

# Study of Socio-Economic-Cultural Impacts and Community Health Due to Oil and Natural Gas Exploration Activities in the Tuban Oil and Gas Field

Ai Siti Patimah<sup>1,2</sup>, Sigit Heru Murti<sup>3</sup> and Agus Prasetya<sup>4</sup>

<sup>1</sup>Department of Mining Engineering, University of Papua, West Papua, Indonesia.

<sup>2</sup>Student of the Doctoral Program in Environmental Science, The Graduate School of Universitas Gadjah Mada, Yogyakarta, Indonesia. <sup>3</sup>Department of Geographic Information Science, Faculty of Geography, Universitas Gadjah Mada, Yogyakarta, Indonesia. <sup>4</sup>Department of Chemical Engineering, Faculty of Engineering, Universitas Gadjah Mada, Yogyakarta, Indonesia

**Received :** 2021-11-23

**Revised:** 2021-12-22

**Accepted:** 2023-02-16

**Keywords:** social; economic; cultural; public health; the impact of exploration; oil and gas field; Tuban

**Correspondent email:**  
[fatimah13lee@gmail.com](mailto:fatimah13lee@gmail.com)

**Abstract.** This research is a social study that captures several problems in the oil and gas sector combined with literature studies that have relevant themes. This study aimed to determine the social, economic, cultural, and health impacts of the oil and gas company's exploration activities in the Tuban Oil and Gas Field. Primary and secondary data were collected in the second half (semester II) of 2018. The methods used in this study were qualitative and quantitative. The qualitative methods used for the primary data acquisition were observation and interviews. Primary data were obtained through direct observation and interviews with respondents selected by purposive sampling. The quantitative method was used to obtain secondary data from research documents and reports relating to government agencies and companies. The primary and secondary data were combined, and interviews using the focus group discussion method were conducted for comprehensive information. The final data obtained were analyzed using descriptive statistical methods. Based on the results, there are jobs available for local workers, but the information is not publicly shared and most of the jobs are temporary or project-based. Most people know and feel the benefits of the presence of oil and gas companies in their area. The community expects the company's efforts to reduce people's concerns about oil and gas activities. Conflicts often occur due to delays in the disbursement of compensation funds, the implementation of CSR, and the direct impacts of several oil and gas company activities on the community. The company's efforts to boost the local economy are by increasing employment opportunities and incomes. Meanwhile, in terms of public health, the correlation between the reported diseases and the activities of oil and gas companies cannot be definitively determined. In general, oil and gas companies have positive impacts on the community around their working areas.

©2023 by the authors. Licensee Indonesian Journal of Geography, Indonesia.

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY NC) license <https://creativecommons.org/licenses/by-nc/4.0/>.

## 1. Introduction

Indonesia has seen an increase in the upstream activities of the oil and gas sector since rejoining OPEC in 2015. These activities start with exploration to find new oil or gas reserves. In 2018, proven crude oil reserves in Indonesia reached 3.7 billion barrels, and the total investment in upstream activities was up to USD 1.8 billion (Cekindo, 2018). However, with the current production levels, the reserves are predicted to run out in about nine years. Therefore, the Indonesian government encourages more oil and gas exploration activities to balance the national energy needs that are constantly increasing every year (IPA, 2020). One of the areas encouraged for the development of oil and gas exploration is Tuban Regency, East Java Province. Pertamina Hulu Energi Tuban East Java (PHE TEJ) is developing the Mudi Field in the Tuban Block by installing the Mudi-26 well. The development of the Mudi-26 well is expected to increase production by 200 barrels per day (Pertamina, 2020).

Upstream activities have geographical impacts. Geographical impacts refer to historical, physiographic

(including geological, climatic, and ecological), economic, and cultural effects exhibited by a spatially delimited area. This affects the nature, development, characteristics, and magnitude of the impact of oil and gas activities on local communities (Haggerty et al., 2018). Upstream activities, especially oil and gas exploration, influence the community around the operational area. Several studies found that oil and gas exploration activities have both positive and negative impacts on local communities. The positive impact of oil and gas exploration activities is an increase in job opportunities and earned incomes. In addition, local economic activities are also increasing because the mobility of people in the area is becoming more dynamic, triggering the emergence of empowerment strategies and initiatives, i.e., efforts to improve the welfare of the community, especially those living around the drilling location (Baik, 2015). Meanwhile, the negative impacts are price inflation, increasing social problems, and environmental degradation, such as noise pollution, soil erosion, and wildlife disturbances (Byakagaba et al., 2019).

Downstream activities, including exploitation, can increase demands for goods and services that support the oil and gas industry and provide benefits to the surrounding community (Abboud & Betz, 2021). Oil and gas exploration activities give more social burdens to the community than social benefits (Akakpo, 2012). Other social problems associated with oil and gas exploration activities are related to public perceptions, such as lack of community participation, poor communication with the surrounding community, local workers with inadequate skills and experience in the oil and gas industry, and poor organizational structures of the local government (Okuthe, 2015).

In building social relations with the local community and government, oil and gas exploration companies may encounter conflicts due to emerging personal interests and distrusts. To minimize these negative impacts, it is necessary to make effective regulations, hold intensive dialogues with the community, and form an imaginative stakeholder organization (Stammler & Wilson, 2006). Evenhuis (2016) argues that cultures develop along with changes in people's mindsets, infrastructure facilities, education, and employee diversity in oil and gas companies. The existence of the oil and gas industry plays a role in shaping the social and culture of the surrounding community (Haggerty et al., 2018). Local cultural differences can hinder communication in recruiting employees. For instance, communication gaps can occur when the oil and gas company hires more workers without disseminating accurate information about the employment; thus, particular strategies to convey this information are needed (Weijermars, 2008; Sayyadi, 2019).

Oil and gas exploration activities also affect the surrounding communities and may lead to public discomfort. The most frequently encountered environmental impacts are caused by groundwater and air pollution. To address and prevent public distrust, it is necessary for oil and gas companies to periodically check groundwater and air conditions (Colborn et al., 2011). Air pollution from oil and gas exploration activities has the potential to cause cancer; for instance, the risks of getting cancer from benzene and ethylbenzene exposure are  $1.0$  to  $3.6 \times 10^{-5}$  and  $7.3 \times 10^{-5}$ , respectively (McMullin et al., 2018). Another health problem is the noise caused by oil and gas exploration activities. The noise level of oil and gas exploration activities can cause sleep disturbances and even cardiovascular diseases (Hays et al., 2017). Communities around the location of oil and gas exploration activities are likely to suffer mental stress due to environmental pollution (air, groundwater, surface water, and noise), truck traffic, as well as psychosocial stress related to community changes (Adgate et al., 2014). Current evidence suggests potential health effects from exposure to oil extraction (upstream activities), such as cancer, liver damage, immunodeficiency, and neurological diseases. Adverse impacts on soil, air, and water quality in oil drilling areas have also been reported (Johnston et al., 2019).

Oil and gas exploration activities also negatively affect public health, both physically and mentally. Many oil and gas exploration activities are in direct contact with the environment, schools, and people's daily lives, which have implications for the community's mental health. This is due to limited community participation and unclear procedures in selecting the operational area of oil and gas mining (Malin, 2020). Public health, especially psychological problems (discomforts) and sociocultural disorders, can be analyzed using an ethnographic approach. Oil and gas exploration

companies can use it to make policies to minimize stress suffered by individuals and communities around their working areas (Perry, 2013).

This study aimed to measure the impact of the oil and gas company's exploration activities on the socio-economic-cultural aspects and public health of the community around the Tuban Oil and Gas Field. The operational activities of oil and gas companies influence the local economy, business and job opportunities, horizontal conflicts in the community, discomforts, and the health of the directly affected people. Studies on the impact of oil and gas industry activities have so far focused on the implementation of corporate social responsibility (CSR) or discussions on only one aspect rather than comprehensively investigating the multifaceted impacts, comprising social, economic, cultural, and public health that are directly related to the company activities.

## 2. Methods

### Research sites

This research was located in the Tuban Oil and Gas Field, which is the working area of Pertamina-Petrochina East Java (P-PEJ). In this study, the area observed is in direct contact with the exploration activities of oil and gas companies, as shown in Figure 1. The study was conducted for six months, with details of the monitoring area indicated in Table 1. The research location covered three regencies in East Java, Indonesia: Tuban (15 villages), Bojonegoro (4), and Gresik (5). The unit of analysis in this study was the village, and these 24 villages were selected because they were directly affected by the exploration activities of oil and gas companies.

The analysis unit of the Tuban Oil and Gas Field consisted of three smaller fields: Mudi Field, Sukowati Field, and Lengowangi Field. Mudi is the most extensive field where the main oil and gas exploration activities take place. The sampling locations for the social, economic, cultural, and public health aspects are presented in Figure 1, visualized using the base map provided by Google Maps.

### Research methods

The method in this study combined qualitative methods for primary and secondary data collection and quantitative methods for descriptive statistical data presentation. Quantitative research aimed to obtain measurable data and interpret their meaning, while complementary qualitative methods were used to gather more detailed and comprehensive information through interviews with respondents and provide explanations about possible relationships between variables in quantitative data (Dowding, 2013). Because the social reality is highly volatile, this mixed-method design is deemed the most suitable for social research (Stolz, 2016). In this study, the geographical perspective was used to observe the differences in the economic, social, and cultural conditions of people living close to and far from the locations of oil and gas activities (Haggerty et al., 2018).

Primary data were collected by direct observation and monitoring in the field, as well as interviews. In qualitative research, the most common methodologies used are observation and interviews (Jamshed, 2014). The initial stage of the research was conducting field observations to find out problems to be explored further through the interview process. Field observations in areas directly affected by the exploration activities of oil and gas companies identified the six most prominent problems, as shown in Table 2 below.

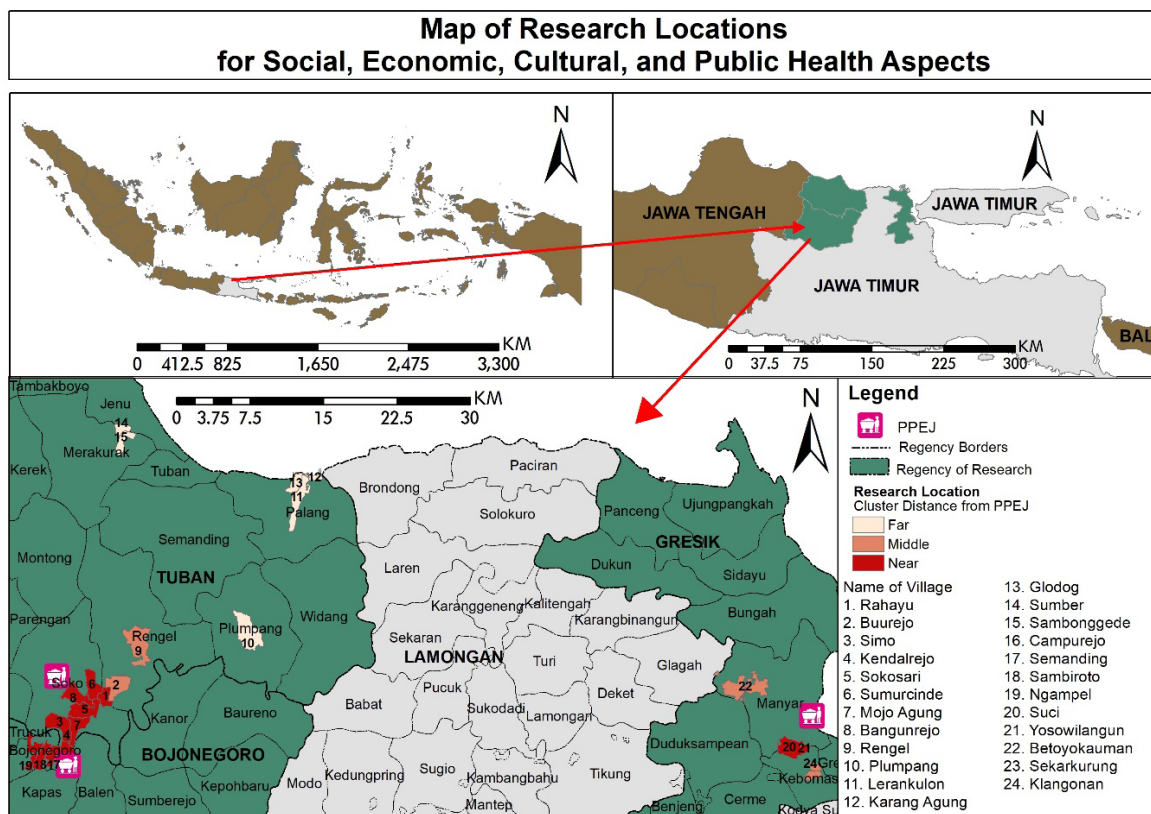


Figure 1. Map of the research locations for social, economic, cultural, and public health aspects (JOB-PPEJ, 2018)

Table 1. Administrative details of the locations of the social, economic, cultural, and public health aspect monitoring

| No | Monitoring Location |          |         | No | Monitoring Location |            |            |
|----|---------------------|----------|---------|----|---------------------|------------|------------|
|    | village             | district | regency |    | village             | district   | regency    |
| 1  | Rahayu              | Soko     | Tuban   | 13 | Glodog              | Palang     | Tuban      |
| 2  | Bulurejo            | Soko     | Tuban   | 14 | Sumber              | Merakurak  | Tuban      |
| 3  | Simo                | Soko     | Tuban   | 15 | Sambonggede         | Merakurak  | Tuban      |
| 4  | Kendalrejo          | Soko     | Tuban   | 16 | Campurejo           | Bojonegoro | Bojonegoro |
| 5  | Sokosari            | Soko     | Tuban   | 17 | Semanding           | Bojonegoro | Bojonegoro |
| 6  | Sumur Cinde         | Soko     | Tuban   | 18 | Sambiroto           | Kapas      | Bojonegoro |
| 7  | Mojo Agung          | Soko     | Tuban   | 19 | Ngampel             | Kapas      | Bojonegoro |
| 8  | Bangunrejo          | Soko     | Tuban   | 20 | Suci                | Manyar     | Gresik     |
| 9  | Rengel              | Rengel   | Tuban   | 21 | Yosowilangun        | Manyar     | Gresik     |
| 10 | Plumpang            | Plumpang | Tuban   | 22 | Betoyokauman        | Manyar     | Gresik     |
| 11 | Lerankulon          | Palang   | Tuban   | 23 | Sekarkurung         | Kebomas    | Gresik     |
| 12 | Karang Agung        | Palang   | Tuban   | 24 | Klangonan           | Kebomas    | Gresik     |

Table 2. Problems identified in the field observations in relation to the oil and gas company's exploration activities

| Observed Problem            | Specific Problem to be Studied  |
|-----------------------------|---|
| Increased Job Opportunities | <ul style="list-style-type: none"> <li>Public perception of local labor recruitment</li> <li>Dissemination of information on the recruitment of local workers</li> </ul>  |
| Public Perception           | <ul style="list-style-type: none"> <li>Knowledge of the existence of the oil and gas company's operational activities</li> <li>Public perception of the operational activities of oil and gas companies</li> </ul>                            |
| Discomforts and Concerns    | <ul style="list-style-type: none"> <li>Concerns about the operational activities of oil and gas companies</li> </ul>  |
| Conflicts                   | <ul style="list-style-type: none"> <li>Horizontal conflicts in the community due to the operational activities of oil and gas companies</li> </ul>  |
| Improved Local Economy      | <ul style="list-style-type: none"> <li>Community's responses to economic improvement in the oil and gas company's operational area</li> <li>Business opportunities for the community</li> </ul>   |
| Public Health               | <ul style="list-style-type: none"> <li>Possible diseases arising from the operational activities of oil and gas companies</li> <li>Data on diseases suffered by the community around the operational area of oil and gas companies</li> </ul> |

Table 3. Number of sampled villages and respondents

| Regency    | Villages   | Number of Respondents | Respondent's Role   |
|------------|--|-----------------------|---|
| Tuban      | Rahayu, Bulurejo, Simo, Kendalrejo, Sokosari, Sumur Cinde, Mojo Agung, Bangunrejo, Rengel, Plumpang, Lerankulon, Karang Agung, Glodog, Sumber, Sambonggede | 40                    | informal community leaders, sectoral agencies, and village government |
| Bojonegoro | Campurejo, Semanding, Sambiroto, Ngampel   | 40                    |   |
| Gresik     | Suci, Yosowilangun, Betoyokauman, Sekarkurung, Klangonan   | 30                    |   |
| Total      |  | 100                   |   |

Table 4. Research parameters, including the data derived from observations, sources of impact, methods of data collection and analysis

| Parameter                           | Information  |
|-------------------------------------|--|
| <b>Increased Job Opportunities</b>  |  |
| Analyzed Data                       | <ul style="list-style-type: none"> <li>Public perception of local labor recruitment</li> <li>Dissemination of information on the recruitment of local workers</li> <li>Number of recruited local workers</li> </ul>  |
| Impact Source                       | Employment during the oil and gas company's operations   |
| Data Collection and Analysis Method | <ul style="list-style-type: none"> <li>Primary and secondary data collection</li> <li>Descriptive statistical analysis</li> </ul>  |
| <b>Public Perception</b>            |  |
| Analyzed Data                       | <ul style="list-style-type: none"> <li>Knowledge of the existence of company activities</li> <li>Public perception of company activities</li> <li>Community's support for the company activities</li> <li>Public perception of the impact of company activities</li> </ul> |
| Impact Source                       | Community involvement in the operational activities of oil and gas companies   |
| Data Collection and Analysis Method | <ul style="list-style-type: none"> <li>Primary and secondary data collection</li> <li>Descriptive statistical analysis</li> </ul>  |
| <b>Discomforts and Concerns</b>     |  |
| Analyzed Data                       | Concerns about the existence of the company and changes in people's lifestyles due to the company's activities   |
| Impact Source                       | The operational activities of oil and gas companies include drilling, land and sea pipeline constructions, noise, and the conversion of agricultural land use.   |
| Data Collection and Analysis Method | <ul style="list-style-type: none"> <li>Primary and secondary data collection</li> <li>Descriptive statistical analysis</li> </ul>  |
| <b>Conflicts</b>                    |  |
| Analyzed Data                       | Number of conflicts occurring in the community due to company activities   |
| Impact Source                       | The operational activities of oil and gas companies are related to drilling activities, pipelines, compensation, and CSR programs.   |
| Data Collection and Analysis Method | <ul style="list-style-type: none"> <li>Primary and secondary data collection</li> <li>Descriptive statistical analysis</li> </ul>  |
| <b>Improved Local Economy</b>       |  |
| Analyzed Data                       | <ul style="list-style-type: none"> <li>Community responses to local economic improvement</li> <li>Business opportunities for the community around the company's activities</li> </ul>  |
| Impact Source                       | The oil and gas company offers CSRs in the form of educational assistance programs (scholarships) and in the environmental, economic, sociocultural, infrastructure, and health sectors.   |
| Data Collection and Analysis Method | <ul style="list-style-type: none"> <li>Primary and secondary data collection</li> <li>Descriptive statistical analysis</li> </ul>  |
| <b>Public Health</b>                |  |
| Analyzed Data                       | <ul style="list-style-type: none"> <li>The number of the varying diseases caused by the company's activities</li> <li>Diseases suffered by residents and their correlation with the impact of the company activities</li> </ul>  |
| Impact Source                       | Complaints about health problems experienced, data on the level of visits to local health care centers, and types prevalent illnesses.   |
| Data Collection and Analysis Method | <ul style="list-style-type: none"> <li>Primary and secondary data collection</li> <li>Descriptive statistical analysis</li> </ul>  |

After data collection through observations in the field (see Table 2), the next step was to find comprehensive information through interviews. The interviews were conducted in a focus group discussion (FGD) to acquire the same understanding and perspective (Dilshad & Latif, 2013). Interviews in the form of FGDs, however, have a weakness in exploring confidential and potentially harmful information that requires prior consent for disclosure (Sim & Waterfield, 2019). Nevertheless, information on the social, economic, cultural, and public health impacts of the oil and gas exploration activities was generally not confidential because the existing problems were publicly known; therefore, the interviews aimed to confirm and classify the problems for an accurate analysis.

Respondents in the focus group discussion (FGD) were selected by purposive sampling. Purposive sampling was chosen because it allows the straightforward collection of data relevant to the objectives of the study, thereby improving the quality of data and research results (Campbell *et al.*, 2020). Data collection using the purposive sampling method is based on the researcher's assessment of which parties are most capable of providing the best information to achieve the research objectives (Etikan & Bala, 2017). This study involved 100 respondents who represented different components of the community, including informal community leaders, sectoral agencies, and the village government. The selected community components are those who had the knowledge of and were directly affected by the operational activities of oil and gas companies. The number of samples and respondents is presented in Table 3.

Secondary data analysis provides preliminary information for answering new questions in primary data collection. However, the challenge in secondary data analysis is the possibility of losing context, meaning that particular efforts are needed to understand the context needed to support and understand primary data (Irwin, 2013). Primary data were obtained by collecting public opinion, perception, and aspiration through observations and interviews. Secondary data were obtained from relevant documents and reports from local government institutions and companies. Some secondary data were obtained from the Monitoring Report of the Environmental Management Plan and Environmental Monitoring Plan (RKL-RPL) compiled by Pertamina-Petrochina East Java, Semester II of 2018 (JOB P-PEJ, 2018). The parameters used in this study referred to Nimon's research (2014) that analyzed and drew conclusions from primary and secondary data. The description of each problem identified in field observations, including the data to be analyzed, sources

of impact, collection methods, and data analysis methods, is presented in Table 4.

Overall, the research methodology for analyzing the social, economic, cultural, and public health impacts of the oil and gas company's exploration activities was divided into three stages, namely case study determination, data collection, and data analysis, as shown in Figure 2. The initial stage started with determining the location, followed by observing the problems at a glance directly in the field. Furthermore, the observation results were combined with existing secondary data to produce preliminary data for field surveys so as to obtain comprehensive information. The last stage was processing and analyzing secondary data and primary data obtained in the field.

### 3. Results and Discussion

Based on the field observations and interviews with 100 respondents around the oil and gas company's operational area, it was found that the respondents had varying perceptions of the local worker recruitment, that this program was very good (9%), good (23%), moderate/neither good nor bad (14%), not good (39%), and bad (15%), as shown in Figure 3. The interview results showed that, according to 58% of the respondents, information on the recruitment of local workers was not publicly shared, and 32% stated that their family members worked in the operational area of oil and gas companies. The primary and secondary data were recapitulated and analyzed using descriptive statistics. The results of using both data may reveal a variety of new information and insights that have never been seen before (Nimon, 2014). The analysis results should be validated, and in this research, the validation process used FGDs. Furthermore, a series of FGDs were carried out to discuss the social, economic, cultural, and public health factors around the oil and gas fields. Participants of varying backgrounds and roles in the community, namely informal community leaders, sectoral institutions, and village governments, were invited to participate in these FGDs to enrich the discussions with their different opinions (Asmone *et al.*, 2022).

There are two types of employment status in oil and gas companies: workers are either permanently employed or outsourced. In addition, regarding employment opportunities, most people understand that these companies only recruit local workers for temporary positions. They are hired by projects (e.g., only during pipeline installation or drilling well construction) and will no longer be employed once the project is completed.

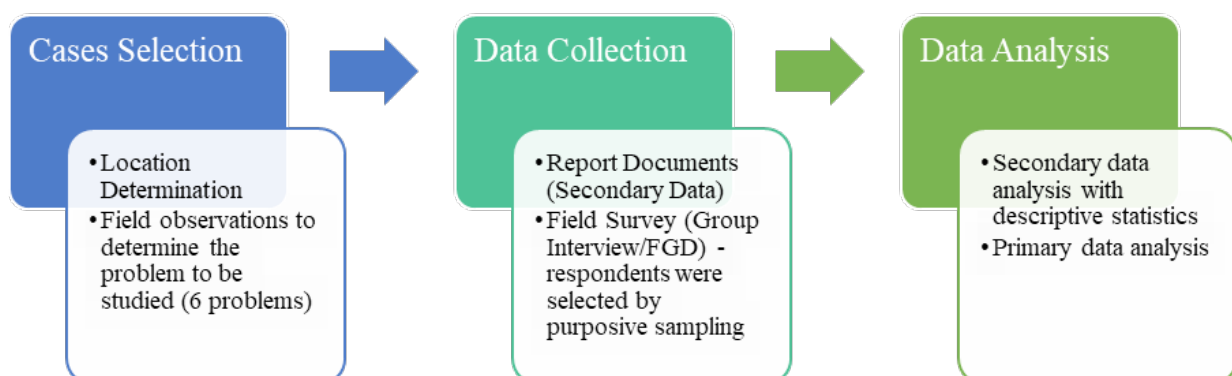


Figure 2. Methodological procedures

The results of observations and interviews were complemented by the conditions of three oil and gas fields, namely Mudi Field, Sukowati Field, and Lengowangi Field. The Mudi Field received the most local workers compared to other operating areas. The people in the Mudi Field complained about the information on local labor recruitment that was not publicly shared. The same complaint was reported in the Sukowati Field, where the community argued that the dissemination of information on local worker recruitment was lacking, and the recruitment was still temporary. However, here, the workers were provided with training on well drilling and other oil and gas-related jobs, which improved their opportunities to work in oil and gas companies outside the Tuban region. Meanwhile, in the Lengowangi Field, the recruitment of local workers was ceased after the well drilling project was completed.

In general, information on local worker recruitment is not disseminated publicly, and their employment is still largely project-based. Although the interview results indicated that most local recruitment is temporary, some local workers are permanently employed by oil and gas companies. It is necessary to investigate the reasons behind the temporary local employment by oil and gas companies. One of the parameters

that affect the company's recruitment is the level of education and competency in certain skills (Morley, 2007). Therefore, it is necessary to conduct more specific and in-depth studies on the correlation between the competency (education level and mine-related skills) of local workers around the operational area and their recruitment by the companies. It corresponds to the special skills training provided for workers in the Sukowati Field. Skills training in the oil and gas industry can create better opportunities for local workers to be accepted as employees of oil and gas companies (Darkwah, 2013).

**Public Perception**

Based on observations on the public responses, the majority of the respondents (82%) were aware of the existence of oil and gas companies in their respective areas and the types of their operational activities. It was revealed that most of the respondents (69%) claimed to support the oil and gas company's operational activities, while nearly one-third (31%) did not, as illustrated in the pie chart in Figure 4. The reasons for those not supporting the oil and gas company's operational activities were different for each village. Several reasons identified from the directly affected villages are presented in detail in Table 5.

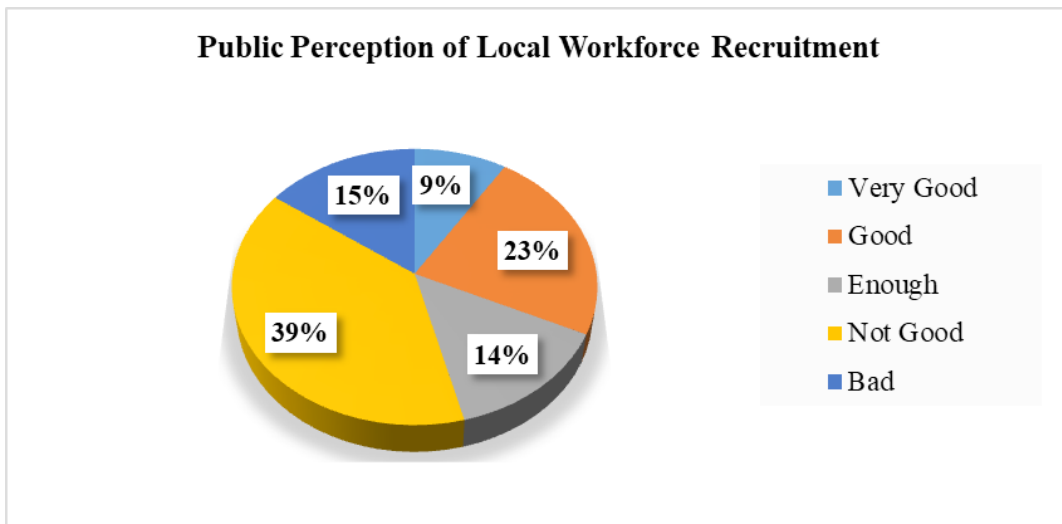


Figure 3. Public perception of local labor recruitment

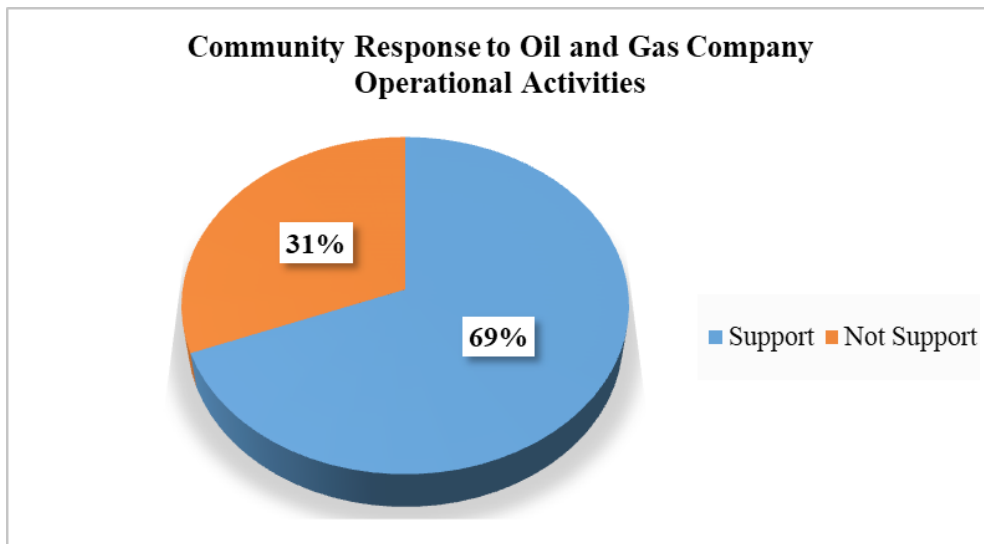


Figure 4. Community's support for the operational activities of oil and gas companies

Table 5. Reasons to not support the activities of oil and gas companies by village.

| Village     | Reason of Disapproval   |
|-------------|---|
| Rahayu      | The amount of compensation obtained is considered inadequate.   |
| Bulurejo    | Not many local workers are hired by the company.  |
| Campurejo   | The community is not adequately involved in the operational activities and receives low attention from the company. |
| Sokosari    | The company's activities contaminate the environment.   |
| Sambonggede | Residents are concerned about the possible impact and the loss of their agricultural land.                          |
| Sambiroto   | The company seems to pay less attention to the surrounding environment.   |
| Lerankulon  | The company's activities do not benefit the residents.  |

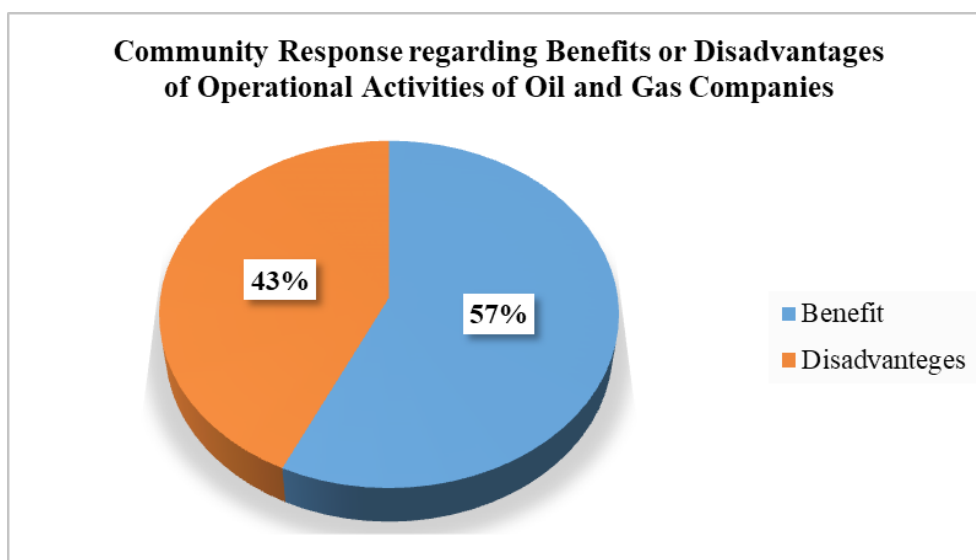


Figure 5. Public perception related to the benefits and the losses experienced due to oil and gas activities

Another parameter observed to understand public perception was the benefits and losses experienced by the community. Observation results showed that 57% of the community benefited from the activities of oil and gas companies, while the remaining 43% were disadvantaged, as shown in the pie chart in Figure 5. The benefits received by the surrounding community from the operational activities of oil and gas companies included business and job opportunities, community empowerment, and additional income from land rent for residents whose properties were affected or traversed by the pipelines. In contrast, some losses experienced by the community were decreased income due to the conversion of agricultural land to accommodate the company's operational activities.

Overall, the community is aware of the operational activities of oil and gas companies in their area, and most have felt the benefits of their existence. However, based on the expressed complaints, some residents experience losses or disadvantages from the oil and gas company's activities. Positive and negative responses to the oil and gas company's activities are based on the benefits and costs or the resulting economic effects (Ahmed & Ebrahim, 2019). The economic contributions make the community feel the advantages of having oil and gas companies in their village, even though some have complained about perceived disadvantages. Regardless, not one village refuses the activities of oil and gas companies in their area. Nevertheless, extensive studies on the role of oil and gas companies in changing their surroundings, such as new

road constructions (Kuklina *et al.*, 2020), are necessary. This can be achieved by researching differences before and after the establishment of an oil and gas company in the area observed.

#### Public Discomforts or Concerns

Based on interviews with respondents directly affected by the operational activities of oil and gas companies, more than half of the respondents (63%) were concerned about and felt uncomfortable with the existence of oil and gas companies in their area. The causes of discomforts and concerns associated with these companies are presented in detail in Table 6.

The local residents expect the company to be more attentive to their concerns, which have so far been inadequately addressed. To minimize public concerns and discomforts caused by the upstream and downstream activities of the oil and gas sector, it is necessary for the companies to initiate an intensive dialogue with the community (Stammler & Wilson, 2006), particularly to communicate occupational safety and health management systems that every oil and gas company has adopted and implemented (Tang *et al.*, 2017).

#### Conflicts in the Community

Based on interviews with the community, 62% of the respondents stated that the operational activities had caused conflicts in their village since the company's establishment. The causes of conflicts were different for each village, as shown in Table 7.

Table 6. Causes of discomforts and concerns about the existence of oil and gas companies in selected villages.

| Disturbance | Cause of Disturbance   |
|-------------|--|
| Concerns    | <ul style="list-style-type: none"> <li>• History of environmental pollution (pipe leaks and odors)</li> <li>• Fear/trauma from previous well drilling activities that caused cracks on house walls</li> <li>• Worried about explosions</li> <li>• Reduced agricultural yields</li> <li>• Noise disturbance</li> </ul>  |
| Discomforts | <ul style="list-style-type: none"> <li>• Changes in people's lifestyles (Example: Campurejo Village)</li> <li>• Changes in people's mindset (e.g., constantly expecting assistances from the company, including compensation funds and CSR programs)</li> <li>• Residents quickly lose their temper, especially in the event of delays in the disbursement of compensation funds.</li> <li>• Changes in the type of work due to the conversion of agricultural land for the operational activities of oil and gas companies</li> </ul> |

Table 7. Conflicts occurring in several villages affected by the operational activities of oil and gas companies and their underlying causes.

| Village                                | Conflict and Its Causes   |
|--|---|
| Rahayu<br>Bulurejo                     | <ul style="list-style-type: none"> <li>• A conflict between residents and oil and gas companies was triggered by the delay in giving compensation money and the diversion of public attention from this issue, which was unacceptable to the residents.</li> <li>• The conflict was resolved by the company.</li> </ul>   |
| Campurejo                              | <ul style="list-style-type: none"> <li>• Conflicts between the community and the company due to the late disbursement of compensation money, unrealized CSR programs, and the lack of openness in the recruitment of local workers caused the residents to become irritable.</li> <li>• According to the community, the conflicts in this village were not dealt with properly because the company was unresponsive.</li> </ul>   |
| Ngampel                                | <ul style="list-style-type: none"> <li>• Conflicts occurred due to problems with the distribution of compensation, recruitment of workers, and the sustainability of CSR programs.</li> <li>• The conflict was resolved in the following period.</li> </ul>   |
| Sambiroto                              | <ul style="list-style-type: none"> <li>• The conflict in 2006 resulted from the leak of exploration wells and compensation that was not immediately distributed after the leak.</li> <li>• The conflict was not satisfactorily resolved. However, records show no similar incidents or conflicts in 2018.</li> </ul>  |
| Sumber,<br>Sambonggede                 | <ul style="list-style-type: none"> <li>• The conflict between the community and the company was caused by the impact of vibrations during well drilling and well testing that caused cracks on the residents' walls.</li> <li>• Well drilling in this village was discontinued, and the well remains inoperative until now; thus, no conflict triggers.</li> </ul>  |
| Karang Agung,<br>Lerankulon,<br>Glodog | <ul style="list-style-type: none"> <li>• The conflicts occurring in these three villages were caused by the operation of the Palang Station undersea pipeline which disrupted the activities of capture fisheries, thus reducing the catches and limiting the fishing routes.</li> <li>• In 2018, there were no conflicts between fishers and companies, but residents felt that the company was not giving them the needed attention, as evident in rare visits and direct dialogues.</li> </ul> |

In general, conflicts occur due to delays in the disbursement of compensation funds and the implementation of CSR, and several activities of oil and gas companies that directly affect housing, such as drilling and economic activities of the community, especially fishermen. To minimize conflicts between the community and the company, it is necessary to hold intensive dialogue and form imaginative organizations of stakeholders in the community (Stammler & Wilson, 2006).

### Improved Local Economy

Based on the results of interviews with the community, it is known that the company's activities can improve the local economy, although less significantly. As many as 65% of the respondents said that the local economy grew as more food

stalls, boarding houses, grocery stores, and other businesses were opened both as a result of the company activities and the local economy improvement initiated by or associated with the company's CSR programs. The oil and gas company's programs and their impact on the local economy in areas around the operational activities are summarized in Table 8. However, the results of the conducted interviews showed that 36% of the respondents did benefit from the company's CSR programs.

Overall, the company has made various efforts to improve the local economy around the operational area of oil and gas companies. This is supported by 65% of the respondents who felt an increase in the local economy, although 36% did not experience the CSR programs directly. Oil and gas companies can operate well if they contribute to the local economy (Ahmed



Table 8. Programs and impacts of improving the local economy in areas nearby the oil and gas company activities

| Company's Program  | Improved Local Economy   |
|--|--|
| CSR programs to increase business and economic opportunities | More food stalls, boarding houses, grocery stores, and other businesses are opened   |
| CSR programs according to community needs                    | Scholarships for education, improvements in the environmental, economic, sociocultural, health, and infrastructure sectors, and skill training |
| Creating Green Open Space (RTH)                              | RTH cafe managed by the community (Youth of Campurejo Village)   |
| Compensation fund  | Compensation money is disbursed properly for communities affected by the oil and gas company activities  |

& Ebrahim, 2019), even though the effect is not shared equally among the community members. Economic improvement can be achieved with various CSR programs and other forms of attention and support from oil and gas companies to the local community (Kirat, 2015). In addition, CSR positively impacts oil and gas companies and the development of the surrounding community. The most important development of the surrounding community is of the environmental and economic aspects (Chowdhury et al., 2019). In the current study, the discussion covers social, economic, environmental, cultural, and public health aspects.

### Public Health

Based on direct observations of the types of diseases suffered since the oil and gas company was established in the study area, 94% of the respondents stated that the operational activities did not cause specific diseases. This information was cross-checked with the data from community health centers in the affected areas/villages, and the results were consistent, i.e., no specific diseases were reported as a result of the operational activities of oil and gas companies. The closest villages to the company's operational activities were within the working area of the Soko Health Center, Bojonegoro Health Center, and Kapas Health Center. Based on the data from several community health centers, the diseases suffered by the residents were upper respiratory tract infections (26.44%), gastritis (10.36%), hypertension (9.39%), and asthma (3.04%).

Based on the field observations and data from several community health centers, the most common diseases in the community were not directly related to the operational activities of oil and gas companies. However, with the mixed-method design (quantitative and qualitative), this research was able to investigate if the company's activities did not indeed harm public health. It is necessary to collect more details on whether the residents were aware of mine-related diseases and would visit the community health centers whenever the symptoms appeared. It is necessary to obtain more information on whether the residents were aware of mine-related illnesses and would seek treatment for even the mildest symptoms at the nearest health center.

The oil and gas industry offers CSR or foster programs as a strategy to manage its social, cultural, and economic effects. The provided program is expected to benefit the surrounding community to improve their financial independence, business opportunities, and economic conditions because not all local residents can be recruited as workers. An example of successful community development programs is the Green Open Space, which also has a cafe managed by the local community. Maximizing the positive impact improves the management of the socio-economic-cultural and health components, especially in developing countries (Blowfield, 2005; Zadek, 2001). This

result corresponds to the work of Idemudia et al. (2006), which states a substantial change in community empowerment occurs only if responsible companies provide social, economic, and cultural coaching. CSR is an approach to reducing negative social, economic, cultural, and environmental impacts caused by oil and gas exploration. This management strategy provides changes to infrastructure development, alleviating social, economic, cultural, and environmental problems caused by oil and gas exploration and exploitation (Okonta & Douglas, 2001).

### Conclusion

This comprehensive social study covers social, economic, cultural, and public health aspects. The oil and gas industry in the Tuban oil and gas field is close to residential areas. This affects the social, economic, cultural, and health conditions of the surrounding population. The impacts of exploration and exploitation by oil and gas companies are categorized into six main issues: opportunities, public perception, concerns and discomforts, conflicts, improved local economy, and public health. Based on these findings, it can be concluded that: (a) there are job opportunities for local workers, but information on recruitment is not shared publicly, and most jobs are project-based; (b) a large share of the community is already aware of and has felt the benefits of oil and gas companies in their area, although some have experienced disadvantages; (c) concerns and discomforts occur because of past trauma related to oil and gas company activities, such as drilling and pipe leaks. The community expects the company to hold intense dialogues with them to reduce public concerns about oil and gas activities; (d) conflicts often occur between the community and oil and gas companies in several villages within their oil and gas working area. This is due to delays in disbursing compensation funds and implementing CSR activities. In addition, several villages reported conflicts due to the direct impact of the company's operational activities on people's homes and work; (e) the oil and gas company has implemented various efforts to improve the local economy, such as CSR and other foster programs, and most of the residents have felt the benefits; and (f) the correlation between the documented diseases and the oil and gas company activities. It requires further studies that involve additional factors, such as the level of public awareness of seeking treatment at the community health centers, and to determine whether the data at the community health centers are representative of the overall health of the community in the surrounding area.

This research suggests that the offered Corporate Social Responsibility (CSR) programs and management strategies be increased and diversified to include more fields: education, health, environment, economy, infrastructure, socio-culture, and public relations. It is recommended that CSR management

be adjusted to the development needed by the community around oil and gas locations, such as skills training, business development, and scholarships. Oil and gas companies are expected to create effective management strategies for alleviating negative socio-economic-cultural impact by improving employment opportunities, public perception, and public health and addressing concerns, discomforts, and conflicts so as not to disrupt operations and production activities. In general, oil and gas companies positively impact the community around the working areas. This is indicated by the benefits felt by the community, although some gain no benefits from or are disturbed by the presence of oil and gas companies in their area. For this reason, further research focusing on strategies to improve the impact of oil and gas company activities on the community and to reduce resulting risks is necessary.

### Acknowledgment

The authors would like to thank PT Pertamina PEP & PHE, Tuban, and the Doctoral Dissertation Research (PDD) funding scheme for data provision and financial assistance. The authors are also grateful to the Doctoral Program on Environmental Science, the Graduate School of Universitas Gadjah Mada, for their support in producing and submitting the article in this scientific publication.

### References

- Asmone, A. S., Goh, Y. M., & Lim, M. S. H. (2022). Prioritization of industry level interventions to improve implementation of design for safety regulations. *Journal of Safety Research*, 82, 352–366. <https://doi.org/10.1016/j.jsr.2022.06.011>
- Abboud, A, & Betz, MR. (2021). The local economic impacts of the oil and gas industry: Boom, bust and resilience to shocks. *Energy Economics*, 99. <https://doi.org/10.1016/j.eneco.2021.105285>
- Adgate, JL, Goldstein, BD, & McKenzie, LM. (2014). Potential Public Health Hazards, Exposures and Health Effects from Unconventional Natural Gas Development. *Environmental Science & Technology*, 48(15), 8307-8320. doi:<https://doi.org/10.1021/es404621d>
- Ahmed, ST, & Ebrahim, AA. (2019). Pros and Cons of Oil and Gas Exploration in Lofoten, Norway: Master's Thesis, University of Stavanger
- Akakpo, GS. (2012). Social Impact Assessment Of Oil And Gas Exploration In The Western Region Of Ghana: A Case Study Of Sekondi/Takoradi Metropolis. *Regional Maritime University Journal*, 2, 44-62. doi:10.13140/RG.2.1.4690.0648
- ADDIN Mendeley Bibliography CSL\_BIBLIOGRAPHY Baik, R. N. (2015). Natural resources investment of oil and gas and regional development impact on community empowerment. *Indonesian Journal of Geography*, 47(1), 60–68. <https://doi.org/10.22146/ijg.6746>
- Blowfield, M. (2005). Corporate social responsibility: reinventing the meaning of development?. *International Affairs*, 81(3), 515-524
- Byakagaba, P., Mugagga, F., & Nnakayima, D. (2019). The socio-economic and environmental implications of oil and gas exploration: Perspectives at the micro level in the Albertine region of Uganda. *The Extractive Industries and Society*, 6(2), 358-366. doi:<https://doi.org/10.1016/j.exis.2019.01.006>
- Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Walker, K. (2020). Purposeful sampling: complex or simple? Research case examples. *Journal of Research in Nursing*, 25(8), 652-661. doi:<https://doi.org/10.1177/1744987120927206>
- Cekindo. (2018). Oil and Gas Sector in Indonesia. Retrieved July 01, 2021, from Cekindo: <https://www.cekindo.com/sectors/oil-and-gas>
- Chowdhury, RH, Choi, S., Ennis, S., & Chung, D. (2019). Which Dimension of Corporate Social Responsibility is a Value Driver in the Oil and Gas Industry? *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, 36(2), 260-272. doi:<https://doi.org/10.1002/cjas.1492>
- Colborn, T., Kwiatkowski, C., Schultz, K., & Bachran, M. (2011). Natural Gas Operations from a Public Health Perspective. *Human and Ecological Risk Assessment: An International Journal*, 17(5), 1039-1056. doi:<https://doi.org/10.1080/10807039.2011.605662>
- Darkwah, AK. (2013). Keeping hope alive: an analysis of training opportunities for Ghanaian youth in the emerging oil and gas industry. *International Development Planning Review*, 35(2), 119-134.
- Dilshad, RM, & Latif, MI. (2013). Focus Group Interview as a Tool for Qualitative Research: An Analysis. *Pakistan Journal of Social Science (PJSS)*, 33(1), 191-198.
- Dowding, D. (2013). Best Practices for Mixed Methods Research in the Health Sciences John W. Creswell, Ann Carroll Klassen, Vicki L. Plano Clark, Katherine Clegg Smith for the Office of Behavioral and Social Sciences Research; *Qualitative Methods Overview Jo Moriarty. Qualitative Social Work*, 12(4), 541-545. doi:<https://doi.org/10.1177/1473325013493540a>
- Etikan, I., & Bala, K. (2017). Sampling and sampling methods. *Biometrics & Biostatistics International Journal*, 5(6), 215-217. doi:10.15406/bbij.2017.05.00149
- Evenhuis, E. (2016). The political economy of adaptation and resilience in old industrial regions: a comparative study of South Saarland and Teesside. Doctoral Dissertation, Newcastle University, pp. 1-304 ADDIN Mendeley Bibliography CSL\_BIBLIOGRAPHY
- Haggerty, J. H., Kroepsch, A. C., Walsh, K. B., Smith, K. K., & Bowen, D. W. (2018). Geographies of Impact and the Impacts of Geography: Unconventional Oil and Gas in the American West. *Extractive Industries and Society*, 5(4), 619–633. <https://doi.org/10.1016/j.exis.2018.07.002>
- Hays, J., McCawley, M., & Shonkoff, SB. (2017). Public health implications of environmental noise associated with unconventional oil and gas development. *Science of The Total Environment*, 580, 448-456. doi:<https://doi.org/10.1016/j.scitotenv.2016.11.118>
- science. (2020). Exploration is needed to support Indonesia's future energy needs. Retrieved July 01, 2021, from IPA (Indonesian Petroleum Association): [https://www.ipa.or.id/en/news/ newsletter/exploration-is-needed-to-support-indonesias-future-energy-needs](https://www.ipa.or.id/en/news/newsletter/exploration-is-needed-to-support-indonesias-future-energy-needs)
- Idemudia, U. and Uwem E. Ite. (2006). CorporateCommunity Relations in Nigeria's Oil Industry: Challenges and Imperatives, *Corporate Social Responsibility and Environment Management*. 13. 194-206. doi: HYPERLINK "https://doi.org/10.1002/csr.101" <https://doi.org/10.1002/csr.101>
- Irwin, S. (2013). Qualitative secondary data analysis: Ethics, epistemology and context. *Progress in Development Studies*, 13(4), 295-306. doi:<https://doi.org/10.1177/1464993413490479>
- Jamshed, S. (2014). Qualitative research method-interviewing and observation. *Journal of Basic and Clinical Pharmacy*, 5(4), 87-88. doi:10.4103/0976-0105.141942
- JOB P-PEJ. (2018). Pertamina PetroChina East Java RKL RPL Monitoring Report, Tuban, East Java.
- Johnston, JE, Lim, E., & Roh, H. (2019). Impact of upstream oil extraction and environmental public health: A review of the evidence. *Science of The Total Environment*, 657, 187-199. doi:<https://doi.org/10.1016/j.scitotenv.2018.11.483>
- Kirat, M. (2015). Corporate social responsibility in the oil and gas industry in Qatar perceptions and practices. *Public Relations Review*, 41(4), 438-446. doi:<https://doi.org/10.1016/j.pubrev.2015.07.001>

- Kuklina, V., Petrov, AN, Krasnoshtanova, N., & Bogdanov, V. (2020). Mobilizing Benefit-Sharing Through Transportation Infrastructure: Informal Roads, Extractive Industries and Benefit-Sharing in the Irkutsk Oil and Gas Region, Russia. *Resources*, 9(3), 21. doi:<https://doi.org/10.3390/resources9030021>
- Malin, SA. (2020). Depressed democracy, environmental injustice: Exploring the negative mental health implications of unconventional oil and gas production in the United States. *Energy Research & Social Science*, 70, 101720. doi:<https://doi.org/10.1016/j.erss.2020.101720>
- McMullin, TS, Bamber, AM, Bon, D., Vigil, DI, & Dyke, MV. (2018). Exposures and Health Risks from Volatile Organic Compounds in Communities Located near Oil and Gas Exploration and Production Activities in Colorado (USA). *International Journal of Environmental Research and Public Health*, 15(7), 1500. doi:<https://doi.org/10.3390/ijerph15071500>
- Morley, L. (2007). The X factor: employability, elitism and equity in graduate recruitment. *Journal of the Academy of Social Sciences*, 2(2), 191-207. doi:<https://doi.org/10.1080/17450140701325782>
- Nimon, K. (2014). Secondary Data Analyzes From Published Descriptive Statistics: Implications for Human Resource Development Theory, Research, and Practice. *Advances in Developing Human Resources*, 17(1), 26-39. doi:<https://doi.org/10.1177/1523422314559805>
- Okonta, I. & Douglas, O. (2001). *Where Vultures Feast – Shell, Human Rights, and Oil in the Niger Delta*. New York: Sierra Club Books
- Okuthe, IK. (2015). Environmental and Social challenges of oil and gas exploration in Kenya. *International Journal of Innovation and Scientific Research*, 17(1), 164-174.
- Perry, SL. (2013). Using Ethnography to Monitor the Community Health Implications of Onshore Unconventional Oil and Gas Developments: Examples from Pennsylvania's Marcellus Shale. *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy*, 23(1), 33-53. doi:<https://doi.org/10.2190/NS.23.1.d>
- Pertamina. (2020). PHE TEJ Promotes Well Drilling for Mudi Development 26. Retrieved July 01, 2021, from Pertamina: <https://www.pertamina.com/id/news-room/energia-news/phe-tej-socialisasikan-pengeboran-sumur-pengembangan-mudi-26>
- Sayyadi, M. (2019). How organizational cultures and structures influence performance in oil & gas companies. Available at: <https://richtopia.com/effective-leadership/organisationalcultures-structures-influence-performance-oil-gas-companies>. Accessed on: 16-05-2020
- Sim, J., & Waterfield, J. (2019). Focus group methodology: some ethical challenges. *Quality & Quantity*, 53, 3003-3022. doi:<https://doi.org/10.1007/s11135-019-00914-5>
- Stammler, F., & Wilson, E. (2006). An Exploration of Relations between Oil and Gas Companies, Communities, and the State. *Sibirica: Interdisciplinary Journal of Siberian Studies*, 5(2), 1-42. doi:<https://doi.org/10.3167/136173606780490739>
- Stolz, J. (2016). Opening the Black Box. How the Study of Social Mechanisms Can Benefit from the Use of Explanatory Mixed Methods. *Analysis & Criticism*, 38(1), 257-286. doi:<https://doi.org/10.1515/auc-2016-0112>
- Tang, DK, Leiliabadi, F, Ologu, EU, & Dawal, SZ. (2017). Factors affecting the safety of processes in the Malaysian oil and gas industry. *Safety Science*, 92, 44-52. doi:<https://doi.org/10.1016/j.ssci.2016.09.017>
- Weijermars, R., & De Jong, V. (2008). Closing communication gaps can improve the success of oil & gas ventures. *Oil and Gas Business Journal*, 1-24. <http://www.ogbus.ru/eng/EL/N77-4426/StateReg/0320200609>
- Zadek, S. (2001). *Third generation corporate citizenship: Public policy and business in society*. London: Foreign Policy Centre