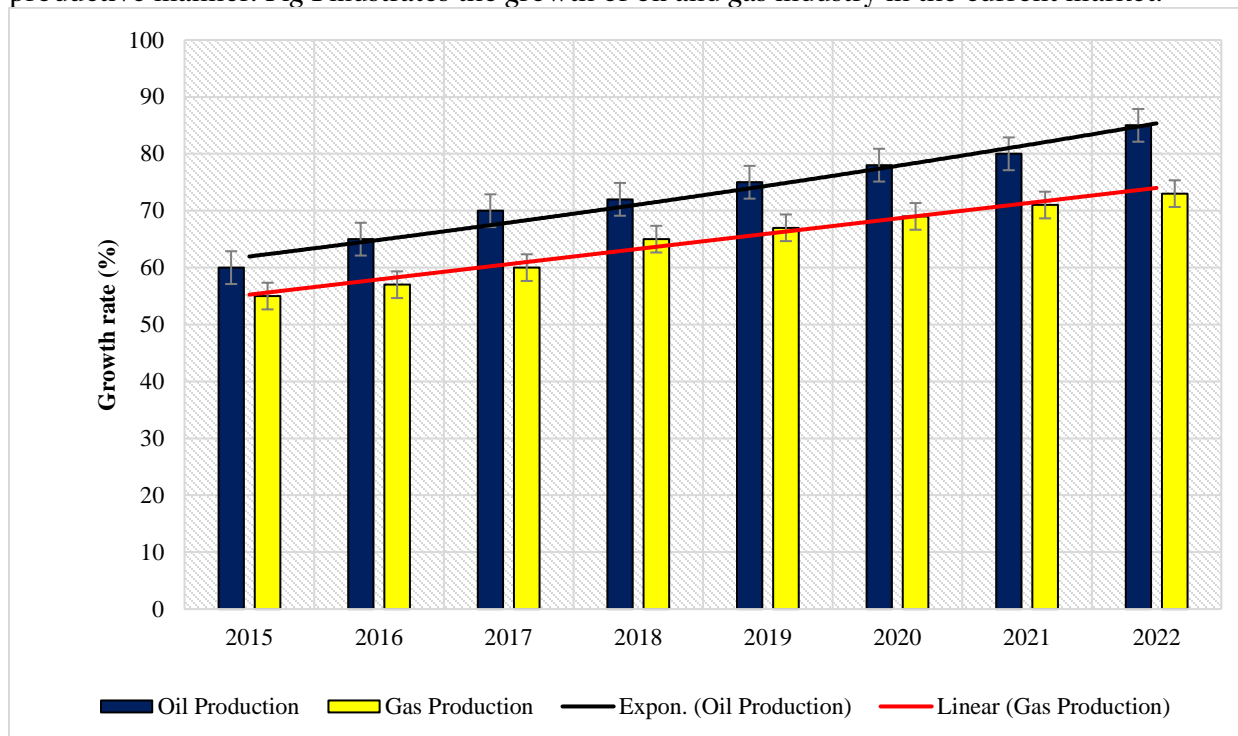


Fig.1. Growth of Oil and Gas

Long-term as well as globally focused, environmental sustainability aims to strike a balance between the economy, the environmental, and society. It requires a holistic approach to human well-being, a focus on the future effects of current actions, and the participation of all groups in society in order to find workable answers.

A. Research Issues

This article addresses the following gaps in the literature by:

- Presenting an analysis of contemporary conceptual approaches to defining sustainable development on the basis of indicators like environment protection, social economic effectiveness, and innovative development in reference to resources for oil and gas in the EPC companies.
- Identifying the connection between both the key objectives of sustainable growth in the context of the development of the EPC companies.
- Providing a framework for adopting sustainability advancement in the context of EPC Company's growth.

B. Importance of Sustainable Development for Oil and Gas Industry

The quantity of oil and gas operations, both onshore and offshore, has increased dramatically over the past several years. The authorization of offshore projects is projected to increase at a rapid clip throughout the projection period (2019-2027), leading to a surge in activity and, ultimately, income. In addition, the oil and gas EPC business stands to benefit greatly from engineering and procurement projects. As the oil and gas industry develops, players in the market will presumably use cutting-edge technology to enhance supply and demand and create more effective business models. These reasons are driving the growth of the oil & gas EPC market, which is projected to reach a

value of US\$ 64.7 Bn by 2027's end. Fig 2 illustrates the oil and gas industries for 2019 to 2027.

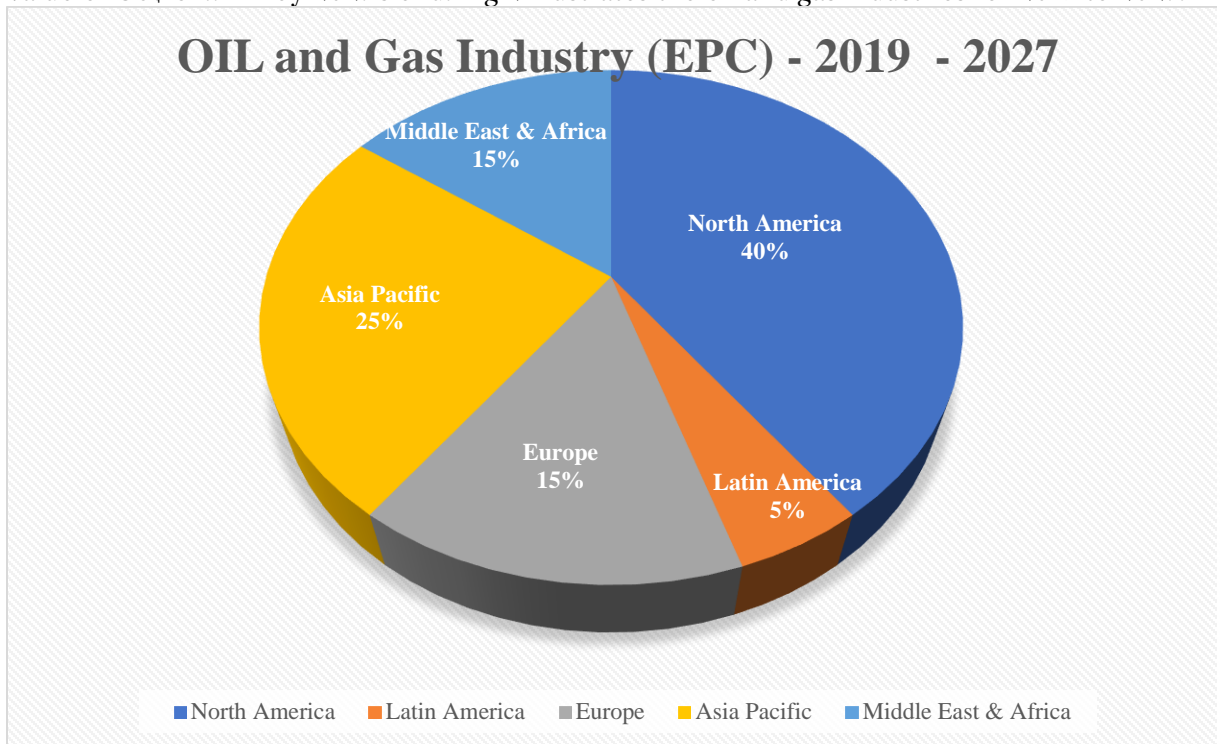


Fig.2. Usage of Oil and Gas for Different Countries

C. Motivation

Reduced crude prices as well as international difficulties have led to an increased supply and some major advances in the oil and gas business, ushering in a new normal of pandemic proportions. While growth in demand is predicted as the globe rebuilds from the epidemic, businesses still need to be flexible enough to adapt to a new normal. The company has to focus on streamlining its operations and supply chain in order to reduce production, distribution, and transportation expenses. The value chain of the oil and gas sector might be disrupted by Artificial Intelligence (AI). Unfortunately, AI models are often implemented in siloed, non-systematic ways that provide little to no overall value. A lack of positive results has an impact on future strategies. Even with the integration of data from diverse disciplines, the industry continues to focus on reservoir, geological, geophysics, engineering, and drilling. By centralising the company's geotechnical demands under one department, we've been able to boost output across the board. The oil and gas sector is unable to implement more widespread cross-functional AI use cases due to an operational division that was established in the past to address cost-cutting demands. Both the government and oil and gas corporations are interested in using the EPC businesses' resources because of how crucial it is to growing the companies' resources and economic potential. As a result, the concepts and methods used to explore for and produce oil and gas must adapt to the realities of a world where sustainable development is an integral part of the energy infrastructure. Today, oil and gas firms must focus on three main areas: (1) environmental sustainability exploitation and transport of hydrocarbons; (2) strong social responsibility and contributions to regional socioeconomic development; and (3) cost-effectiveness of oil and gas sector. As a crucial part of the long-term viability of resource exploitation by EPC firms, the researchers also consider requirements for creative and technical advancement in the oil and gas industry. To guarantee that hydrocarbon shipping and manufacturing processes are in compliance with strict environmental regulations, that the economic growth of the northern provinces become incorporated into the country's economy of Russia, that production lines in the oil and gas industry are upgraded in an innovative manner, and that development efforts in this region is balanced from an environmental perspective, EPC companies should follow the guidelines of environmental sustainability in the development of oil and gas fields. The purpose of the research is to design and present a justification for a fair system of environment, socio-economic, and creative indicators for determining whether the exploitation of the distinctive hydrocarbon deposits is sustainable. The authors of the study theoretical framework is based on the basics of the sustainable development idea and current methodologies for gauging the long-term viability of manufacturing processes. The study presents a examination of theoretical approaches used to define sustainable

development when it comes to oil and gas resources, such as those found in EPC industries, characterises target priorities for the sustainable development, and identifies the connection between the environmental, social economic, and imaginative domain names in the context of EPC resource development. Study findings show the potential impact of large-scale gas projects on regional growth and allow for more informed judgments to be made on whether or not the development of oil and gas reserves can be deemed sustainable in light of the concept's underlying principles.

As a result, the paradigm shift that has occurred as a result of the many responses to the difficulties of sustainable development in the industrial sector. It's a transition from a piecemeal approach to environmental problems, wherein only the final stages of the life cycle are considered (i.e., "end-of-pipe solutions"), to a life cycle approach that considers financial, environmental, and social considerations and thus produces more sustainable outcomes. But measuring industry's performance toward sustainable growth is one of the primary challenges it confronts in this environment. The remainder of this article will focus on this issue.

2. RELATED WORK

Climate change is a major problem that needs immediate attention. To a large extent, we can attribute this to human activity. Heat waves, cyclones, heavy rainfall, droughts, reduced water availability, loss of land mass, and vector-borne illnesses are only some of the extreme weather phenomena whose frequency and severity have changed as a result of climate change. The industrial business, particularly the oil and gas industry, is vulnerable to climate change because of its impacts on physical infrastructure and process efficiency. Assets may be damaged, manufacturing may stop, the supply chain may be disrupted, water may become scarce, and the health of workers may be negatively affected, among other potential consequences. All these effects bring up not only bodily dangers and losses, but also monetary ones. For this reason, it is crucial for companies to take steps to reduce their exposure to climate change risks. The oil and gas industry is already feeling the effects of climate change, and this study shows how these effects are spreading and how mitigation strategies are being put into place to make the industry more sustainable and increase environmental resilience. Major depletion of reserves and a late stage of development in most areas define the current state of Russia's oil and gas sector [11]. At the same time, most of the time the reserves in newly developed fields are difficult to extract. The Arctic and its offshore regions are home to the majority of the world's untapped oil and gas potential, but unlocking these reserves is a far more challenging process owing to Arctic-specific factors. This underscores the need for a novel strategy for tapping the Arctic's untapped oil and gas reserves. The purpose of this article is to shed light on the part innovation plays in the long-term growth of the Arctic's offshore oil and gas potential. This article provides a concise overview of the most pressing aspects of Arctic development that underline the importance of innovation to the region's long-term success. The Innovation Policy Road Mapping (IPRM) technique, in line with the notion of the Sustainable Development Goals (SDGs), for elucidating how innovations would contribute to sustainable development, is then introduced as the methodology employed in the study. This article provides a policy roadmap for innovation to aid in the long-term sustainable exploitation of oil and gas resources in the Russian Arctic and its shelf zone [12]. The host communities of the Niger Delta area and the oil and gas firms operating there in collaboration with the Nigerian government have been at odds for years. Depending on how it was handled, conflict, which is here defined as the expression of disagreement between individuals and organizations stemming from divergent and incompatible goals, may have both good and bad outcomes. Minimizing destructive effects is the name of the game in conflict management. This research looked at how Oil and Gas Company and host communities in the Niger Delta may make the most of the good aspects of conflicts via better conflict management. The research used an interdisciplinary methodology, a literature review, a case study, and an analytical approach to data analysis. According to the research, economic, social, political, and ecological reasons are the most significant causes of tensions between the oil and gas business and local residents in the Niger Delta. Methods exist that may be implemented in the management of conflicts. Among them are evading, accommodating, or smoothing; contending, or pressuring; competing; compromising; and partnering. Depending on the context, the nature of the dispute, and the methods available, any of these may be effective in managing it. The issue is that the oil and gas firms in cooperation with the Nigerian government frequently chose the incorrect strategy in dealing with the dispute with host communities, utilizing avoiding or pressuring techniques. The research suggests teaming up for a mutually beneficial long-term solution [13]. This study compiles and categorizes the various wastes generated by the offshore oil and gas sector. Several trips were made to offshore rigs and platforms owned by various oil and gas corporations operating in the Arabian Gulf region between 2002 and 2010. This, along with other material, was used to compile the work's descriptive approach. It emphasizes the need to create and carry out waste management strategies and measures in order to make the most of oil and gas offshore

resources. It also illustrates the waste management hierarchy that may be implemented to lessen the offshore oil and gas industry's negative effects on the environment and aid in attaining sustainable growth in this crucial economic sector [14]. Sustaining economic growth of any country can be seen in its oil and gas sectors, which have historically been at the forefront of technological innovation. The Russian oil and gas sector can only maintain its current domestic and global success by continuing to push forward with cutting-edge development trends. When it comes to oil and gas companies, the authors recommend using an integrated strategy for the planning and execution of cutting-edge development initiatives. To begin, companies in the oil and gas industry need to use a plethora of cutting-edge technologies that have the ability to significantly increase their own reserves. Deployment of advanced technologies by empowering of the energy resources provides for large economic advantages and improving the efficiency of an organization within a short time. Enabling innovation technologies is another part of the issue, as are management technologies or management innovations, which are the modifications made to provide an optimal setting for the success of innovative technologies. One of the most important aspects of progress is the establishment of a conducive management system as the foundation for creative processes. With this suggested approach, local Russian businesses and the Russian economy as a whole will be able to innovate and grow. The current study is a mixed-methods investigation since it employs both quantitative and qualitative methods to investigate the professional competency of hotel managers in the oil and gas business. The methods of both qualitative research and meta-analysis have been used. He has employed the quantitative strategy of fuzzy structural equation modelling. A new paradigm of sustainable growth in the oil, gas, and energy business has been attained, and it's all thanks to the data. These elements are: overall spectacular performance, analytical thinking, specific specialized qualifications, overall professional skills, employment data and awareness, mental abilities, innovative personality, basic specialist knowledge, work engagement, expert approach, desire to Job development, inherent personal attributes, and rising considerations that emotional abilities and rising factors of professionalism are positioned in the fourth level and were identified as the primary and perhaps most efficient dimensions in the creation of long-term development of oil, gas and energy industry. Overall performance today is the least significant of the dimensions we looked at [16].

Although there are many different ways to evaluate sustainability, the majority of these criteria are standard across the board. However, when analyzing specific systems, it is vital to take into consideration their features, the ways they relate to the environment possible threats they represent to the climate, and whether there is chance to adopt sustainable development principles. In light of this, while focusing the emphasis on particular economic models, it is desirable not to change general measures but rather to construct new indications that better represent the qualities of the item under study.

The follows must function as the core concepts for creating a comprehensive set of indicators for measuring the sustainable growth of resources:

- Contemplation of the three major aspects of sustainable development (environmental, economics, and social; more pillars may be added according to the nature of the thing being considered);
- Collaborative omission and collaboration of sustainability indicators;

3. 3 PILLARS OF SUSTAINABLE DEVELOPMENT IN OIL AND GAS INDUSTRY

Following is a description of the three pillars that make up the sustainable growth of the oil and gas sector.

ENVIRONMENTAL INDICATORS

- The environmental impact Use of resources.
- Climate change.
- Depletion of ozone layer.
- Acid deposition.
- Eutrophication.
- Photochemical haze Toxic impacts on humans Ecological effects Waste accumulation Efficient use of resources Intensity of resources and energy used, recycled content of materials, product longevity, and availability of services
- Environment Activities on Your Own Initiative
- E.M.S. - Environment enhancements beyond those required by law Evaluation of Providers

ECONOMIC INDICATORS

- Money-related metrics
- Gross domestic product (GDP) contribution
- Value-added - Protection of the environment spending

- Environmental liabilities
- Ethical investments
- Employment Impact of Human Capital Indicators Issues with employee retention, spending, and development stem from high turnover rates, poor health and safety records, and a lack of investment in the future of the company's workforce.

SOCIAL INDICATORS

- Ethical Measures Sustaining cultural traditions -stakeholder inclusion taking part in local initiatives Codes of behavior on a global scale -business interactions - child labor - fair pricing - partnering with repressive governments known for their corruption Fairness between generations
- Indicators of well-being - income distribution; job satisfaction; community needs met

4. MATERIALS AND METHODS

Fig 3 illustrates the pictorial architecture for sustainable development in the oil and gas industry.

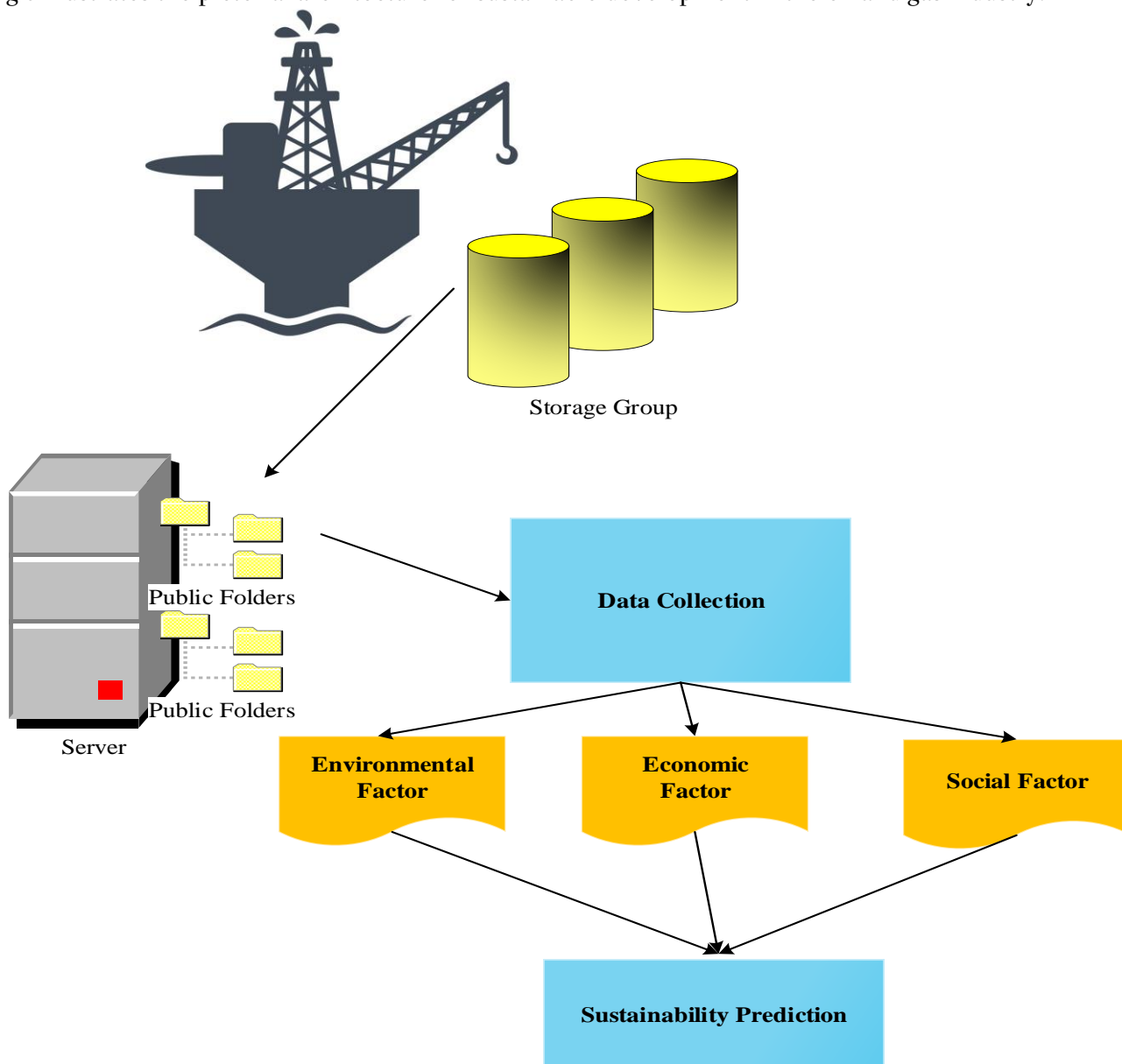


Fig.3. Flow for Sustainability Development in Oil and Gas Industry

Authentic well logging data is analyzed using many multiple linear regression model. Oil and gas layer patterns may be accurately identified with the help of the model. In this study, we do a multivariate analysis to determine which variables will have the most impact on the petroleum products market in the future. In order to construct the linear

regression, we employed statistical package. Estimated results of Oil and Gas sector growth were determined using multiple regression, with consideration given to the suggested set of indicators for environmentally, economic, and inventive sustainability. The first and second sustainable environmental criteria were determined by analyzing data from strategy papers outlining plans for the growth of EPC firms in the areas of regional production facility commission, treatment facility upgrade, and sludge sewage disposal.

5. DISCUSSION

The oil and gas industry is one of India's eight essential sectors, and its decisions have a significant impact across the board. Demand of oil and gas is expected to rise in tandem with India's rising economy, making the industry an attractive one in which to put money. As of the year 2021, India remained the third in the world user of oil. The rise in demand has prompted the government to implement a number of new measures. It's opened up numerous areas to 100 percent FDI, particularly oil and gas, petrochemical products, and factories. With no lack of investment or dilution of national ownership in current PSUs, the FDI ceiling for public service refining projects has been increased to 49%. Businesses like Reliance Industries Ltd (RIL) and Cairn India witness to the fact that it is now a preferred location for investors from all over the world.

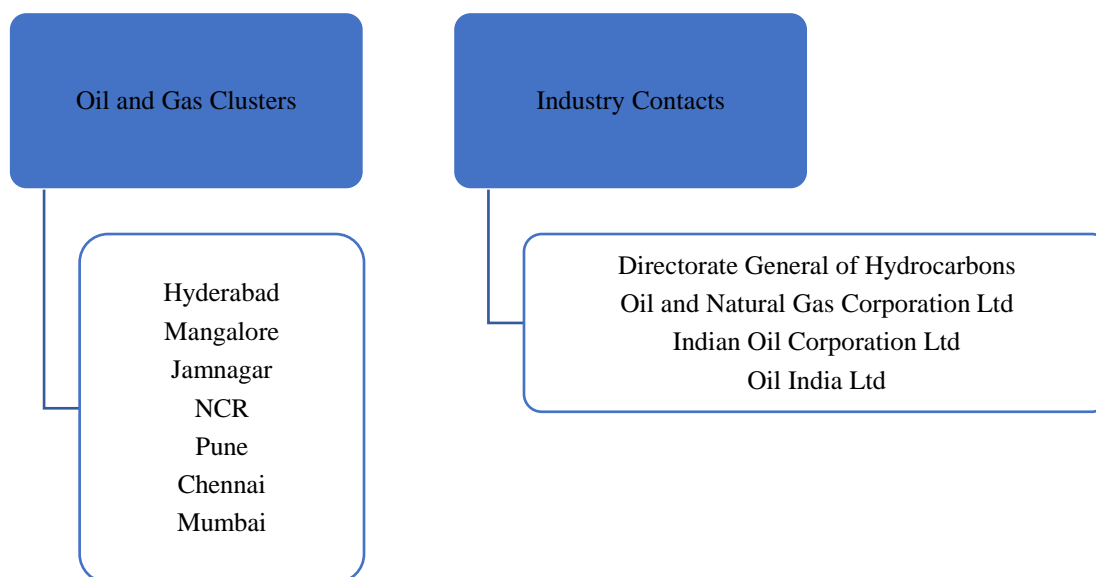


Fig.4. Contacts and Countries of Oil and Gas Industry

Investment in production and exploration is forecast to reach \$25 billion by 2022. India has 21 refineries, making it a major refining centre, and there are plans to expand by attracting investment from abroad in export-oriented infrastructures such as product pipelines and exporting ports. An estimated 5 million barrels of oil are used each day to serve Today's 60 million daily customers at its gas stations.

GROWING DEMAND

- By 2045, it is expected that India's oil consumption would have increased by a factor of two, reaching 11 million barrels per day.
- By 2045, diesel and gasoline would account for 58% of India's oil consumption, up from 33% in 2029-30.
- By 2024, it is projected that India's natural gas consumption would have increased by 25 BCM, or by an annual of 9% each year.

RAPID EXPANSION

- To collect money for infrastructure improvements and to store more oil in case prices go up, India plans to commercialise half of its strategic petroleum reserves.
- ONGC said in May 2022 that it will spend US\$ 4 billion between FY22 and FY25 to ramp up its exploration activities in India.

SUPPORTIVE FDI GUIDELINES

- In July 2021, an order was issued by the Department for the Promotion of Industry and Internal Trade (DPIIT) permitting oil and gas PSUs to receive 100% FDI through the automatic method.

- One hundred per cent FDI in upstream as well as private industry refining projects has been implemented by the state.

POLICY SUPPORT

- Customs duties on a number of essential substances were lowered in the Union Budget for 2022-23. These included methanol, acetic acid, and heavy feed stocks for petroleum refinery.

- India and the United States agreed to increase their energy cooperation in September 2021.23. Their efforts would centre on developing their respective domestic markets' access to new and alternative fuels.

Recently, Fortune Corporate Insights released a case study they had undertaken on the the oil and gas engineering, procuring, and constructions (EPC) industry. The study's primary objective is to provide the customer with in-depth market research on future business prospects in the industry throughout the projected period; it was commissioned by a major shipbuilding firm in South Korea. The customer also wanted to know where they were in relation to the competition so they could make informed strategic choices to cement their position in the market. In order to determine market price and estimates, the following steps were taken:

- Conducting a survey of all participants in the oil and natural gas EPC market;
- Projecting average income based on market fragmentation and service offerings;
- Forecasting the investment environment, industry outlook, and other market trends;
- Consolidating a basket of knowledge and insight from thought leaders and industry participants on the latest market dynamics;
- Determining market value and figures after carefully analyzing the various aspects.

RESEARCH OBJECTIVES & SCOPE

Research and forecast the worldwide oil and gas EPC market, disaggregating results by region as necessary. Further, a comprehensive look at the future of the South Asian and South Korean markets. Indicators such as location, operator, provider, contractual amount, the year award, specifications of the project, etc., for all awarded EPC contracts from 2015 through 2018 should be provided. Start providing marketing information on major market drivers, constraints, developments, possibilities, future demand, market share of companies, and current developments by regions, as well as comprehensive profiles of companies operating in the global oil & gas EPC market, which include their strategic planning, SWOT analysis, key developments, recent projects, etc.

RESEARCH METHODOLOGY

Model developed by keeping tabs on all Engineering, Procurement, and Construction (EPC) contracts award given by oil & gas operators through a combination of paid and public data sources, predicting EPC revenue based on portfolio, gathering market viewpoint from industry leaders, and triangulating the results to estimate consumer needs. Key players in the oil & gas EPC industry were interviewed, and data was gathered from their annual reports, investor presentation, news releases, and business websites.

RESEARCH OUTCOME

The customer was interested in understanding how they stacked up against the other major oil and gas EPC providers. The research was commissioned because of the requirement for market knowledge about forthcoming business possibilities and industries in different nations over the anticipated term. Our client requested that we present the study's results at an executive discussion and utilise the data to help them develop a strategic marketing strategy for the following quarter targeting the nations studied.

Controversy has always surrounded the EPC industry's pursuit of oil and gas reserves. The environmental and social elements of resource extraction are frequently debated in the EPC Circle, in addition to concerns about the economic viability of capital-intensive EPC projects in light of the volatile energy market and a drop in demand and prices for energy supplies, mainly oil. Striking a balance between exploiting the region's resource potential, protecting the environment, and ensuring the long-term health of the region's social and economic structures is a problem that affects people all over the world. To ensure domestic needs for hydrocarbons and stable exports, minimize environmental damage, develop knowledge-intensive technologies and facilities, fully utilize production capacities, build out transport and social infrastructure, and create new high-tech jobs are all aspects of oil and gas sustainability in the EP.

The issue of how to safely remove and transport materials has taken center stage. Even in the present day, oil and gas development, particularly on the continental shelves, and transport growth pose significant threats to the environment. If oil or gas leaks occur during shipping, the results might be disastrous for the Arctic Ocean. Given

that the development of hydrocarbons on a large scale contributes to the acceleration of the global warming process, addressing this issue should take precedence over the pursuit of commercial and geopolitical gains from the growth of EPC firms.

6. CONCLUSION

This research aimed to examine the conceptual characteristics of the sustainable development paradigm within the context of growing the oil and gas industry for EPC businesses, in addition to the methodological methods sustainability evaluation. Conditions for environmental sustainability in the EPC's development of hydrocarbon resources were recognized, as were the unique aspects of social and economic growth of EPC firms with respect to the oil and gas sector, and the potential for creative upgrading in these areas was explored. This research provided the basis for proposing actionable indicators for gauging the long-term viability of oil and gas resource development. These metrics account for the one-of-a-kind characteristics of hydrocarbon potential-based initiatives, the peculiarities of regional economic development, and the effects of the worldwide energy system's transition. Effective data of regional growth in India were examined across several time periods to evaluate the proposed set of indicators and aid in the analysis and assessment of the sustainability of large - scale wind gas production in various nations. Regression analysis was used to provide in-depth projections for all of the metrics. The study's findings provide solid evidence for the viability of applying sustainable development concepts to offshore resource extraction. One key suggestion for extending the proposed system's usefulness is to include additional criteria for ecological sustainability. Special strategies are needed to guarantee ecologically sound hydrocarbon extraction and transportation under varying circumstances, given the substantial environmental hazards of EPC-based gas and oil projects, the fragility of environments, and the rising environmental consciousness. Sustainable development indicator levels must be tracked on a regular basis, and new targets established, to account for emerging patterns in oil and gas industry growth.

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