Quantitative analysis of multiple types of waste generated from Kadanwari field to evaluate the severity of environmental hazards on site.

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Muhammad Shoaib Khan[1], Dr.Prof Khan Muhammad brohi[2], Dr. Muhammad Safar Korai[3],
[1,2]*Institute of Environmental Engineering Management Mehran University of Engineering and Technology Jamshoro*

Abstract: The solid waste generated at surface bodies are capable of damaging the surface commodities at large scale. Indeed, it is very necessary to find a way to evaluate the amount of waste that is being generated at any particular geographical region and there should be an immense solution for disposing the waste. The aim of this study will be to collect data on the current state of environment in the Kadanwari field to observe the impact of company's activities on the local community and environment. The data that has been taken for the laboratory analysis is taken from 12 departments of Kadanwari field namely; Auto department, Mechanical department, Clinical department, Electrical department, Instrumentation department, Production department, Drilling department, Camp1 and Camp2, Westcon, Project and W/H department. The methodology will be adopting for study is based on qualitative and quantitative characterization of samples from the field. Environmental assessment that is being conducted during the monitoring and evaluation process to define an impact of a project. It must take place when the project is being initiated so at the beginning of the project but after a decision of implementing it.

Keywords: *Department, Environment, Kadanwari field, Hazardous and non-Hazardous,* Proximate and Ultimate Analysis

1. Introduction

Saita has proved itself as a best leading consultant company in the field of tunnel projects, irrigation projects and particularly they have great expertise in oil field development projects. These projects speak volumes about the commitment of the company to the future of our country.

In the beginning of the interventions and the outcomes of the survey that was directed by CORAD has recapitulated this testament (Shuler et al., 2019). The basic aim of the study was to assess the lush by the regions that were first focused by the inauguration of the interventions so that the development in the project concentrated in its outcome could be found out. To check the authenticity of the programs field surveys are quite helpful in this regard, which also incorporate the program's achievements.

The prime drivers of climatic change also threat the societies created by man, habitants of the animals and flash flood woodlands, famines, epidemics, droughts, acidic rains cold and hot waves *(Faheem et al., 2018)*. The purpose was aimed to gather statistics on the present condition of environs in the field of Badhra and Bhit to have a look on the company's accomplishments on the general environment and community. The research is a good tool that have analyzed the cyclic emission of Canadian oil when it was tested and thus provides the resulting conclusions as well *(Rodrigues et al., 2020)*. To establish a locating guideline for testing equipment's and to maximize the dust sampling projects, the objective lied in building up the transmit mine alongside cement industrialized lodge. In Nigeria there are crucial environments supporting the degeneration of the associated gas and oil because there were numerous oil spills in the last 50 years *(Ménard et al., 2015)*. The happenings begun with small oil spills that was over the half a million barrels in one single instance. However, unfortunately, at that time there were no strategies that came through to rescue environment that could challenge the problems by pollution in the country. The answers of Environmental Impact Assessment (EIA) were listed in the report that was procceded by (EMC) Environmental Management Consultants at jabho Dhands/Lagoons and at Nurri (Lattanzio, 2014). It is situated Badin concession region for the exploration developments. The EIA was conceded out captivating into deliberation Sierra Leone's Environmental Protection Agency's legislation and policy and other international environmental regulations involving to the project (Sarwar et al., 2016). The study was mainly concerned to figure out the details regarding the environment in the Kadanwari filed to check out the effect of the proceedings by the company on environment and local habitants (Sumah, 2019).

These include dangerous smoke release, different types of waste annually produced, ground water capitals that supported the way to conclude the details by a survey that provides a basic idea concerning social-economic effects and the removal measures to lower down the environmental pollution and efficiency (Mutyambizi et al., 2020).

The methodology will be adopting for study is qualitative and quantitative data collection. Environmental assessment that is being directed during testing and checking the procedure to describe the impacts of tasks. Initiating this project must be at the beginning but after deciding how to implement the concerning program. Environmental assessment can also be used as an accompaniment to a qualitative and quantitative data. Environmental assessment is for socio economic studies and for planning community development projects an environmental assessment as a benchmark for all future activities. The policies are assumed either existing or unapproachable, as these strategies and risks are pretty highlighted and basic information is also listed. This way is a sound mean of directing the output of assignment to enhance the strategies that prevent little efforts and media movements to mobilize community. This research provides the outlook of making inform decisions and its effects of the project on the focused inhabitant. Similarly, keeping other strategies in mind and the utilizing the control groups it also supports in appreciating change in the focused population. Evaluation tools are normally the same as used in assessing environment. This is vital for confirming which organization associates "apples to apples". The way forward, directing the activities of environment suggest that other resources and time for tools utilized in evaluation are lowered or they can be eradicated through the research that will evaluate company's performance that are impacting the local inhabitants or not and to evaluate how the company is playing its role in facilitating people.

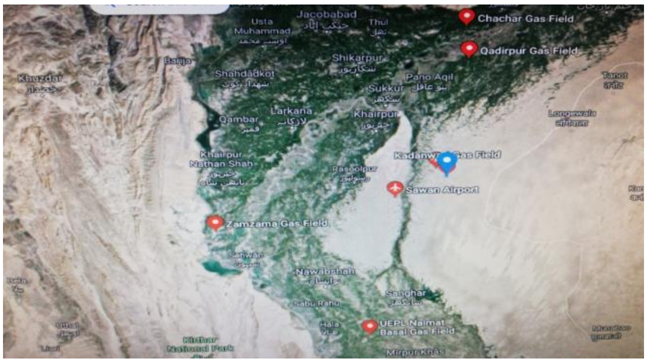

Figure.1. Road Map of Kadanwari Field

After the industrial revolutionization, there has been seen an enormous amount of increase in hazardous and non-hazardous waste that has adversely impacted the health and social life of the local communities. Mainly the companies are using old designed machineries which generates high amount of smoke which directly impacts the heart leading towards the heart related issues. It is very important to identity the most vulnerable types of waste along with its volume in order to get rid of this menace. Kandanwari field is located at one of the environmentally vulnerable areas and it produces natural gas which lead to generation of multiple types of wastes, which are directly affecting the lifestyles across the field activity areas. Henceforth, it is very necessary to conduct the waste evaluation study. The aim of this study is to quantify the Proximate analysis parameters including volatile matter, fixed carbon and moisture content for departmental waste generated at site. Moreover, Environmental assessment has been carried out for one of the oils and gas field of Pakistan in order to highlight the waste generated per year through different departments of the field with the help of provided field data and extensive laboratory testing. This study will help the company to address their concerns related to environmental waste management system.

2. Methodology

The network design of a hazardous waste management system is a long-term strategic decision and is therefore influenced by a high level of uncertainty in the planning environment (Sepúlveda et al., 2010). That is, the construction and construction of hazardous waste, the cost of site operations and transportation, etc., which further complicates the decision-making process. However, many types of hazardous waste management statistics are done by decentralization and proper control of boundary uncertainty is inadequate (Oguzcan et al., 2019). In fact, making decisions on all input parameters that are fully known in advance is not possible and the inability to deal with uncertainty can reduce the complexity of the model results. When deciding on hazardous waste management strategies, it will be more costly to convert, and inefficiency will reduce the use of decision-making methods. For these reasons, we are building a two-step model with multiple objectives to build a network of hazardous waste management system under an uncertain environment. In this paper, using a mathematical approach, we aim to answer the following research questions: How can you make decisions in the network configuration of a hazardous waste management system that affects uncertainty? What are the benefits of using a stochastic model? Some papers are arranged like this. Most of the solid municipal waste is also dumped in waterless and hazardous waste dumps (Chakraborty, 2001). The safety requirements for each type of waste disposal are increasingly increasing with toxic waste and its potential to affect humans and the environment, thus ensuring temporary and long-term isolation from the environment. Prior to the release of new regulation of radiation, which is treated as a standard waste in Spain, radiation production can be considered one of the signs that must be controlled to end the last solid waste. However, after the publication of the new law in 2010 the SAITA radiation regulatory framework has been established in Spain. Another official document describes SAITA's industries that can produce SAITA waste. The integration of SAITA's industries, the mechanisms for regulating the use of natural radiation in those industries, and the effective emission standards are part of other Spanish documents. In order to incorporate organic waste production into this management process, similarities can be established. The initial determination of the properties and chemical residues produced in the industrial process should include, in the case of SAITA, and the standards for solid waste production. The steps to be followed after this feature may be the same as those used for conventional, non-radioactive waste, although some difficulty should be included because the effect of radiology is assessed by active, non-direct dose measurements, instead of specific measurements of work concentration. If any toxic substances to be detected, other than solid waste, are above “permissible levels” they should be treated as hazardous waste. Further testing of solid waste generating standards (this study does not cover the required technical measurement capabilities) should be conducted in the case of SAITA waste. As each waste disposal option offers different levels of environmental protection, different levels of waste disposal can be made at each option. In order to “reduce” the amount of waste that will be disposed of, release / approval rates may be accepted for the unconditional management of residual waste, including reuse, reuse or torture. In addition to those exemptions / permissions, conditional standards can be obtained by considering certain exposure conditions and conducting quantitative assessments under those circumstances (Li et al., 2020). Therefore, a description of the required levels of solid waste disposal is required in this study a proposal was made for these solid waste production phases above the release rates, which could be considered for SAITA waste management at conventional waste disposal sites. After this initial reduction has been made, the remaining waste should be disposed of in a proper disposal site.

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Table 1: Proximate and Ultimate Analysis Parameters Description

Parameters	Formula	Temperature	Description	Time	Equipment	References
M.C %	MC (%) = [(a- b)/a] 100	105^0C	M.C (%) = Moisture content percentage A = Initial weight of sample B = Final/Dry weight of sample after oven drying	24 Hours	Oven	(Lemma, 2007)
V.M %	VM = [(b-c)/b] x 100	950^0C	V.M (%) = Volatile Matter percentage c= Final weight of waste sample After muffle furnace B= Final/Dry weight of waste sample after oven drying	7 Minutes	Muffle Furnace	(Amin et al., 2016)
F.C %	FC = (c/b) x 100	950^0C	F.C (%) = Fixed Carbon percentage c= Final weight of waste sample After muffle furnace B= Final/Dry weight of waste sample after oven drying	7 Minutes	Muffle Furnace	(Wang et al., 2013)
C.C %	C.C = 0.0637 x FC + 0.455 x VM	—	—	—	—	(Demirbas and Demirbas, 2004)
H.C %	H.C = 0.052 x FC + 0.062 x VM	—	—	—	—	(Demirbas and Demirbas, 2004)
O.C %	O.C = 0.304 x FC + 0.476 x VM	—	—	—	—	(Demirbas and Demirbas, 2004)
HHV (kcal/kg)	HHV = 30.32 x CC + 142.3 x HC	—	—	—	—	(Demirbas and Demirbas, 2004)
LHV (kcal/kg)	LHV = HHV - 2433 x MC	—	—	—	—	(Demirbas and Demirbas, 2004)

3.Testing procedure of samples

In order to generate the required results for the samples collected at filed site for laboratory experiments. In total 12 samples have been analyzed at Mehran Universities Environmental Department Laboratory. Two samples with different weight for each waste i.e. wood waste, cardboard waste, plastic waste, paper waste, rubber waste and food waste were taken for the experiment. First of all, weight of empty vessels was determined through sample weight machine (Fig. 2) and denoted with M1, after which vessels were filled with samples and again weight was determined and denoted with M2.

Figure.2. Sample of weight machine

In third step samples were placed in oven under 105 °C temperatures for 24 hours (Fig. 3). Once again, the sample weight was determined after 24 hours heating in oven and denoted with M3. At the end heated samples were placed under muffle furnace for 7 minutes duration at 950 °C temperature denoted with M4 so that the moisture of samples can be absorbed and the final wight of the samples could be determined.

Figure.3. Oven with waste samples

Figure.4.Muffle Furnace

4. Results and Discussion

In this chapter of results and discussion several hazardous and non-hazardous waste associated from twelve different departments of the company has been discussed in detail. The type of waste that comes under these departments are, metal, plastic, rubber, tetra pack, paper/cartoon and glass or empty bottles all these comes under the section of non-hazardous waste. On the other hand, in hazardous waste we have considered, filters, oily rags, chemicals, empty cans/drums, used oil, clinical material, oily sand, tube light, bulb and batteries.

It has been observed from the field data and laboratory experiments that volume of hazardous waste outweighs the non-hazardous waste with highest volume of perilous waste from machinal department followed by production department with 23,719 Kg and 26,381 Kg respectively. Moreover, Electrical department remains at third number with 7366 Kg of risky material followed by Camp-1 at 829 Kg volume. If we talk about the non-hazardous associate waste, Camp-1 dominates over all other departments with total volume of 9203 Kg. The sum of total non-hazardous waste for the year 2020 is 13683 Kg and the sum of total hazardous waste for the year 2020 is 59489 Kg.

Table 2: Auto Department Waste

Month	Non-Hazardous	Hazardous
Jan	0	0
Feb	0	0
Mar	0	0
Apr	0	0
May	0	0
Jun	153	100
Jul	0	0
Aug	0	0
Sep	0	80
Oct	0	0
Nov	0	11
Dec	0	0

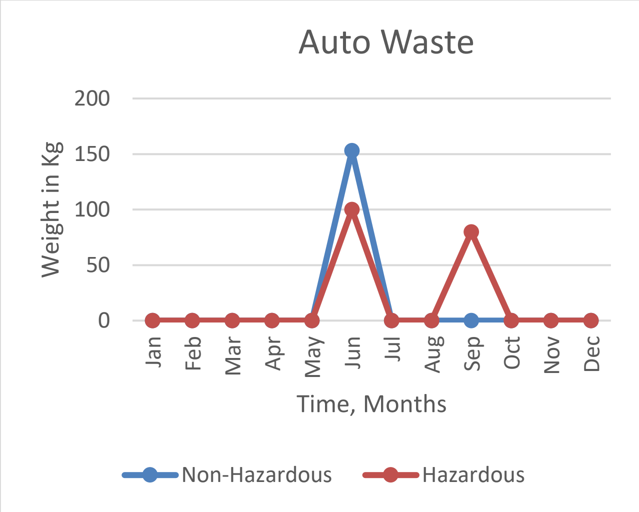

Figure 5. Hazards and Non-Hazards of Auto Waste Department

(Fig. 5) Shows the auto department waste analysis of a year. It can be observed that there is no hazardous material at the start of the year till May. Meanwhile, an increase in hazardous 100 kg and non-hazardous 153 kg is observed from May to June. In September an increase in only hazardous material is observed about 80kg.

Table 3: Clinical Department Waste

Month	Non-Hazardous	Hazardous
Jan	0	0
Feb	0	0
Mar	0	0
Apr	0	0
May	0	0
Jun	153	100
Jul	0	0
Aug	0	0
Sep	75	26
Oct	0	0
Nov	0	11
Dec	0	0

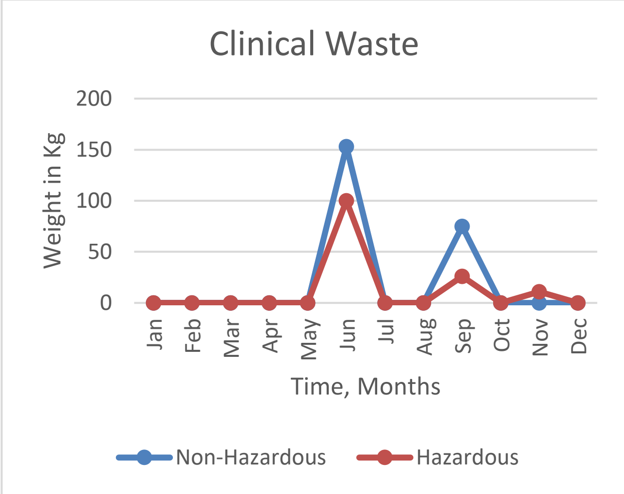

Fig 6: Hazards and Non-Hazards of Clinical Waste Department

(Fig. 6) illustrates the Clinical department waste analysis of a year. It can be observed that there is no hazardous material at the start of the year till May. Meanwhile, an increase in hazardous material 100 kg and non-hazardous 153 kg is observed from May to June. In September an increase in hazardous material 26kg and non-hazardous material 75kg is observed. In November 11 kg of hazardous material is observed.

Table 4: Camp-1 Department Waste

Month	Non-Hazardous	Hazardous
Jan	1275	220
Feb	772	100
Mar	1388	86
Apr	371	25
May	323	0
Jun	782	80
Jul	515	55
Aug	292	47
Sep	152	80
Oct	926	85
Nov	533	24
Dec	696	27

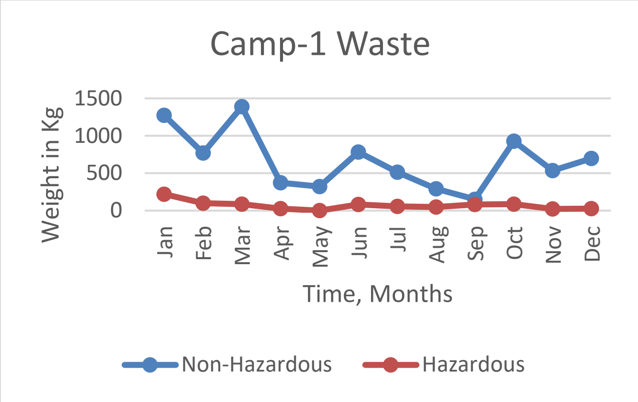

Fig 7: Hazards and Non-Hazards of Camp-1 Waste Department

(Fig. 7) illustrates the Camp-1 department waste analysis of a year. In January higher percentage of non-hazardous material 1275 kg and 220 kg of hazardous material. In February, a decrease in non-hazardous material 772 kg and hazardous material 100 kg is observed. In March increase in non-hazardous material 1388 kg and 86 kg in hazardous material. In April, a decrease in hazardous material 25 kg and non-hazardous material 371 kg is observed. In May decrease in hazardous material 0 kg and non-hazardous material, 323 kg is observed. In June increase in hazardous material 80 kg and an increase in non-hazardous material, 782 kg is observed. In July decrease in non-hazardous material 515 kg and a decrease in hazardous material, 55 kg is observed. In an august decrease in non-hazardous material 292 kg and hazardous material, 47 kg is observed. In September decrease in non-hazardous material 152 kg and an increase in hazardous material, 80 kg is observed. In October increase in non-hazardous material 926 kg and an increase in hazardous material, 85 kg is observed. In November decrease in non-hazardous material 533 kg and a decrease in hazardous material, 24 kg is observed. In December increase in non-hazardous material 696 kg and an increase in hazardous material, 27 kg is observed.

Table 5: Camp-2 Department Waste

Month	Non-Hazardous	Hazardous
Jan	0	0
Feb	100	40
Mar	227	10
Apr	60	20
May	150	42
Jun	120	40
Jul	255	65
Aug	215	45
Sep	0	0
Oct	265	116
Nov	445	90
Dec	130	18

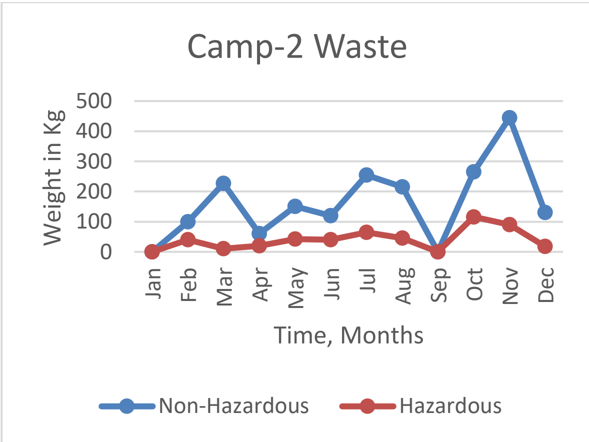

Fig 8: Hazards and Non-Hazards of Camp-2 Waste Department

(Fig. 8) shows the Camp-2 department waste analysis of a year. At the start of the year, a moderate percentage of non-hazardous material 227 kg is observed, and also a sudden decrease is observed after March till June in the percentage of non-hazardous material. In November highest percentage of Non-hazardous material, 445 kg is observed. Meanwhile, a low percentage of hazardous material is observed throughout the year in Camp-2 Department.

Table 6: Mechanical Department Waste

Month	Non-Hazardous	Hazardous
Jan	78	4979
Feb	0	9586
Mar	5	15
Apr	0	300
May	0	620
Jun	0	0

Jul	0	1105
Aug	350	1235
Sep	0	1795
Oct	150	1219
Nov	0	15
Dec	10	2850

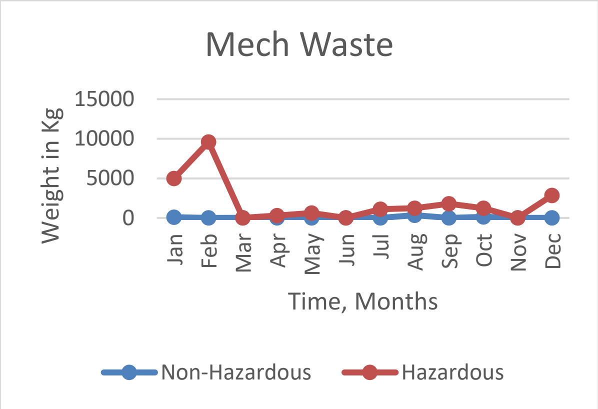

Fig 9: Hazards and Non-Hazards of Mechanical Waste Department

(Fig. 9) shows the Mechanical department waste analysis of a year. At the start of the year low percentage of non-hazardous material, 75 kg is observed till July and a sudden increase of 350 kg is observed in August. Meanwhile, the highest value of hazardous material 9586 kg is observed at the start of the year and after March till the end of the year low value of hazardous material is observed.

5.Conclusion:

The prime objective of this research study was to conduct the quantitative analysis of the different types of waste generated from Kadanwari field of Sindh, Pakistan. Through available field data and extensive laboratory testing of 12 samples of Wood Waste, Cardboard Waste, Plastic Waste, Paper Waste, Rubber Waste and Food Waste. In total there were 12 departments of Saita Company of Pakistan were shortlisted: auto department, clinical department, camp1 & camp2, mechanical department, electrical department, instrumentation department, production department, Westcon department, W/H department and on-going project. Overall, the contribution from hazardous waste stood at 81% i.e. 59387.5 Kg and the remaining 19% i.e. 13693 Kg was from non-hazardous waste. This proves that waste material at Saita can be very risk for the environment and the people living around it, if not managed properly. Plastic waste has the highest heating value as compared to all other waste products with 2289.06 Btu followed by 2288.44 Btu by wood waste. As per the facts and figure it can be concluded that the amount of hazardous and non-hazardous waste generated per year from the field is the matter of grave apprehension as far as the environmental destruction is concerned.

Notably, rubber waste Samples has greater higher heating value, but less volume produced as compared to the other wastes, which has higher heating value but lower production sources. On the other hand, food waste samples have higher heating value and high volume of production as compared to the wood waste which has still higher heating value but lower production volumes. However, the combustion of most of the solid wastes is exothermic.

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About Authors

Engr. Muhammad Shoaib Khan and I have done B.E in petroleum and N.gas Department in 2011. I am currently working in United Energy in Pakistan from last 4 months and my last experiences Companies are in Allen Petro Company, Drill Exec Company and United track system and Leopards couriers System in management department and i have PEC membership.

Dr. Engr. Muhammad Safar Korai He is assistant professor in institute of environmental engineering and management, MUET jamshoro. His major interest areas are Solid waste management, waste disposla technique, waste energy, anaerobic digestion technology.

Prof. Dr. Khan Muhammad Brohi He is Dean of Architecture and civil engineering, MUET Jamshoro. His major interest areas are Health Safety and Environment, EIA and Air and Noise Pollution.