آثار المخلفات البترولية في التربة والبيئة المحلية للمنطقتين ملوط ومابان في شمال اعالي النيل –جنوب السودان

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الخلاصة:
هدفت هذه الدراسة الي تقييم أثر المخلفات البترولية في التربة والبيئة في فلوج وعداريل بدولة جنوب السودان. احتوت شاملة الدراسة على (30000) من ساكني المنطقة البحثية، تم اختيار عدد (265) مبحوث ليمثلوا **عينة الدراسة** بطريقة عشوائية. المتغيرات البحثية شملت ثلاثة أولا: التربة الملوثة بالمخلفات البترولية، ثانيا: الأثر على البيئية المحلية. تم جمع نوعين من البيانات بطريقة المسح العام (البيانات الأولية) جمعت باستخدام الاستبيان مع المواطنين وموظفي الموارد الطبيعية وموظفي الحكم المحلي بالمنطقة البحثية. والبيانات المعملية جمعت من خلال اخذ عينات من التربة لثلاث حفر من المخلفات البترولية في ثلاثة مواقع. تم تحليل البيانات الأولية باستخدام برنامج SPSS من خلال التحليل الوصفي. اما تحليل (البيانات المعملية) فقد تم باستخدام جهاز منظار الامتصاص الذري (AAS 700). أظهرت نتائج الاستبيان ان 80.7 % من المبحوثين ذكور ,% 51.9 متوسط الاعمار , 44.4% تعليمهم ثانوي ,77.8. % أكدوا تعرية التربة، 75.6% لاحظوا نزعات الاراضي في منطقة البحثية، 85.2% أكدوا زيادة الكثافة السكانية، 71.9% لاحظوا وجود تلوث الهواء. أما مبحوثين الموارد الطبيعية 66.2% منهم أكدوا زيادة موت الحيوانات في منطقة البحث ,93.8% لاحظوا هجرة الحيوانات البرية. أما مبحوثي موظفي الحكم المحلي، 73.8% منهم ذكروا بأنه لا يوجد إشراف حكومي على الشركات في منطقة البحث، 92.3% أكدوا دفن المخالفات في التربة , 89.2% منهم أكدوا قرب سكن المواطنين من آبار البترول، 53.8% ذكروا أن الخدمات التي تقدمها الشركات غير كافية. وفي البيانات المعملية أظهرت نتائج تحليل التربة وجود مستويات لعناصر مثل الزئبق الأر سينك والحديد أعلى من المستوى المسموح به دوليا في التربة، بينما كانت في عنصري الحديد والمنجنيز أقل. وقد أوصت الدراسة بالآتي أولا: عدم دفن المخلفات البترولية في التربة لاحتوائها على عناصر كيمائية. ثانيا يجب على شركات البترول الالتزام بالتنمية والتوعية عن المخاطر مخلفات البترول ثالثا: ابعاد المواطنين الذين يسكنون بقرب الابار الي مناطق اخري مع تقديم الخدمات الاساسية (كالتعليم ,الصحة ومياه الشرب والكهرباء.

الكلمات المفتاحية: المخلفات البترولية، التربة، البيئة المحلية، أعالي النيل، جنوب السودان

THE IMPACT OF PETROLEUM WASTES ON SOIL AND LOCAL ENVIRONMENT IN MELUT AND MABAN - UPPER NILE STATE- SOUTH SUDAN.

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Abstract

This study aims to investigate the impact of petroleum waste on soil and local environment in Paloch and Adar Yale counties in South Sudan. Population of the study is 30,000 persons. 265 respondents were selected randomly as a sample of the study. Variables were, soil pollution, and effect on Natural Resources. Data were collected through field survey, involving (primary data) which were collected by using questionnaire and (laboratory data) which were collected from soil in three locations. (SSPS) was used for primary data analysis by using descriptive statistics, while for the laboratory data; Atomic absorption Spectroscopy (AAS700) was used. Findings of primary data showed 80 .7%, of the respondents are male, 51.9% were moderate ages, 44.4% were a secondary educational level, 77.8% observed soil erosion, 75.6% observed land dispute, 85.2%, indicated increasing population density, 71.9% illustrate increased air pollution. Natural Resources employees shows that 66.2% noticed animals' death, 93.8%, illustrate emigration of wilds life. Regarding local government employees, 73.8% of them reported absence of supervision from government, 92.3% reported that petroleum wastes buried in the soil, 89.2% of respondents were live near petroleum wells, 53.8% of respondents reported absence of services to the residents. While the laboratory data indicates presence of (Hg, As and Pb) in higher levels compared to the normal international allowed one, and the level of (Fe and Mn) were lower. Recommendations were. Avoid burial the petroleum waste in soil, Petroleum companies must commit for development and awareness about oil hazards and to convinced the residents live away from the petroleum wells with services such as (Education, hearth, water drinking and electricity).

Keywords: *petroleum waste, soil, local environment, Upper Nile, South Sudan*

1.INTRODUCTION

South Sudan is country fall at East Africa, it is one of the youngest countries in the world; it was separated from the old Sudan and forms new State in 2011 in an autonomous referendum with its population of 12 million people, and it has oil revenue which almost acts as the main lifeline of economic status. The oil content in the soil of nearly 4.8 million hm2 may be over the secure value (Liu et al, 2007). Crude oil activities lead to soil contamination with hydrocarbons this drastically affects normal functioning of soil contamination risked future, Soil pollution caused by petroleum waste which may contain petroleum hydrocarbon, metals annually occurring radioactive materials, salts and toxic chemicals, have potential to cause soil pollution and prevent the growth of vegetation , Oil activities caused contamination on the soil and result in nutrition al constrains negatively affect plant growth and low productivities. Oil might affect soil physically properties pore aspect might be clogged which could reduce soil aeration and water infiltration and increase bulk density, subsequently affecting plant growth than water might reduce and restrict soil permeability (Abosede 2013). Oil decomposes in soil bacteria fungi will naturally degrade oil and gas if they have two things. Fertilizer and energy a mixture of nitrate and phosphate agricultural fertilizers used at very low concentrations is usually enough to meet the first requirements. For energy bacteria use fertilizers like nitrate iron of sulfur. (Steven 2018). During the process of oil and gas exploration, development, gathering, refining, storage and sales, the accidents, incorrect operations and equipment maintenances and other reasons would result in the overflow and emissions of petroleum hydrocarbons (Shi et al, 2013). Oil is the most dangerous substances that can contaminate soil through (Appiah-Adjei, Baidu et al. 2019). contamination can biodegrade the soil for a long time, putting human and animals' lives at stake (Sushkova, Minkina et al. 2019). Oil products are the danger to soil, due to their toxicity, spreading scale, and migration ability and as the result of this, the world is working tirelessly to overcome such a deadly future by introducing some mechanisms to avoid depletion of ecosystem sustainability and serve the services of natural ecosystem in check by remediating the contaminated soil (Weihang Shena and Pingxiao Wu a 2015). The elements that contaminate the soil are (Mercury, Asbestos, lead, creosote and iron arsenate and others) the total petroleum Hydrocarbons like (PAHs) spreads into environmental as toxicants basically formed at the time of incomplete combustion of hydrocarbons. (Shen, Ashworth et al. 2016). And clean the sites with kerosene oil (Mohammad Nazrul Islama Available online 27 June 2017).

2-OBJECTIVES

The objective of the study involves:

2.1. Main Objective of the study

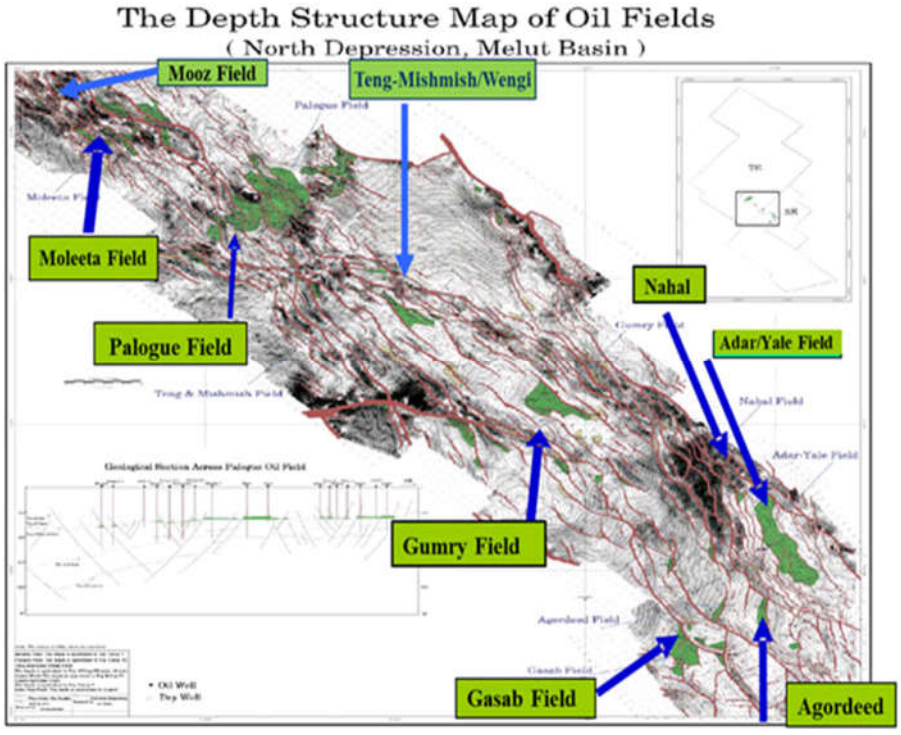
To investigate impact of the petroleum waste on the soil and local environment in the research area.

2.2. Specific Objectives of the study

2.2.1. To aware the local communities about oil hazards.
2.2.2. To describe some personal characteristics of the respondents in the research area.

3. MATERIALS AND METHODS

The materials and methods used in the study include:



3.1. Description of physical environment in study area

Melut (Paloch) lines between 4℃ *to* 10 ℃ the climate is hot and the area is swampy in the rainy season, between June and October, and increasingly dry during the rest of the year. The inhabitants are predominantly Dinka and Maban. They mostly live by herding, cultivation, and fishing. During the wet season, they stay in permanent settlements on the slightly higher ground, for the most part, small sandy ridges, surrounded by the black clay soil that floods and is not fit for settlement. Villages in these areas would typically count between 450 and 950 inhabitants. There are also numerous smaller settlements, sometimes with a handful of home only. In the dry season the land becomes parched hence pastoralists move their herds toward the river for water, graze and fishing. While in wet seasons, they move to higher ground. It is also characterized by sunshine for long periods during the year with high temperatures. The rainfall is from mid-June. Extremes of temperature, on average, are low in January, is about 28 °c rising to 41°c in April and May.

3.2. Population of the study

Melut County residents about 50000 individuals with 35% of them live within Paloch near of the oil areas, and 65% lived within Melut and others areas.The second area is Adar Yale with population about 53000 individuals which is 25% live within or near petroleum and 75% live in further areas around Adar Yale. Melut and Maban counties are two counties of the 13 counties of the Upper Nile State. Melut composed of five administrative units (Payams), also Maban composed of five units. Paloch, Adar Yale and Gumry were selected from the two mentioned counties to represent the study area. Population of the study area is 30000 residents (17000 in Paloch and 13000 in Adar Yale and Gumry).

3.3. Sample of the Study

Sample of the study was composed of 265 respondents, which was selected randomly from the population as follows; (135 from residents, 65 from employees of Natural Resources and 65 from employees of local government).

3.4. Data collection

Two types of data were collected for this study the first was; primary data**:** in which detailed questionnaires were presented of (265) respondents in the study area. The questionnaire was directed to local communities' residents, employees of natural resources and employees of local government. While the second type of data was; laboratory data**:** in which, three samples of contaminated soil by oil were collected from three different locations in the study area which were; Paloch, Gumry and Adar Yale**.**

3.5. Data Analysis

Analysis of the first set of data (Primary data) Statistical Package of Social Sciences (SPSS) was used, through which descriptive statistics was used for the questionnaire in form of ratios, tables, percentage and frequency distribution to achieve the objectives of the study. While the analysis for the second set of data (laboratory data) concerning the samples of soil a device called Atomic absorption Spectroscopy (AAS700) was used, this device as standard method to determine the soil pollution and contamination by heavy metals mixed with hydrocarbon and organic.

4. RESULTS AND DISCCUSION

This part of the study is consecrated for data analysis and discussion as follows

Firstly: Analysis of the questionnaire

A-Analysis resident's questionnaire

Table (4.1) Frequency distribution of the respondents by gender

Gender	number	percentage
Male	109	80 .7%
Female	26	19.3%
Total	135	100%

Table (4.1) indicates that 80 .7%, of the respondents were male and 19.3% of them were female. This study is difference with funding the male is successfully (Brodsky M. A1993). Successful female corporate managers and individuals.

Table (4.2) Frequency Distribution of respondents by age

Age	Number	Percentage
Small age (15 – 30) years	48	35.5%
Medium age (31 -50) years	70	51.9%
Old age (51 years & above)	17	12.6%
Total	135	100%

Table (4.2) shows that 51.9% of the respondents were in the medium age, 35.5 % and 12. 6% of them were small and old ages successively. This study was agreed with www.josrjournals.org

Influential Determinants of Capacity Building to Cope with Stress among University Students.

Table (4.3) Frequency distribution of the respondents by educational level

Educational level	Number	Percentage
Illiterate	16	11.9%
Primary	15	11.1%
Intermediate	20	14.8%
Secondary	60	44.4%
University and above	24	17.8%
Total	135	100%

Table (4.3) indicates that 44.4%, 17.8% and 14.8%, of the respondents have a secondary, university and intermediate level of education respectively. This study agreed with (Tazkia Islamic 2018). An Assessment of Customers preference on the Selection of Takaful Conventional.

Table (4.4) Frequency distribution of the respondents by their perception of soil erosion

Soil erosion	Number	Percentage
Existed	105	77.8%
No existed	30	22.2%
Total	135	100%

Table (4.4) reflects that 77.8% of the respondents were observed soil erosion compared to 22.2% of them who did not, this result was similar to (Fuentes et al., 2016,) A plasmid Set for effect Bacterial Artificial Chromosome (BAC)Transgenesis in Zebrafish.

Table (4.5) Frequency distribution of the respondents by their perception of land disputation

Land disputation	Number	Percentage
Existed	102	75.6%
No existed	33	24.4%
Total	135	100%

Table (4.5) illustrates 75.6% of the respondents were said land disputation was existed between local citizens compared to 24.4% of them who did not. This finding was agreed with Sirait M.T. 2009). Indigenous people and oil palm plantation expansion.

Table (4.6) Frequency distribution of the respondents by their perception about population density

Population density	Number	Percentage
Increased	115	85.2%
Decreased	20	14.8%
Total	135	100%

Table (4.6) shows that 85.2% of respondents were noticed increasing in population density compared to only 14.8% of them who were noticed it was decreased. This was result agreed with (O. Callaghan – Gordo et.al, 2016). Health effects of non -occupational exposure to oil extraction.

Table (4.7) Frequency distribution of the respondents by their perception of development

Existence of development	Number	Percentage
Existed	60	44.4%
No existed	75	55.6%
Total	135	100%

Table (4.7) explains that 44.4% of the respondents were observed the existence of developmental features compared to 55.6 % of them who were said no development in the research area. This result was differing from that in (Journal 2021) which was highlighted a socio-economic sustainability of the development of oil and gas resources in the Arctic.

Table (4.8) Frequency distribution of the respondents by their perception of air pollution

Air pollution	Number	Percentage
Increased	97	71.9%
Decreased	38	28.1%
Total	135	100%

Table (4.8) expresses that 71.9% of the respondents were urged that air pollution was increased compared to 28.1 % of them who were observed that it was decreased. This result was agreed with (Hänninen and Vardoulakis 2011) concerning air pollution and air quality impacts, which have been studied for many years around the world reporting varying degrees.

B-Analysis of Natural Resources Questionnaire:

The table (4.9) Frequency distribution respondents by wilds and domestics animals' death

Animals death	Number	Percentage
Observed	43	66.2%
Not observed	22	33.8%
Total	65	100%

Table (4.9) indicates that 66.2% of the respondents were observed animals' death compared to 33.8% of them who were not observed it. This result was agreed with (Chu W H. 2006) concerning the effects of petroleum pollutants on soil and animals' life.

Table (4.10) Frequency distribution of respondents by their perception of emigration Phenomenal of wild life in the study area

Emigrations of wild life	Number	Percentage
Observed	61	93.8%
Not observed	04	6.2. %
Total	65	100%

Table (4.10) reflects that 93.8% of respondents observed wilds life emigration, compared to only 6.2% of them who were not. This result was agreed with (Busnel R.G. and John Fletcher 1978). Effects of noise on wildlife. New York: Academic Press.

C-Analysis of Local government questionnaire

Table (4.11) Frequency distribution of respondents by presence of directives from local government to the petroleum companies to reduce wastes

Presence of directives	Number	Percentage
Present	17	26.2%
Not Present	48	73.8%
Total	65	100%

Table (4.11) illustrates that 73.8% of the respondents said that there were no directives from local government to the petroleum companies to reduce wastes compared to 26.2% of them who were said there were a directive. This result was differing from that found in (National Waste Report 2022) which reflects that "the local government plays an integral role in waste recycling services in Australia".

Table (4.12) Frequency distribution of respondents by their perception of local government has given punishment to the Companies

government punishment to Companies	Number	Percentage
punishment	22	33.8%
No punishment	43	66.2%
Total	65	100%

Table (4.12) 66.2% of respondents indicated that no punishment by the local government to Companies, while 33.8% agreed. the finding was different to (A.d.s Cesar et al 2017). The potential of waste cooking oil as supply for the Brazilian biodiesed chain.

Table (4.13) Frequency distribution of respondents by observing the way of getting rid of the petroleum wastes (burring wastes in the ground).

Burring wastes in the ground	Number	Percentage
Observed	60	92.3%
Not observed	05	7.7%
Total	65	100%

Table (4.13) illustrates 92.3% of the respondents were observed the petroleum waste was buried in the ground so as get rid of it by the petroleum companies compared to only 7.7% who were not observed that in the research area. This study was agreed (Khan et al .2018). Toxicity assessment of fresh and weathered petroleum hydrocarbon in soil.

Table (4.14) Frequency distribution of respondents by their perception of natives living near petroleum wells

Natives living near the petroleum wells	Number	Percentage
Existed	58	89.2%
No existed	07	10.8%
Total	65	100%

Table (4.14) indicates 89.2% of respondents were existed near petroleum wells compared to only 10.8% who were not existed near the petroleum wells. This result was contrasted with that one in (aborrego@edf.org). which highlights how overburdened communities in New Mexico and across the U.S.

Table (4.15) Frequency distribution of respondents by presence of services by companies to the residents

Presence of services	Number	Percentage
Present	30	46.2%
Not Present	35	53.8%
Total	65	100%

Table (4.15) shows that 53.8% of respondents were said that there were no enough services introduced by the petroleum companies to the residents in the local communities compared to 46.2% of them who were said they were present. This result was contrasted to that with (Journal (2021) which reflects that the services were cover a wide range of interests, from economic benefits for oil and gas producers and the state to new incentives for the socio-economic development or regions to improved wellbeing of the population.

Secondly: Analysis of soil samples in the research area

Table (4.16) Analysis of soil samples in the three locations of the research area

Elements Location	Hg / mg	As / mg	Fe / mg	Pb/ mg	Mn/ mg
Paloch	22.654	20.023	15.195	2.549	2.703
Adar Yale	19.709	20.462	14.931	1.868	1.833
Gumry	17.956	16.350	14.097.	1.630	1.577

Table (4.16) indicates the analysis of pollution of soil by heavy metals mixed with hydrocarbon and organics in the study area, On the other hand, three of the under research five elements which were Hg, As and Pb showed a higher figure compared to the normal international allowed figure which were (6-20) mg for Hg, (10-14) mg for As and 1.5 mg for Pb. While the found figures for the two rested elements Fe and Mn were lower than the allowed figures which were (20-30) mg Fe and 1.4 mg Mn successively. This result was agreed with HM which include essential metals (Cu, Zn, Co, Cr, Mn, and Fe), non-essential metals (Ba, Al, Li, and Zr) less toxic and highly toxic metals (As, Hg, Cd, and Pb) (Duffus ,2002). Heavy metals a meaningless term (IUPAC, Technical Report.

5-CONCLUSION AND RECOMMENDATIONS

The oil production in South Sudan it was supported the country with gross domestic product (GDP). In the study area (Paloch and Adar Yale) North of Upper Nile State where oil drilling operations release waste on the environment without any treatment identified, the concentrations on soil and local environment, caused health problems and hazards to the humans, animals and plants. increased heavy metal in the soil it reduced soil organic carbon and exchangeable bases, it was cleared that identified from oil spill negative impacted on agricultural production reduced and land contained heavy metals contaminated soil. Oil production need a good management and conservation of the local environment include soil, duties of government and local communities to monitoring the natural resources from petroleum companies' activities to reduce the waste or to get treatment. Communities in the research area are not aware about environmental hazards. If local government and petroleum Companies continuous to neglect the local environment in the research area will loss the natural resources in future. For full surely soil pollution affected organisms which are living sub ground and others negative such as land dispute, density population, air pollution, increased numbers of death animals, emigration of wilds life, no directives no punishment by the local government to offence companies, petroleum waste were buried in the soil, exist natives living near petroleum wells without enough services. Laboratory analysis of soil indicates that pollution by heavy metals mixed with hydrocarbon and organics in the study area. Finally, the research recommends the following; first. Avoid burial of the petroleum wastes in soil. Second; Petroleum companies have to commit for development and local community awareness about oil Hazards. Thirdly: convinced the residents who were living near of petroleum wells to live away, and providing them with services such as (Education, hearth, water drinking and electricity). Petroleum companies must retreat the wastes instead of disposal waste randomly in soil.

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