

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT OF HYDROCARBON MINING: A CASE STUDY OF QADIRPUR (DIST. GHOTKI, SIND) GAS FIELD

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ABSTRACT

This paper provides an overview of the social and environmental impacts of oil and gas mining in the Qadirpur gas field (Dist. Ghotki, Sind) People's perception was collected with the help of 400 questionnaires (sample size). Questionnaires were distributed among the staff and residents both through random sampling. People's profiles and effects on the area were collected from respondents, from health problems to the environmental problems facing the community. The assessment shows that Hydrocarbon mining has many effects on the environment and those who inhabit it, including but not limited to humans. It is a common occurrence in hydrocarbon mining that the surrounding area may be contaminated with the product or the chemicals used to obtain a said product, especially in poor and developing countries like Pakistan. Although mining of such natural resources is an essential requirement to bring economic prosperity to a region, it must also be monitored by regulatory bodies to avoid social and environmental devastation.

KEYWORDS: Hydrocarbon mining, Environmental devastation, Qadirpur, Community, Chemicals, Ghotki.

1. INTRODUCTION

Pakistan has an abundance of natural resources (Tareen et al 2018). A developing country like Pakistan needs serious steps to extract more oil and gas. (Kuch & Bavumiragira 2019) Natural resources including hydrocarbons have become one of the most essential resources of energy for humankind (Eshagberi 2012). Crude oil is one of the most important driving factors of any economy today. The oil industry has a huge contribution to the economic growth and development of the country but at the same time ecosystem of the region has serious adverse effects due to unsustainable exploration and production (Legge & Zhibo 2018). The environmental and social impacts of mining are serious concerns for sustainable developments. The exploration of oil and gas affects the peasant population in the area (Amimc, 2003). The major objective of the study was to identify the environmental & social impacts of the Qadirpur gas field. Oil production can have an impact on local soil, water, and air, affecting community health. (Johnston et al 2019). As oil resources are being produced in close proximity to human settlements. Going by this

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statement it was important to find out to which extent the people near the oil fields of Qadirpur were being affected.

1.1. Study Area

Qadirpur gas field is located 28° 2' 49"N latitude & 69° 21' 47" E longitude. It is situated in the central Indus basin south of Sui gas fields and Kandhkot gas field and is located at a distance of 8 KM from District Ghotki in Sind province. Qadirpur is one of the largest gas processing fields of Asia. It is one of the major gas reserves of Pakistan. It is located at a distance of 8 km from dist. Ghotki Sind.

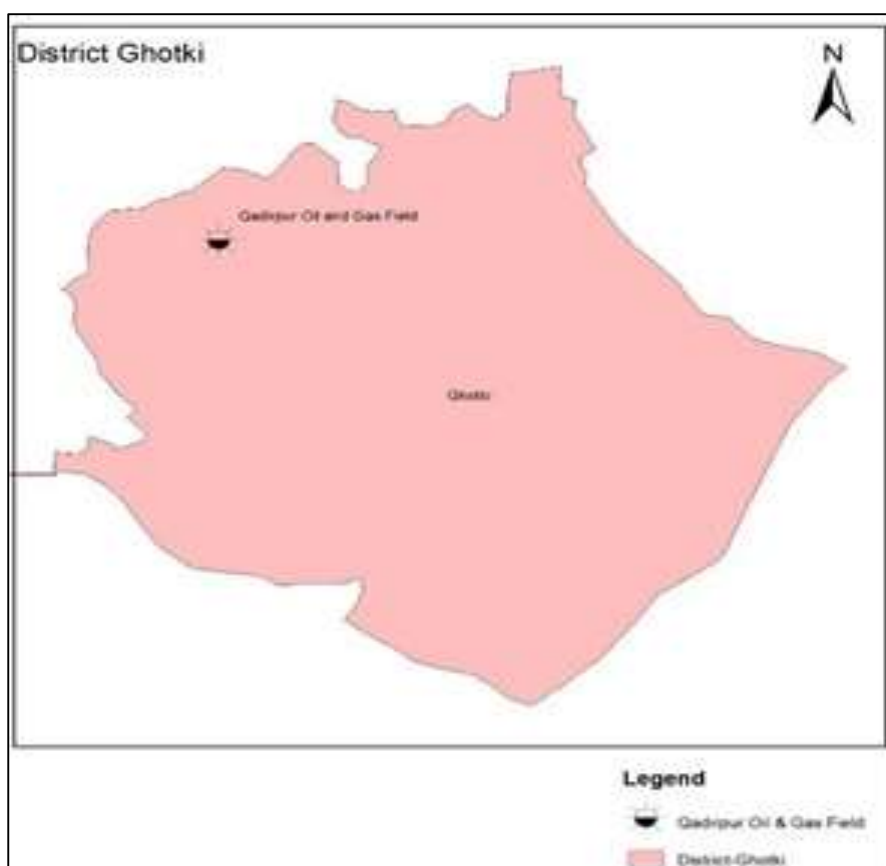


Fig. 1: Location of the Study Area

2. MATERIAL AND METHODS

This study is mainly based on people's perceptions about the consequences of oil and gas extraction at the Qadirpur (Dist. Ghotki, Sind) gas field. Both primary and secondary data was collected. Primary data was collected through a questionnaire, by random sampling. The sample size was calculated by using Solvan's method

$$n = \frac{N}{1} + Ne^2$$

Whereas given above,

n=sample size, N=population size, e= level of significance

By incorporating the population of the Ghotki district according to the 2017 census which is 52000

$n = 52000 / 1 + 52000(0.05 * 0.05)$, $n = 52000 / 1 + 130$, $n = 400$

So, the number is 400, which means 400 was the sample size for the study, 400 questionnaires were filled. 250 questionnaires were filled from the residents of the area and 150 from the staff of the Qadirpur gas and oil field. However, for the collection of secondary data books, published research journals articles, census report of 2017, and analysis of government reports and policy documents were utilized to acquire information.

3. RESULTS & DISCUSSION

3.1. Profile of the respondents

3.1.1. Gender

The data was collected from 260 residents of Qadirpur in the study area and data from 140 staff members was also collected, bringing the total to 400 participants. Out of the 400, 49.5% (198) were male residents and 14.5% (58) were female residents of the area. Furthermore, 35% (140) of the respondents were male staff members employed in the Qadirpur Gas field. Overall, the percentage of male workers and residents who filled the questionnaire was 85.5%. The female percentage at 14.5%, who were exclusively residents. Reasons for a higher number of male participants in the study compared to female participants comes down to the social conditions of the area, in which females mostly stay indoors taking care of household affairs while the males work, as shown by the 140 participants employed in the gas field who were male and mostly male residents who responded to the questionnaire.

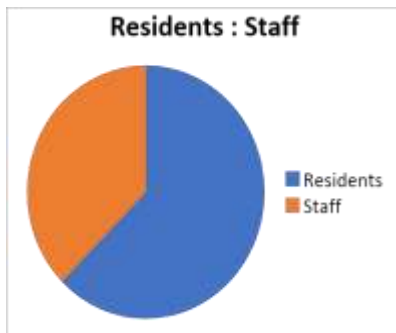


Fig 2. Ratio of Residents and Staff.

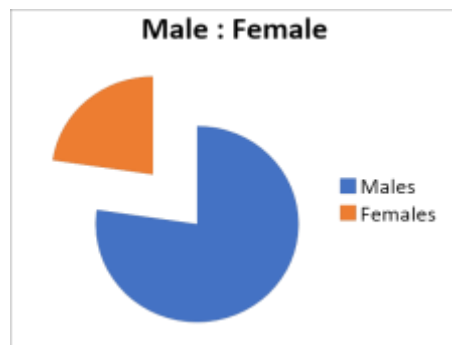


Fig 3. Gender distribution of participants.

3.1.2. Age

As shown in the graph below, most respondents from the residents' group belonged to the age group between 26 and 30, while most from the employees' group belonged to the ages between 36 and 40.

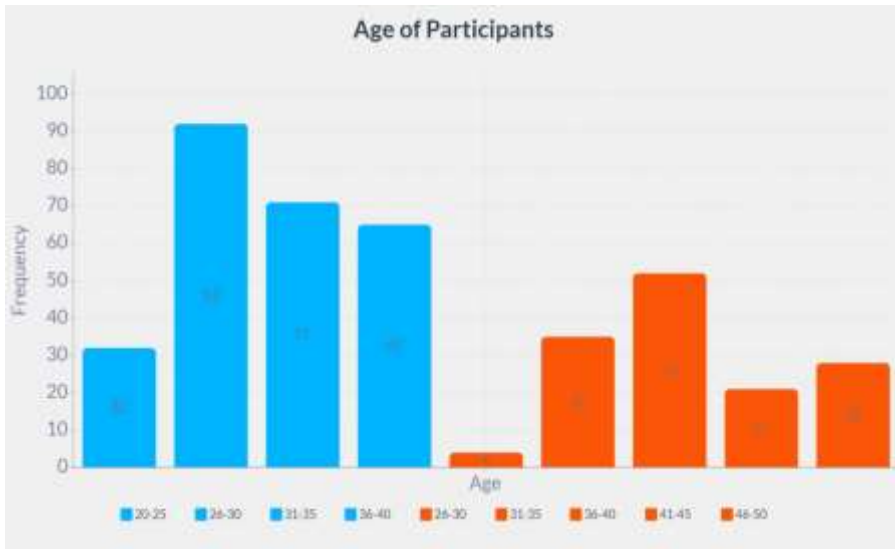


Figure 4. Showing age of participants (Blue: Residents, Orange: Staff)

3.1.3. Marital Status

Out of the 400 participants, 335 were married while the remaining 65 were vice versa.



Figure 5. Marital Status of respondents.

3.1.4. Education

Out of the 260 residents, 72(27.7%) replied as being illiterate. 63(24.2%) as having completed primary education(matriculation),79(30.4%) as having completed secondary education (intermediate) or were in the process of doing so. Finally, 46(17.7%) residents were in the process of or had already obtained a tertiary education (University).

In contrast, most of the employees out of the 140 were highly educated, only 3(2.1%) replied as being illiterate. 22(15.7%) had completed primary education, 19(13.6%) secondary and the vast majority, 96(68.6%) had completed tertiary education. Although, the employees were exclusively men, which has to be taken into consideration as women are not as encouraged to pursue education in the general public.



Figure 6. Awareness of hydrocarbon exploration activities in the region.

3.1.5. Awareness

As shown in figure 2.1 majority of the staff questioned were aware of hydrocarbon exploration activities, with 90.7% being aware while 9.3% were not. Almost the complete opposite can be observed with the residents, out of which 84.2% were not aware of any activities relating to the exploration of hydrocarbons in the region. Only 15.8% were aware.

3.2. Effects of hydrocarbon mining in the region.

3.2.1. Methods of operation

As shown in figure 2.2, 5.7% of the employees believed that hydrocarbon mining activities had no effect on the natural environment whatsoever. 27.9% replied that the land had degraded. 32.1% said that heavy machinery had an adverse effect on the natural environment. Finally,

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34.3% replied that pollution had significantly increased with more and more hydrocarbon exploration and mining activities. Almost half (45%) of the population replied that pollution had increased in recent years. 33.1% were of the opinion that the land had been degraded, only 5.4% thought that heavy machinery was to blame and 16.5% were of the inclination that there were no observable effects.



Figure 7. Methods of operation that have adverse effects on the environment.

A specific question on land degradation due to multiple factors involved in hydrocarbon exploration was also asked and the leading cause given by both employees and the residents was the use of toxic materials. (Abha S & Singh C.S 2012) Consistently, toxic compounds are unknowingly released into the environment, which may cause problems. Mostly the staff agreed that the use of heavy machinery has serious impacts on the climate.

3.2.2. Groundwater

A majority of both staff and residents agreed that they observed a noticeable decrease in the groundwater after hydrocarbon exploration activities began. (Uko et al 2020) Fresh groundwater is an important resource as it serves as both a source of energy and a habitat for the globe's living creatures. Although, it serves as a sponge for multiple anthropogenic pollutants from industrial activities. This has massive social implications for the residents in the sense that many of them rely on groundwater to farm (35.8% of the 260 residents are farmers) and many rely on it as a very important resource in daily life. The claim is backed up by the staff due to there being 13 well operators on the payroll.

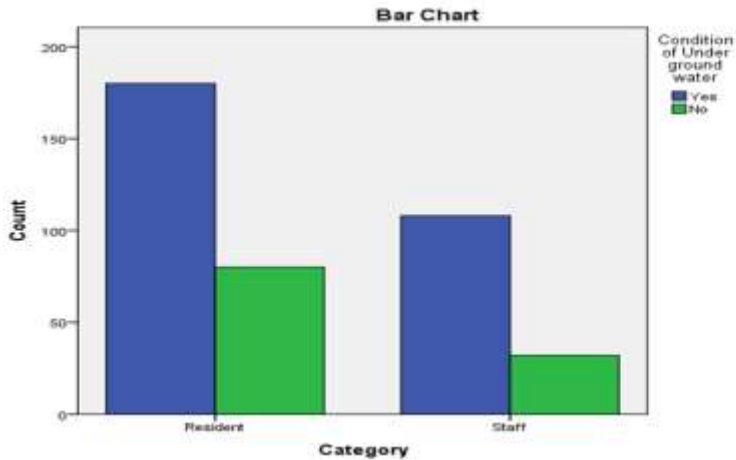


Fig 8. Decrease in level of groundwater after exploration activities.

3.2.3. Shelter and vegetation

Another social impact was seen, this time relating to the shelters of the residents. (Kadafa & Ayuba 2012) Exploitation and extraction of oil affect the day to day lives of the local people who depend on the ecosystem for their livelihoods leading to increasing insufficiency and dislocation of people, so, both groups were asked if they had any knowledge about there being any demolitions of houses and buildings prior to any hydrocarbon exploration. Surprisingly, both groups had the same ratios to the yes or no question. 65% of both the residents and staff concurred that demolitions had taken place while 35% disagreed. This shows that there might have been a significant number of people displaced to make room for the exploration of hydrocarbons.

Finally, an environmental effect was also observed on which both residents and staff agreed on and it was the removal of plants and trees to make space for hydrocarbon exploration 63% of the 400 staff and residents agreed to observe the removal of greenery while 20% disagreed and 17% had no opinion on the matter. (Oladipo. E 2015) Deforestation in many nations has led to the destruction of trees, has led to the extinction of wildlife and reduces sustainability on a global scale mostly for developing countries. Hence, the cutting of trees may lead to some lasting effects on the surrounding environment. Although, on both fronts, there were mitigating actions taken by the company to provide shelter for the displaced communities and replantation of trees and plants to offset the environmental degradation. Both the staff and residents seemed to agree. As to the question about the effectiveness of these efforts, both groups collectively had a majority saying that more needed to be done by the company as shown in the graph. had contracted due to them being in close

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proximity to the hydrocarbon mining operations. The numbers of the staff and residents are shown in the graph. A total of 15.25% had contracted.

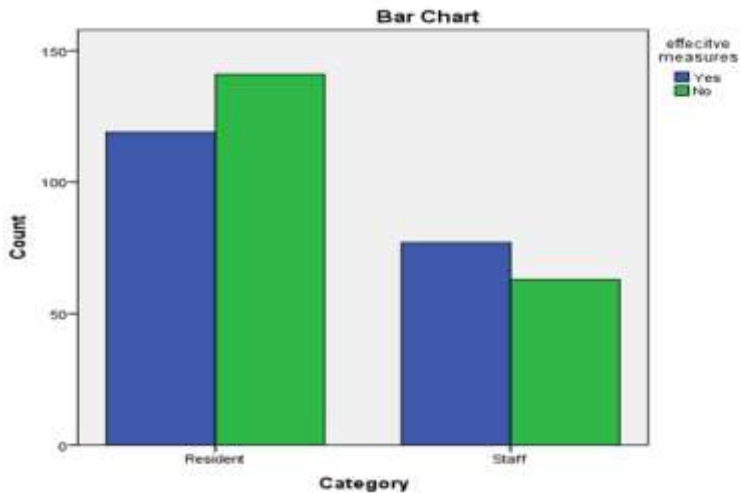


Fig 9. Graph showing the effectiveness of methods deployed by the company to counter-balance the destruction of the environment and buildings.

3.2.4. Health Affects

Health problems created by oil extraction are hard to detect and slow in showing effects (Ordinoha & Brisiba 2013). The respondents were asked what diseases they Malaria, a further 27.75% had diarrhea, 12.75% had various skin diseases, 21.75% had some form of respiratory disease (including catarrh) and 8.25% of respondents had acquired all of the mentioned afflictions. The most common amongst both residents and staff were diarrhea, followed by respiratory diseases and malaria. By the data, the company is most likely the cause of these diseases and as such should provide healthcare to the residents and staff of the area.

Furthermore, the following question about disease contraction by family members was asked. The highest percentage belonged to respiratory diseases at 49.5%, the second-highest being malaria at 26%, third-highest being diarrhea at 12.5%, fourth-highest being skin diseases and finally, fevers at 4.25%. This proves that a large number of the respondent's family members were also being affected by the hydrocarbon mining activities. Another health problem was also observed amongst staff and residents. They were asked if they had hypertension, also known as higher than normal blood pressure. A surprisingly large number of the respondents suffered from this. 43% of residents had hypertension while a higher

number was observed amongst the staff at 60%, considerably higher than the residents. The reason could be attributed to a more stagnant lifestyle adopted by the staff relative to the residents. (Chen et al 2013) Hypertension is estimated to cause more than 50% of the estimated 17 million deaths a year due to cardiovascular disease (CVD) throughout the globe, as shown the matter should be taken seriously.

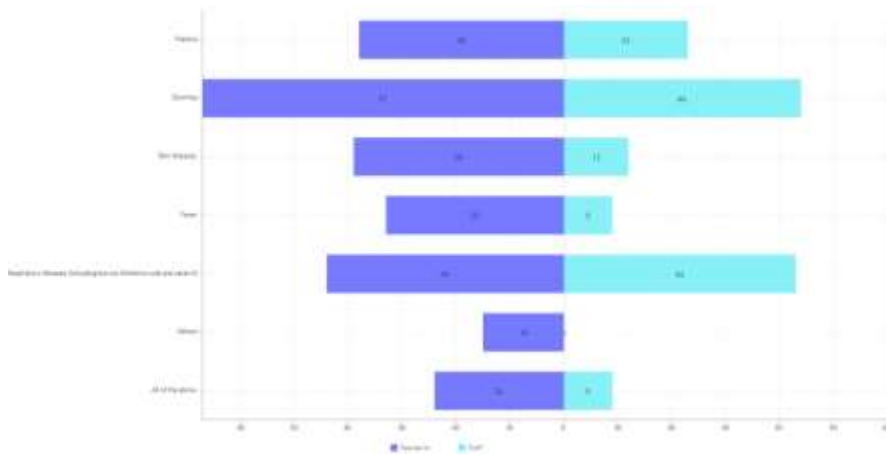


Figure 10. Diseases contracted by respondents by being in close proximity to mining operations.

3.2.5. Mitigating measures.

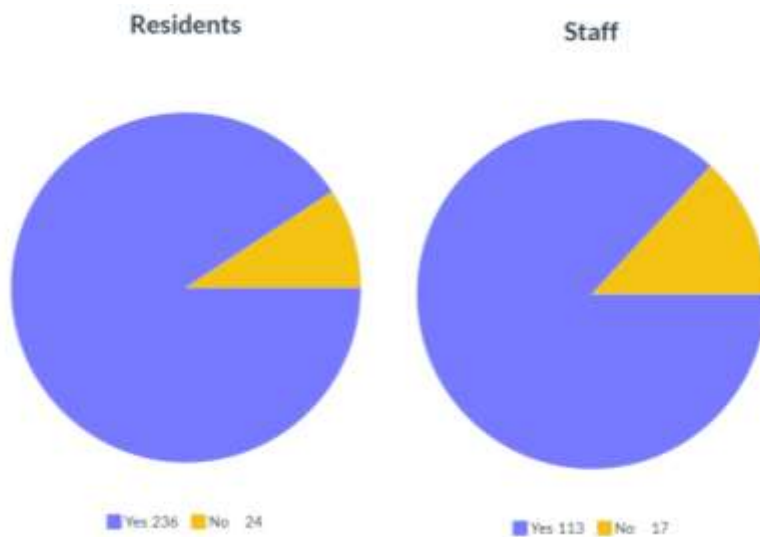


Figure 11. Answers to the question; Are any efforts to cure diseases or infections being caused by mining operations.

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As shown above, a very strong majority of respondents said yes when asked if there were any measures taken to help with any other diseases or infections that were caused by the hydrocarbon mining operations. Although these actions carry weight the problem at large might not be mitigated. Chemicals have been found that have the ability to harm in a litany of different concentrations if protective measures are not put in place (Haswell, M and Shearman 2019)

3.3. Organizational activity.

Although there has been an effort made by OGDCL toward the welfare of the community and its workers, there is a sentiment amongst the respondents that government bodies are not monitoring the situation. 65% of the residents agree that the Pakistan Environmental Protection Agency (PEPA) is not taking steps to monitor the effects of the company's impact on the environment while 57.9% of the staff are of the same opinion.

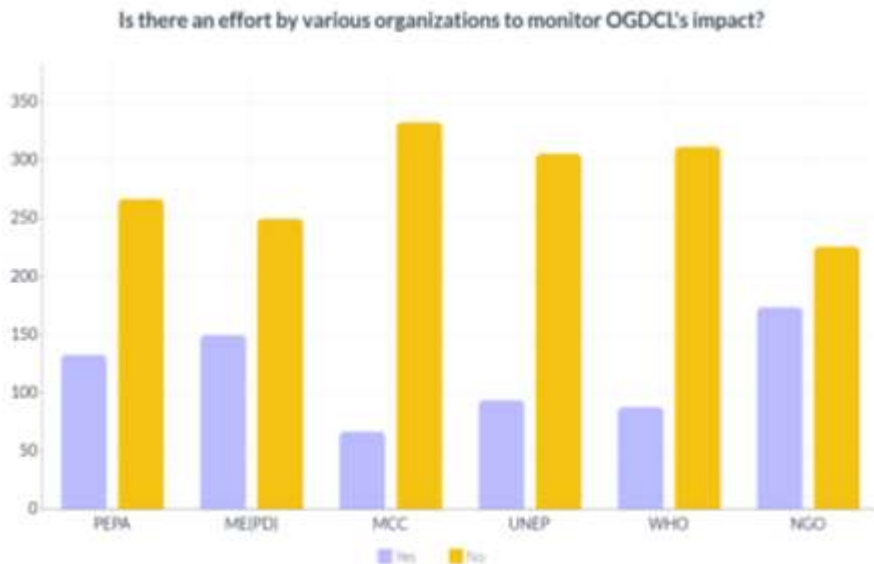


Figure 12. Efforts made by various organizations to monitor OGDCL's overall impact. (Respondents answers).

80% of the staff agreed that they were in contact with NGOs, through which they conducted various social programs as evidenced by previous questions, the public might not be aware of these NGOs, hence the skewed results of the last part of the graph. (Eisenstadt & West 2017) In developing countries since clean water, biodiverse woods, and uncontaminated land are essential for many impoverished people's

survival and quality of life, so, these institutions should be more involved to protect the people of the affected area.

4. CONCLUSION

This paper provides an overview of the social and environmental impacts of oil and gas mining in the Qadirpur gas field (Dist. Ghotki, Sind) People's perception was collected with the help of 400 questionnaires. Almost 91% of residents answered positively while almost 81% of staff had the same opinion, which shows some hope for the inflicted. A majority of residents and staff also agreed that there were ample facilities like clinics, hospitals and pharmacies in their vicinities. Although a small group preferred to get their healthcare from Hakeem's in their area which is known to have little to no effect while treating diseases other than providing a placebo effect similar to homoeopathic medicine. 63.1% of residents and 72.9% of staff also agreed that OGDCL had built healthcare facilities in the area, the remaining respondents who replied with no said that only a few facilities and hospitals were properly staffed and functional. A further 65% of residents and 83.6% of staff also said that there were health-related activities carried out by the company such as health awareness programs with participation by guest doctors and distribution of various the counter medicine. Most of the 400 respondents across the board as shown in the graph were unified in the opinion that various organizations including the Ministry of energy petroleum division [ME (PD)], Ministry of climate change (MCC), United Nations Environmental Program (UNEP) and the World Health Organization (WHO) were all not doing anything to monitor the social and environmental impact of OGDCL's activities. The only outlier was the opinion of various non-governmental organizations that were providing some services.

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