Research

A COMPARATIVE ASSESSMENT STATUS OF SOIL POLLUTION IN SELECTED RURAL AREAS AND URBAN AREA OF DISTRICT KASUR.

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SESSION: 2018-2021

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A THESIS SUBMITTED TO KINNAIRD COLLEGE FOR WOMEN IN FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

BACHELOR OF SCIENCE IN GEOGRAPHY

By

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LAHORE 2021

RESEARCH COMPLETION CERTIFICATE

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Department of Geography has carried out research work entitled "**A Comparative Assessment Status of soil pollution in selected rural areas and urban areas of district Kasur**. "Under my supervision.

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ACKNOWLEDGEMENT

All praises be to Allah Almighty, the most beneficent and the most merciful who gave me health, strength, and well-being to complete my research thesis.

At first, I would thank my parents who have supported me throughout the process at every step of the way and have prayed, encouraged, and made sacrifices for my education and better future. Especially my mother who has helped me with my research and made my work easier.

Second, I would thank my institution, Kinnaird College for Women University, and my supervisor Ms. Shumaila Majeed for the constant motivation and supervision and providing me remarkable educational environment to reach my potential.

In the end, I am thankful to PCSIR, Laboratories complex Lahore and soil & water testing laboratory Kasur who helped in my soil testing and showed moral support at the time of difficulties. I express my gratitude to everyone who has helped me in this research.

Masuma Raza

ABSTRACT

The current knowledge of the soil pollution in Kasur an urban area of Pakistan is discussed with special reference to heavy metals. Irregular increase in this urban community has started showing some concerns in recent years that has become the major concern for the pedologist and is acting as a barrier for agricultural activities in that area. The soil of urban area has been investigated and it turn out to be a contaminated soil. This study will show the comparison between the soil quality of an urban area and a rural area. The selected rural areas are from the vicinity of District Kasur. As the urban soil has been contaminated with heavy metals such as arsenic, lead, nickel, and chromium such pollution in soil is the result of tanneries and rapid urbanization. The above-mentioned metals are high in urban area as compared to rural areas. The more the far a rural area is from urban the better is the quality of a soil. The samples will be collected from Kasur city and four villages (Maan , shaikpur Kuhna , Mahlem Kalan and sultan shahwala). The villages chosen are approximately 15 to 20 km away from Kasur and falls in the vicinity of Ganda Singh boarder. Through the sampling assessment variation in the metal content between these areas was evaluated. The farmers of rural areas are unaware of the necessity of soils qualitative analysis which is why this research is based on such comparison. The level of chromium was also tested from the selected samples. The highest and alarming was found in city sample and the least was found in the village sample. The purpose of this study and sampling was to highlight the fact that urbanization may cause concentration of high-level metals pollutant in its adjoining rural areas. The high concentration of heavy metals in rural soil was not found.

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List of Abbreviations

As	**Arsenic**
BDL	**Below Detectable limit**
Cr	**chromium**
EPA	**Environmental Protection Agency**
FAO	**Food and agricultural organization**
GIS	**Geographic Information System**
GPS	**Global Positioning System**
GSO	**Gulf Standardization Organization**
GWQI	**Ground Water Quality Index**
KPK Khyber	**Pakhtunkhwa Mg Magnesium**
NTU PEQS	**Nephelometric Turbidity Units Punjab Environment Quality Standards**
pH	**Potential of Hydrogen**
SO4	**Sulphate**
SPSS	**Statistical Package for the Social Sciences**
TDS	**Total Dissolved Solids UC Union Council**
WHO	**World Health Organization**
WQI	**Water Quality Index WASA Water and Sanitation Agency**

Chapter I

1.1 INTRODUCTION

In recent times many communities have become aware about the soil pollution that has been increased. This now has become the reason for the environmental pollution in our everyday lives. In recent years the government has finally shown some attention regarding the soil quality and also its effect on humans and environment. The major concern regarding the soil is as its pollution results as repository of much pollution that can transmit the most unwanted substances to the groundwater and work as the supplier of contaminants in crops. Such concerns are the reason why recently the Government agencies has shown huge concern towards soil. Other attitudes of soil pollution basically vary from country to country with respect to their political and economic situation. Basically the lack of knowledge can affect the community perceptions with regards to the severity of pollution problems although everyone wants and hope for the change in this situation. As compared to European cities that were established for centuries the pollution in our cities was expected to be less but there is he abrupt boom in environmental pollutants international-wide. the industrial revolution become the primary cause that has resulted in pollution in our principal urban centers. Now these pollutions are now found in different resources and elements of earth such as air pollution, water pollution and soil pollution basically these are the factors of an environment now if any of one kind of pollution is present that would eventually pollute the environment.

This research is going to be about the soil pollution and how it is affecting the urban areas and rural areas a comparative analysis will also be conducted through soil sampling of different areas that from rural and urban.

First one must be aware about the background and definition of 'contamination 'and 'pollution'. Mostly people just know that 'contaminated' soil is just the hazard that happens because of the of a potentially unwanted substance addition but its relation towards health and environment may cause is unclear. A contaminated soil is basically an addition of pollutants or contaminants in soil that puts risk on health and environmental. Soil properties are majorly tormented by herbal elements and anthropogenic sports acting at numerous scales. Through the soil variability some of

the factors affecting are controlled they can be short-range action on the other hand mostly are probably to be operated at huge distances.

Nature of Urban Soil

Through the management and checking of the contamination in city soil has been recognized by its complex behavior and addition of abnormal substances in soil. The complexity has increased because of interacting land uses. The intensive activities of humans that are associated with buildings, shipping and recreation is the purpose behind the disturbance of city soils that has motive barriers within the utility of soil technological know-how with appreciate to its characterization and amelioration of their contamination.

Due to less research in the field agricultural soil has restricted the officials to get more information regarding the reasons behind the soil contamination in rural areas. Extensive reshaping of the land surface, deep cultivation is the reason behind the disturbance in soil texture. The construction of buildings and roads, landfilling, importing of materials for parks, gardens and general landscaping has created unpredictable layering in young soil physical modifications consisting of compaction, terrible structure and higher bulk densities affects the quality of water (tiller et al.,2018).

basically, the natural factor and human interest are both playing a role in figuring out the complex spatial erratum of heavy metal concentrations in soil. this may be a enough understanding of the resources of soil heavy steel variability and the difference among the fine of soil is important due to the fact it can serve as a basis for hazard assessment, soil remediation in addition to powerful management recommendations

Figure 1.1 picture of rural area near Kasur city.

Soil pollution is a hidden danger that is lurking behind human feet as it can be invisible and is far away. Soil pollution is a universal issue which destruct our soil, poison the food we consume the water we drink and greater importantly the air we breathe. The soil pollution is inflicting critical hazard to the meal's protection, human fitness and the surroundings that is why this research is based on the comparison between the soil quality of an urban land and rural area. The main reason the research of rural area is as we know soil its an exceptional potential to filter out and buffer contaminants, degrading and attenuating the bad outcomes of pollutants however this capacity is finite. Now we can easily guess that urban soil is polluted because of industries and urban waste that is harmful on the other hand rural soil can be polluted because of unsustainable farming practices, usage of fertilizer.

As Pakistan is an agro-based country and villages in the vicinity of Kasur plays an important role as the importer of staple food. But now the city has become polluted that is why a comparison is being conducted between the soil of Kasur and four chosen villages (Maan , shaikpur Kuhna , Mahlem Kalan and sultan shahwala).

This research will be conducted on the different sampling of soil from different villages of Kasur as for rural sampling and Kasur itself as urban sampling of soil. The soil sampling will help us to identify the chemical pollutant of soil, further research will be done by comparing these pollutants and the source of such pollution will be identified.

1.2 STUDY AREA AND FACILITIES AVAILABLE

This project was be conducted in the district Kasur and its adjoining rural areas. The chosen rural areas are Maan , shaikpur Kuhna , Mahlem Kalan and sultan shahwala. All the sampling of soil was be done on PCSIR laboratory and soil and water testing laboratory Kasur.

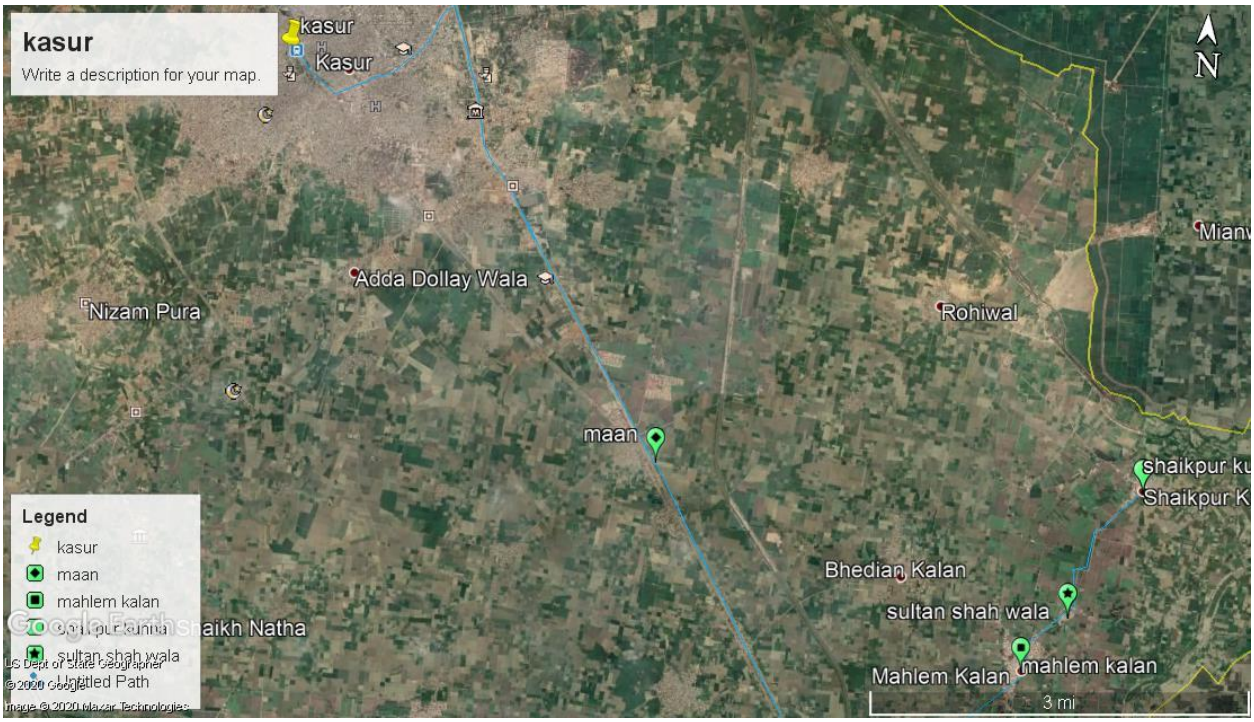

Figure 1.2 An image of study area through google pro earth.

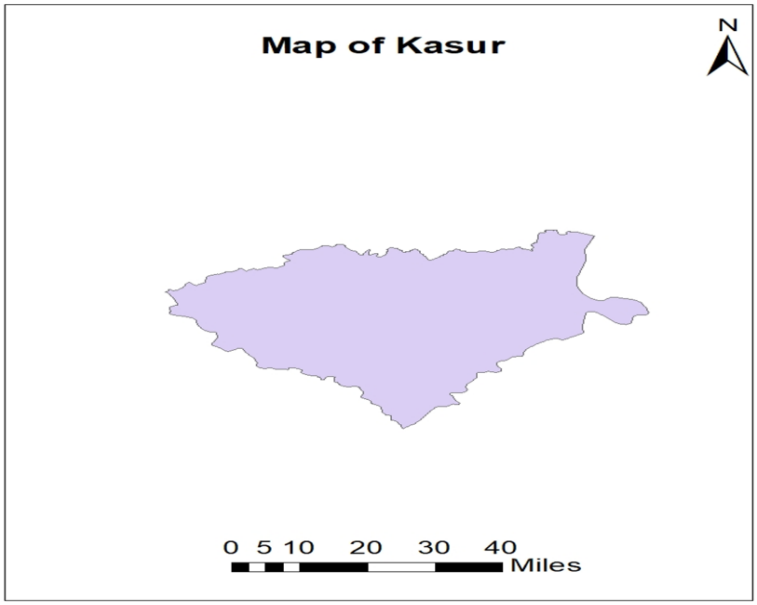

Figure 1.3 Map of Kasur

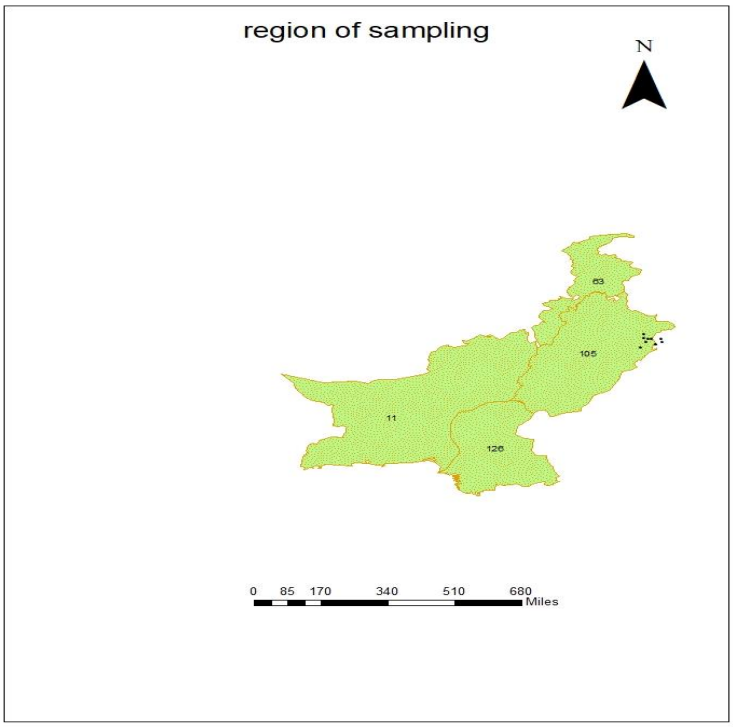

Figure 1.4 map showing region of sampling

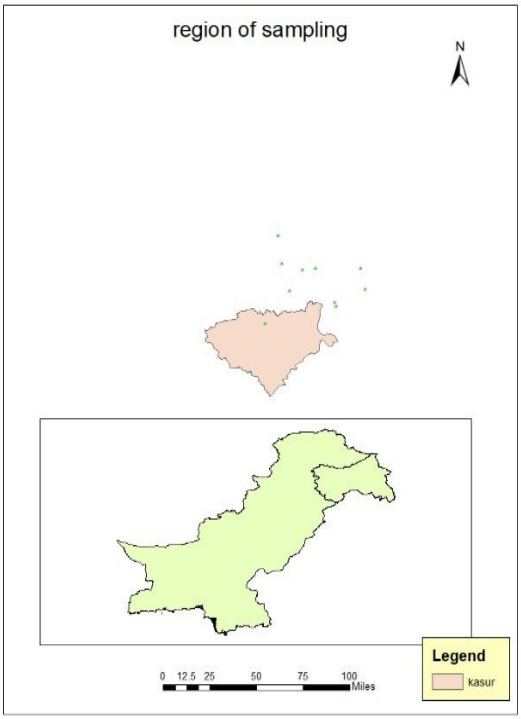

Figure 1.5 map of study area

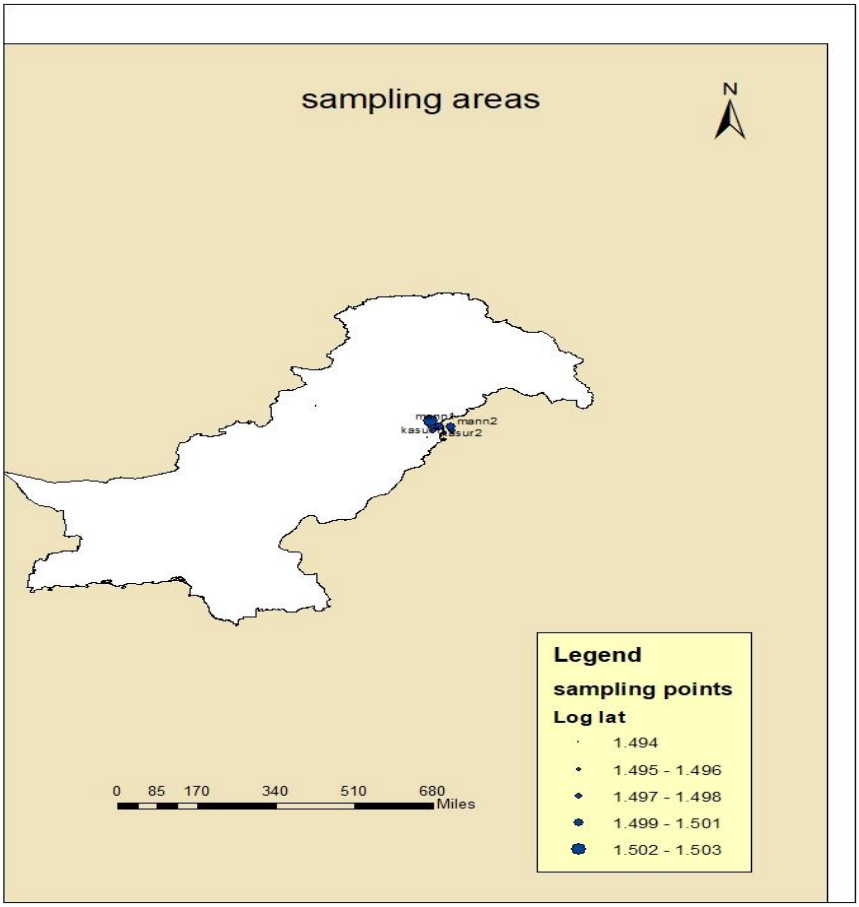

Figure 1.6 map showing areas of sampling through their locations.

1.3 STATEMENT OF PROBLEM

For a state to prospers the process of urbanization and preservation of agricultural soil must go hand in hand, unchecked urbanization is affecting the quality of rural area (agricultural) soil through pollution that why a comparative analysis on the status of soil quality will be conducted in Kasur district and its adjoining rural areas.

1.4 HYPOTHESIS

*H*0= the concentration of metals in rural soil is not high due to urban industries and pollution.

*H*1= the concentration of metals in rural soil is high due to urban industries and pollution.

1.5 RATIONALE

Soil pollutants such as arsenic, chromium, lead and nickel are found in the urban soil that has been polluted and now the main purpose is to compare the soil quality with the soil quality of urban area. Kasur is a city that has almost 300 tanneries, untreated waste and other human activities which is why the soil of the city has been polluted but now the main question is about the soil quality of adjoining villages that are basically the agricultural land and that imports the staple items. Comparison between the soil will obviously help the farmers in agricultural activities. There will be a correlational analysis among the metal status of urban and rural areas with the suggestive information on the emission of this source. This study considers sources and extent of soil pollution with reference to background levels in urban and rural areas. The sampling will be conducted from the villages with the distance of 15 to 20 km far from the city. The rural soil quality will help to identify the sources of pollution in this rural area(village). The farmers will easily become aware about their soil quality and according to that they can decrease the use of fertilizer or maybe they can switch to other options that are not harmful for agricultural soil.

1.6 OBJECTIVES

The objectives of this study are stated below,

- Soil quality is decreasing in urban areas by industrial activities.
- To find the heavy metals or waste that is distributed into agricultural soil that effects the quality of soil.
- To identify the amount of arsenic and chromium from the collected samples.

Chapter II

2. Literature review

Davis et al,.(2009) Searching the resources of neurotoxic metals in rural and concrete soils could be very vital for mitigation of human exposure. intellectual retardation and developmental put off (MR/DD) turned into observed inside the kids from four areas with that were selected for soil sampling and different nine metals were found and characterized in soil type and through GIS-based data its effect on the climate, ecological region, land use and industrial facilities was collected. To discover commonalities of metal distribution the major factor analysis (PCA) and cluster analysis (CA) have been used. One rural and urbans had equal soil sorts and has high range of soil metal concentrations. PCA and CA results declared that Ba, Be and Mn had been gift due to natural sources including Pb and Hg from anthropogenic sources and As, Cr, Cu, and Ni from both sources. Low great of arsenic became predicted that became linked with a third PCA component and had a complex shape that complicates the mitigation strategies for the minimization of concentrations and exposures.

Afzal et al,.(2012)Because of industrialization many heavy metals are found in soil and water. Such contamination has become a major environmental difficulty of Pakistan. That's why it turned into very essential to locate the extent of infection in soil and water which might be close to business regions. This have a look at has assessed the infection of heavy metals present in the soil and groundwater which are across the leather-based industrial place of Kasur, Pakistan. Samples of soil and water had been collected from the area of have a look at and has examine the Cr, Fe, Ni, Cd, Pb, Zn, Co, and Mn thru atomic absorption spectrophotometric technique. The result declared that soil and groundwater of the vicinity are surprisingly infected with all tested heavy metals. To be unique the wide variety of chromium concentrations was very high in soil and groundwater such became the situation with other metals. essentially, through evaluation its turned into recognized that the heavy metals inside the groundwater and soil of the chosen region become

having a commonplace beginning of contaminants in them and that became believed to be the leather-based enterprise of Kasur.

Samrana.S et al,.(2017)The increased industrialization and urbanization is the reason of consistent release of toxic effluents in environmental that has caused the rise of pollution in Pakistan .These effluents are dangerous for both soil and water that is effecting the crop production. Almost 80% people of Pakistan that lives in urban areas faces the lack of access in clean and potable water because of discharges rom industrial wastes, toxic synthetic natural chemicals, heavy metals, pesticides and municipal wastes. heaps of tons of greens are produced in Pakistan, but these greens are contaminated with chromium, cadmium, copper, lead, nickel, zinc, cobalt, magnesium, iron and arsenic and the purpose at the back of this contamination is the untreated metropolis pollution. A huge wide variety of shallow subsurface aquifers and tube wells have been infected as in with high arsenic tiers which became of 10 ppb. Soils that are deep soils from the same location has especially excessive concentrations of arsenic. inside the agricultural areas of Sindh, the best average arsenic content in was discovered in soil that changed into forty-six.2mg/ kg followed by 35 mg/kg in soil accrued from the floor of diverse regions of Punjab. The effects on human had been also found in nearby of Pakistan due to the intake of arsenic infected water and vegetation.

Shafiq et al,. (2017) Kasur is known as the ne among hubs of leather industry in the Punjab, Pakistan, they use the chrome tanning approach for leather this is used for numerous functions. The excessive level of Chromium (Cr) turned into observed in irrigation water, soil and seasonal vegetables of the villages which are located in the location of wastewater treatment plant and stable waste dumping web site of Kasur Tanneries Waste management company (KTWMA). The information turned into assessed thru the analysis of variance (ANOVA), clustering analysis (CA) and important issue evaluation (PCA). From the data accrued by 30 sampling web sites from each of the three villages for irrigation water, soil and seasonal greens allows to interpolated surface maps for Cr. essentially the quantity of contamination in the 3 villages became related with the gap from KTWMA wastewater remedy plant.in Faqeeria Wala the very best stage of Cr infection in soil (mg kg−1) changed into found, at Dollay Wala (30.33) it became intermediate and the least turned into in Maan (25.sixteen). a completely slow change in Cr accumulation was found among

those villages from contaminated wastewater which have at least infection level (2.02–4.40 mg L−1), in soil (25.sixteen– 37.67 mg kg−1) and (156.67–248.33 mg kg−1) in seasonal vegetable vegetation that are cultivated on this vicinity. the very best degree of Cr become additionally determined. The research not just expected the current state of affairs of Cr infection in those villages however additionally factor out the fashion of boom in Cr infection from irrigation water to soil with a view to affect the agricultural plants. among those all factors of Cr contamination in greens, soil irrigation the main reason located became floor water which turns to be the dominant one.

Handayani et al,.(2017) Development in urban areas is the reason that now people are giving attention to soil profile and soil quality as it has been proven that it could impact soil functions including, water motion, aeration and vitamins mineralization which can be released from soil natural count (SOM). today we see that because of the growth in enlargement of city areas tit got here in noticed that soil characteristics attributable to urban versus rural management are important to be decided. That's the motive of this have a look at basically to pick out the differences and contrast of soil properties that collected from urban and rural areas in Kentucky. Soil samples gathered from relevant and western Kentucky had been as compared after which became analyzed for their general porosity, macro porosity, compaction, water retention, natural rely, water strong aggregates and the level of acidity. variant in the analysis became discovered through scholar t-check, Pearson evaluation of correlation and regressions were used to locate the best remedies that can assist to identify the relationships between soil homes and subject place.

S. Zafar and M.R. Khan.(2014) The analysis of this affected soil was due to the practicing of agricultural activity in the soil of Kasur that was regained after the wastewater from tannery's drainage. There was installation of pretreatment plant whose purpose was to make sure that crops must be toxic free as heavy metals must not be present in the production of food chain. The reports analysis is based on the presence of dangerous metals in soil such as Cr, Cd and Cu. The amount of total heavy metals was measured by the standard methods of analysis on the other hand the results were analyzed and compared with various international standards of agriculture selected by international organizations and experts. The results proved that within permissible limits the

amount of total heavy metals Cr, Cd and Cu are present in agricultural soil. The conclusion was that the reclaimed land area around Kasur tanneries was suitable for agricultural practices.

Zhao et al., (2010) For thesoil heavy steel variability and its risk assessment the records and knowledge with the help of spatial variability and multi-scale are very vital particularly for soil remediation as it allows to provide the control guidelines which can be powerful. From Luhe, China the topsoil samples (zero–20 cm) (n= 330) were amassed. Multivariate factorial kriging of geostatistical with strong estimation on variograms with spatial overly analysis and indicator kriging was carried out to hit upon the correlations of heavy soil metals (Cu, Zn, Pb, Cr, Ni, Cd, and Hg) across the spatial scales. The sources of spatial variability and the capability hazard of soil infection become diagnosed. the quantity of heavy metals in soil became evaluated and the correlations with the chosen heavy metals in the soil of the examine place depend upon spatial scale. At short-range the scales had been particularly managed from bedrock had been Copper, Zn, Cr and Ni. The correlations between Cr and Ni at short- and long-variety scale imply that geochemical is the assets of Cr and Ni. whereas the anthropogenic activities has triggered an affects on the concentrations together with Cu, Zn, Pb, Cd and Hg. The threat due to infection is defined as they measured heavy steel soil that has increased the background values of Chinese language Environmental great well known for Soils that turned into located in Cu, Zn and Pb and respective areas are included with 3%, 3.4%, and 1.four%. according to the modern-day and historical industrial emissions from Dachang industrial region became the resources of Cu and Zn infection. however the small factories heavy visitors flows nearby the regions of the county are ability areas of Pb infection which can be attributing to the commercial emissions from Dachang business area. From 1940–1970s the threat of Hg contamination had been carefully related to the extensively use of Hg-related pesticide.

Nikolić et al.,(2011) In Siberia there was manufacturing of Copper Mining and Smelting Complex RTB--Bor that causes the consequences on soil pollution. Through probe twelve different measuring points were selected for soil sediments from the surface layer. In these measuring points both urban and rural zones were included all within 20 km of their smelting plant. A middle of a soil with the radius five cm and intensity of 30 cm became eliminated in the course of the manner

of sampling. The manner includes the analyzation for pH and heavy steel concentrations inclusive of (Cu, Pb, As, Cd, Mn, Ni and Hg) thru the spectrometric methods. The very last consequences of soil with the concentration of heavy metal indicates the subsequent values: Cu; 2,540 mg kg-1 , Pb; 230 mg kg-1 , Cd; 6 mg kg-1, Ni ;530 mg kg-1, Mn; 1,300 mg kg-1, As;260 mg kg-1 and Hg;zero.3 mg kg-1. according to the multi-standards selection method made for the metallic contents are from the desire enterprise method for Enrichment evaluation/Geometrical analysis for Interactive assistance (ROMETHEE/GAIA) they decided on the polluted soil zoned areas and ranked them. these techniques are generally utilized in chemometric studies are desired multivariate. The maximum polluted zones were at places conserving whose vital capabilities is with the metropolis had been stated truly thru the end result of rating. The outcomes for human health can severely emerge if these metals input the food chain due to the excessive bioavailability of heavy metals with the complicated response of those metals that might be present within the soil and are effecting the plants.

Moller et al.,(2005) The heavy metallic contamination in arable soils of the Damascus Ghouta is primary reason of this study had been to get the determine at the quantity and severity in this place with intensive agricultural production. In 51 soil profiles and in 22 topsoil samples of Damascus Ghouta have been tested via the prevailing diploma and spatial distribution of heavy steel concentrations. through aqua regia for heavy steel analysis the soils had been digested. The topsoil exhibited anthropogenic essentially increases the values of Pb, Cu and Zn concentrations. The emissions from the automobiles have been the most important resources for the heavy metal contamination in city Damascus. The transported emission by air and sewage water with household and business sewage effluents are taken into consideration because the purpose for the increased heavy metal concentrations that is gift within the soils of the relevant Barada vicinity. while for the rural use the values were in the main tolerable values of soil. near a tannery industrial property their Cr concentrations turned into up to 1800 mg kg 1. according to the soil residences which are discovered in the observe place the bioavailability and mobility of heavy metals are least vital when it worries the fitness danger within the populace. handiest whilst children inhale the dust as it is able to make contributions the most within the accumulation of heavy metallic in human and livestock was cleared thru direct ingestion of soil.

Keshavarzi et al.,(2019) This research's main object was to get assess in the level of infection(PTEs) in commercial soils from city and peri-urban areas of Ahvaz metropolis discover the identification of source, geochemical fractionation and health danger because of those probably toxic elements on human beings. For the concentrations of 16 PTEs the aqua regia digestion changed into used for measuring of inductively coupled plasma mass spectrometry with the full of 92 floor soil samples. through the superb matrix factorization receptor version, they use it with geostatistical analyses and geochemical methods with possible assets of PTEs that may be determined quantitively. PTEs specially Pb, Hg, Zn, Mo, Sb, Fe, Cu, and Cd have been extended and in line with the results it takes place in the regions wherein long-term industrial sports had been stronger to excessive level. The steel and iron industries were contaminating most of the study area. The Contamination includes the deaccumulation index, pollution index and Nemerov integrated pollution index through the use of multivariate statistical analyses. n soils round special industrial clusters the effects attained from Kruskal-Walli's take a look at proved that there has been a big trade inside the soil concentrations with recognize to As, Hg, Mn, Cu, Fe, Pb, Mo, Cd, V, Zn, and Sb. As evaluate to other studied elements the best mobility factors belonged to Zn (81.49%),Pb (seventy six.71%), Cu (71.65%), Hg (66.23%), Mn (sixty two.forty eight%), and Mo (fifty nine.27%) and so forth. The PMF version genuinely shows that steel and iron industries (fifty one.2%) and natural assets (23.4%) are the main reason of pollutants, after that comes the commercial towns (sixteen.7%) and ultimately the power flowers (eight.7%). essentially, it become the end result of the studies. because the surface soils this is gathered from around the steel and iron industries was measured with PTEs maximum bioavailability. proper interest was paid to Hg, Pb, Zn and Cu in commercial soils of Ahvaz because it turned into based totally on the consequences of the health chance evaluation version

A.M. Moldoveanu(2014) As its main aim was to get he examine on stage of soil contamination with heavy metals including lead, cadmium, mercury, manganese, nickel, general chromium, zinc, cobalt, copper and arsenic observed in 34 counties of Romania. The manner of sampling was carried out at some stage in the autumn time. Human activities which include industries are the reason of continuous spread in urbanization that has elevated the soil pollution in diverse methods.

The poisonous substances that could enter the vegetation and the floor water due to soil pollution are very dangerous for human fitness. From the areas around kid's devices like nurseries, kindergartens, faculties, playgrounds for children here the soil samples were interested in the max intensity of 20 cm. From the county capital towns those samples had been accumulated. while other soil samples were taken from the regions land is used for agricultural purposes inclusive of the farmlands and gardens. both in city and rural regions the alert thresholds have been examined for lead and copper in those two counties named Maramureș county and Sibiu County. A historic pollutants sample because of the industrialization in Baia Mare regions of Maramureș county or Sibiu County have already got the stays of pollution in soil. each in city and rural regions the copper threshold was handed. there was excessive range of cadmiums, nickel, manganese, cobalt and arsenic inside the soil of rural areas as compared to the soil of city areas. according to the consequences basically the variety of chromium, zinc and mercury were found in similar ranges within the soil of both city and rural regions.

K. G. Tiller(1992) The present condition of Australian city soils pollutants turned into studied with unique reference to heavy metals. large boom inside the investigation and rehabilitation of infected soils has turn out to be the concern of the government all through the current time. The development of regulatory tactics and the status quo of some new environmental businesses has developed reassessment tasks. basically the take a look at consciousness on assets and volume of infection. With the reference of heritage tiers in city and rural regions many extraordinary procedures had been installed. assessment of contaminated websites are in the main based totally on remote places experience however for the Australian soils there are site strategies and wanted climates. there has been collaboration with the Australian and New Zealand Environmental and Conservation Council and the countrywide fitness and scientific research Council for the development programmed through the nation authorities. The fundamental use of soil-based research and for soil sampling preferred processes with site evaluation and movement is careworn. Many alternatives had been found for the soil scientists as they want the issues of soil infection and rehabilitation to be resolved.

Guan et al,.(2020) The development or the investigate of soil chance in a de-industrialized place an assessment approach with integrated and quantitative are used for soil pollution, land use, threat receptor vulnerability and source of danger. For the spatial and temporal traits of soil chance a case look at was conducted that effects inside the complete soil threat values that degrees in 2008 from 128.24 to 2,3670.50 and in 2015 from 104.08 to 3,8421.70. The inconsistent of soil pollutants turned into improved by means of normal quantity. through the risks related to soil pollution there has been extended Pearson correlation coefficient turned into calculated from 39,655 extracted statistics factors via the characterization in complete stage. there was a greater danger that 1 is most advanced and undeveloped blocks that suggests the maximum comprehensive soil dangers inside the regions of noticeably stable and less affected pollutants with converting of status with de-industrialization. in the location of have a look at there has been 0.ninety nine less pollutants in approximation of 35.23%. such changes have been large in which human-land relationships had been more potent. This studies commonly focused on the danger characteristics and developments after de-industrialization with their stage of severity. That's why extra particular and regionalized soil danger control strategies are required in de-industrialized areas based on their preventive danger evaluation approaches.

Jafari et al,.(2020) Research in Australia was focused on the investigation inside the area of the industrial complicated on the Port Kemble, New South Wales with their local distribution for trace elements in 395 soil samples which might be encompass former lead and copper smelters referred to as integrated steelworks thru the association of industries. The extent of infection Cu, Pb, Zn, Ni, As, Se, Sn and Sb's overall trace element concentrations inside the soil samples was excessive in samples that were positioned close to the Port Kemble here copper smelter stack changed into determined and the Kanahooka lead smelter that shows the direct soil pollution because of all anthropogenic activities. The elements with the enrichment in eight traced factors range changed into 1 to 6 backgrounds while its maximum concentrations variety became 15 to 78×background. Sampling with most contaminated areas were increase towards the applicable trace detail whose

ranges are according to the guidelines of ANZECC and ARMCANZ sediment quality. As for the environmental assessment the bioavailability poses an important potential health risk.

Chen & Deng.,(2020) For the human survival soil quality is very important and separation of soil from human life is impossible. The rate of soil pollution in China has increased severely and specially with respect to heavy metal pollution. In rural areas of northern Anhui a method was proposed where the process of evaluation will affect the heavy metal pollution and its treatment. For the study area Liulang guan Lane, Nanling and Dapu in the south of Anhui Province was chosen. Through the use PLSR model the heavy metal content soil was collected and creates the sample data of the area. The method used for the analyzation was the fuzzy comprehensive as it helps in the evaluation of heavy metal pollution controlled rural areas. The results declare that the grades of 2 and 3‘s soil quality evaluation need to be retreated. The evaluation results are more credible with the accuracy in method that is greater than 0.9500.

Zhang et al,.(2020) focus on investigation of concentration, speciation systemically and their assess to risks that will occur due to race metals and metalloids from RDS comprehension. Basic purpose was that self-regulation of urban ecosystems is decreased due to intensive urbanization that leads to accumulation of persistent pollutants which are the traced metals present in city area. Such contaminants that are taking part in the contribution for urban runoff pollution are road-deposited sediments (RDS) as they carry the traces metals and metalloid.

At the agricultural-urban fringe, industrial, residential, industrial, and the herbal areas were analyzed the amount of those steel were As, Cd, Cr, Cu, Mn, Pb, and Zn, inside the soil and their overall concentrations. the selected 23 websites across six land type for sampling turned into in Daxing District of Beijing, China. The assessment of different factors consists of the infection levels. The awareness level of metals become additionally analyzed for trace metals and metalloids from rural-urban fringe from where the samples were collected. predicted variations become located as in the concentrations of Cr, As and Cd in rural-city place. commercial sites display the best average values for all hint metals and metalloids. The specific posed greater have been As and

Cu. Cr, Cd and Pb in e threat specially for Cr. site visitors place confirmed signs and symptoms of contamination for Cu, Pb, and Zn. The low ecological risk was found in Commercial and residential areas. Cu contaminations in both areas was not found as for As, Pb was not found in the residential area. Despite the high concentration values none of the research place had been contaminated through Mn. while excessive level of Cr contamination become determined in many sites. consequences clearly states that metals of excessive attention now not constantly motive the excessive danger. more interest has to be given to the systematical threat evaluation in which hint metals and metalloids are high inside the awareness.

Moghtaderi et al,.(2020) Globally in urban areas the quality of soil is destroying because of excessive anthropogenic actions. In Ira's city shiraz the heterogeneous industrial activity and anthropogenic release has affected its urban soil quality. Basic objectives were the determination of soil properties and cobalt, chromium, iron and nickel concentration in soil, the deaccumulation index and it access. different thing and pollutants of the studied metals and their impact on the environmental best and human fitness With 0-20cm depth total 143 soil was collected from the study area. The process of multivariate were used for analysis of soil that also includes the spatial mapping. Following the Canadian guidelines, the average level of chromium and nickel were checked and was high in number at residential, parkland, commercial soils. in line with Swedish and Canadian guiding principle the common cobalt concentration become much less in these areas. It became showed through multivariate analysis that the heavy metals had the equal starting place compared to anthropogenic activities that has an important effect on the soil that are contaminated with the heavy metal. Due to the contamination factor the indication for the soil samples were from the slightest to the highest contaminated of nickel, chromium and cobalt. Indicated areas for soil sampling were tested. According to modified potential ecological risk index , in the urban soil samples they found for moderate to high ecological risks due to heavy metal contamination of soil.

Fei et al,.(2020) Hangzhou was selected as the location here heavy metallic pollutants in soils has attracted the issues. For quantitative evaluation of pollutants, the synthesis application of advantageous matrix factorization and GeogDetector fashions were used to discover the supply with prevention and remediation of subsequent soil pollution. 2150 surface soil samples had been

accumulated in general from the region of take a look at. alternatively mean concentrations of As, Cd, Cr Hg and Pb within the soils of China were lower as compare to standards of National Environmental Quality for Soils. Whereas there were higher contents of As and Cd in local background values with the approximately of 1.31 and 1.fifty nine instances. The indication of heavy metals has expanded in topsoil. the main assets of heavy metallic pollutants in the soil's bills from 63.4%, 19.8% and 16.8 of overall heavy metal infection is determined in agricultural activities, business sports and additionally on the soil discern substances. From soil determine substances 80.72% of Cr become derived. In agricultural activities 73.68% of Cd were found. The application of fertilizer was found in sewage irrigation. In industrial activities, coal mining and smelting 92.38% soil was contaminated with mercury. Overall percentage of contamination was as following agricultural 57.83% , natural sources 35.56% sources and the association of Pb in industrial was 42.42%. For the estimation of the source that distributes the heavy metals in soils the models of new synthesis models were useful.

Foti et al,.(2020) The vital component of urban ecosystems are city soil. In public green spaces consisting of public activity, city cooling, or water infiltration soil plays an critical position. This take a look at is based on a hundred and eighty forest and lawn floor soil samples that constitute the chemical, physical and hydro structural traits from the Paris region that turned into taken alongside an urban-rural gradient. For the identification on how those soils are affected by urbanization.21% Forests and lawns constitute the principle plants kinds observed on this area and the rest of 22.2% represent the territory's surface vicinity. distinct houses of city woodland soils very from their sites texture, natural carbon content, total nitrogen and carbonate contents this is due to the urban forests. because of higher foot visitors the urban lawn was greater compacted compared to the urban forests. Sandier texture of city forests results the urbanization at times, confounded with other factors. The surface soil traits had been motivated by way of beyond city making plans. The basic purpose was with constitution of a baseline analyzation that monitors the quality of soil in the region.

Zheng et al,.(2020) For the security of food and human health heavy metal contamination is one of the most alarming concerns. Soil pollution that enters the food chain is huge risk to human health and that concepts needs understanding. Through systematically the potential risks are

assessed of contaminated soil and crops with heavy metals. From the Pearl River Delta urban agglomeration of China 2241 pairs of soil and 78 species of crop samples collected. In soil and crops from all the heavy metals cadmium was found the most as compared to other identified pollutants. In Huizhou the high risk of Cd was ingested from leaf and root vegetables that are consumed the most in that area. In rice and maize the highest risks were found for human health as they were contaminated with heavy metals. From heavy metal contamination in soil and crops it was first time that the risk to human health was found and through assessed systematical their associated spatial risk pattern was created in China.

Chapter 3

3. METHODOLOGY FRAMEWORK

3.1 Study Area

An industrial city Kasur of central Punjab, Pakistan (31°.70N. 74°.27E). Kasur population is more than 3 million on the other hand its area is 3996 km2. But the surrounding villages of involved in agricultural activities that is why its soil quality matters the most. Kasur is famous. For its business activities and leather-based processing that dominates the alternative aspects. Sugar producing, woodwork, textile, embroidery and glazed pottery is also made. The villages such as Maan, shaikpur Kuhna, Mahlem Kalan and sultan shahwala are the leading producers of sugarcane, cotton, wheat, rice and other vegetables.

3.2 Soil sampling and methods of soil collection

Soil was collected from each selected points from villages and was gather in a polythene bag. The random areas of soil samples were selected, and points were made based on visual examination of city. The standard sampling guidance was followed. Each of the polythene bag that contained the soil was labeled clearly.

3.3 Determination of heavy metals in soil quality

Samples of soil collected were ten, two sample from each one of the areas. To view the PH level of soil and level of chromium and arsenic in the soil was also measured through the soil testing. For the investigation and analyzation of the acid digestion in soil the samples were send to the PCSIR laboratory of Lahore. It is a realistic approach and the output surely shows the real picture of total quantity of decided on heavy metals from the soil.

3.4 soil testing

The testing was done in PCSIR laboratories complex Lahore.

Soil sampling strategy

- Samples were taken at a consistent depth, preferably 4”.
- Followed the pattern that was from city nearest villages towards the far.
- Was collected from normal tools that are used in farming.

- Soil was collected in clean plastic container whose amount is about 1 cup.
- Samples were air dried before they were sent to the labs.

3.5 Statistical analysis

IBM SPSS statistics 21 software program was utilized for the statistical evaluation of the results collected through the soil testing which is shown in the form of charts and tables**.**

3.6 Map making

Google Earth Pro and ARC gis 10.5 of ARCGIS software were used for the construction of maps of selected areas and GPS was used for marking the locations from which the samples were collected.

3.7 Flow chart

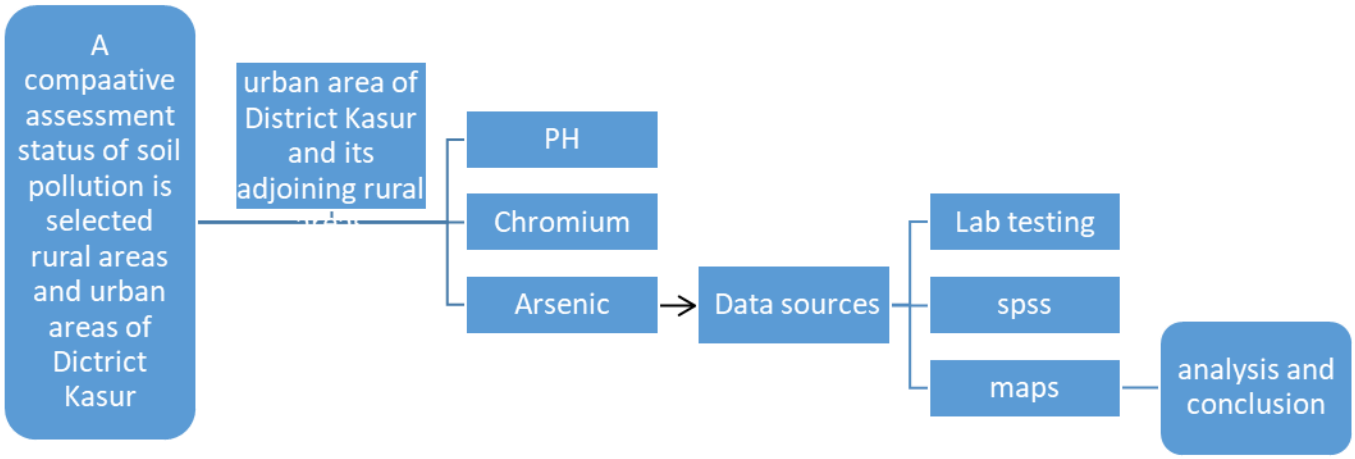

Figure 3.1 flow chart describing methodology process.

CHAPTER IV

4.RESULTS

The research study includes a comparative analysis between the city and village areas soil quality. Two samples were collected from the city Kasur and other eight samples were collected from the adjoining rural areas of Kasur whose name are Mann, Mahalam kalam, Sheikhupura Kuhna and Sultan Shah Wala. To samples were collected from each village. Firstly, the PH value of each sample was tested from the soil and water testing laboratory Kasur. None of the soil was considered acidic. No problem of soil nordicity was found in the analyzed soil samples. The analyzed samples were fertile showing no sign of hazardous substances.

4.1 Below shows the descriptive result of PH level in soil samples.

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Region	10	4.00	1.00	5.00	3.0000	.47140	1.49071	2.222
Ph	10	2.30	6.10	8.40	7.7700	.25563	.80836	.653
Valid N (listwise)	10							

Interpretation

None of soil was below than **6.10** ph value as 5 and >5 is considered as acidic. The most least ph value was from the sample one of Mahalam kalam that is a rural area and the maximum value that was **8.4** in samples. which show that the soil is alkaline (best condition for agricultural activity) is also found in the sample 1 of rural area called Maan. Overall, no acidic level was found in the

collected samples. According to agricultural department soil having ph 7.0-7.5 had all the essential minerals, 7.6-8.0 level of ph showed lesser amount of zinc, manganese needed, 8.1-8.5 level of ph showed lacking in phosphorous and 8.5 or above makes the soil toxic which will need delt with while cultivating of crop. The above discussed minerals which are lacking in the soil samples are fulfilled through fertilizers.

Table 4.2 **Frequency of soil in selected region**

Region

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Kasur	2	20.0	20.0	20.0
	Mann	2	20.0	20.0	40.0
	Mahalem	2	20.0	20.0	60.0
	Sheikhpurakuhan	2	20.0	20.0	80.0
	sultan shah wala	2	20.0	20.0	100.0
	Total	10	100.0	100.0	

Table 4.3

Statistics of ph

		Region	Ph
N	Valid	10	10
	Missing	0	0
Mean		3.0000	7.7700
Std. Error of Mean		.47140	.25563
Median		3.0000	8.2000
Mode		1.00[a]	8.20[a]
Std. Deviation		1.49071	.80836
Variance		2.222	.653
Range		4.00	2.30
Minimum		1.00	6.10
Maximum		5.00	8.40
Sum		30.00	77.70

Table 4.4

Shows the ph value in the samples

Ph		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6.10	1	10.0	10.0	10.0
	6.70	1	10.0	10.0	20.0
	7.30	1	10.0	10.0	30.0
	7.80	1	10.0	10.0	40.0
	8.20	2	20.0	20.0	60.0
	8.30	2	20.0	20.0	80.0
	8.40	2	20.0	20.0	100.0
	Total	10	100.0	100.0	

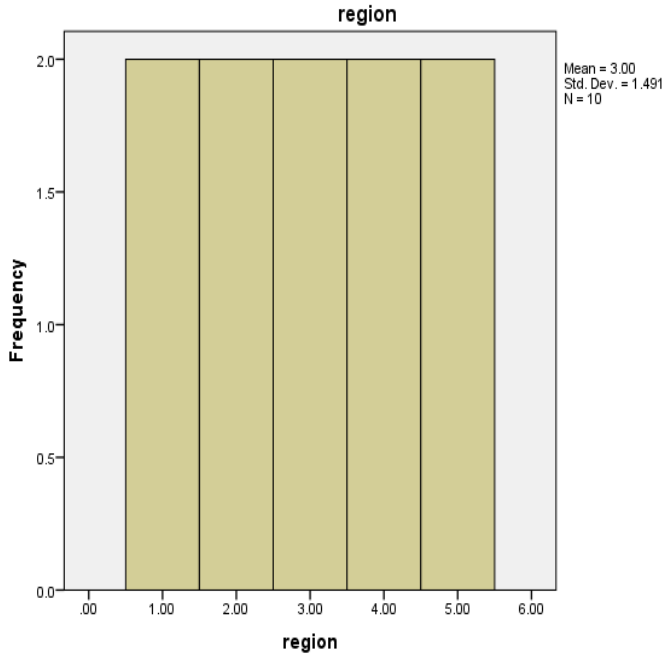

Figure 4.1 showing the frequency of ph value in soil

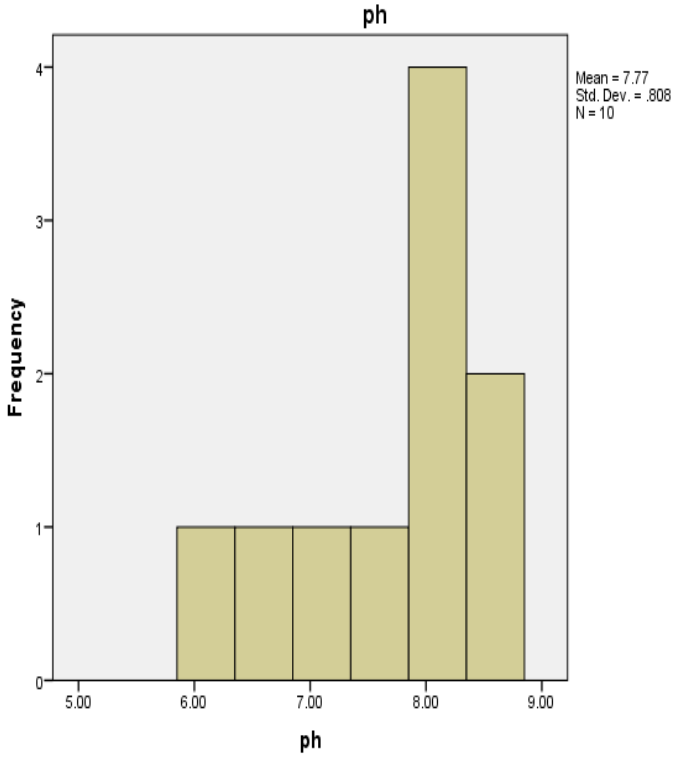

Figure 4.2 showing the value of ph in soil

Chromium testing

The samples of soil collected from the respective areas of Kasur and nearby rural area were given for testing to the Pakistan council of scientific and industrial research laboratories complex, Lahore. According to the result level of chromium detected in the city samples which were collected near the area of Kasur tanneries was 566.89 and 520.56 that is quite high according to the standard value. The major cause of this lies in the fact that the area is surrounded by the tanneries. The water and other waste material from the tanneries are causing the deterioration of soil fertility in Kasur.

Table 4.4

Shows the standard value of metals in soil as per FAO/WHO

Serial No	Elements	*Target Values of soil (mg/kg)	**Intervation Values of soil (mg/kg)	***Permissible Value of plants (mg/kg)
1	Cd (Cadmium)	0.8	12	0.02
2	Cr (Chromium)	100	360	1.3
3	Cu (Coper)	36	190	10
4	Pb (Lead)	85	530	2
5	Ni (Nickel)	35	210	10

*Target values are specified to indicate desirable maximum levels of elements in unpolluted soils.

**Intervention when remedial action is necessary; Source: Denneman and Robberse 1990 and Ministry of Housing, Netherland 1994.

***Source: WHO (1996).

Table 4.5

Level of chromium in soil

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Region	10	4.00	1.00	5.00	3.0000	.47140	1.49071	2.222
Chromium	10	414.34	152.55	566.89	300.5640	55.66773	176.03681	30988.960
Valid N (listwise)	10							

Interpretation

The tables shows that the minimum value is **152.55**. This value is the result of sample 2 which was collected from the rural area called Sultan Shah Wala. The maximum value of chromium is **566.89**. This value is the result of sample 1 of **Kasur** area that was collected from the area near Kasur tanneries. Ten samples were tested to determine the value of chromium from different areas. The second sample resulted in 520.56 mg/kg Cr**. Mann** first sample showed 450.23mg/kg Cr, second sample result showed 469.63 mg/kg Cr. **Mahalam** first sample resulted in 170.13 mg/kg and

second resulted in 178.01mg/kg. **Sheikhupura kuhan** first sample result shows the amount of 176.54mg/kg Cr and second one resulted in 165.99mg/kg Cr. The last region **Sultan shah Wala** first sample resulted in 155. 11mg/kg Cr in soil and second shows the amount of 152.55mg/kg Cr in soil that is the lost value of Cr found the selected area of testing.

Table 4.6

The frequency of chromium in region

Region		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Kasur	2	20.0	20.0	20.0
	Mann	2	20.0	20.0	40.0
	Mahalem	2	20.0	20.0	60.0
	Sheikhpurakuhan	2	20.0	20.0	80.0
	sultan shah wala	2	20.0	20.0	100.0
	Total	10	100.0	100.0	

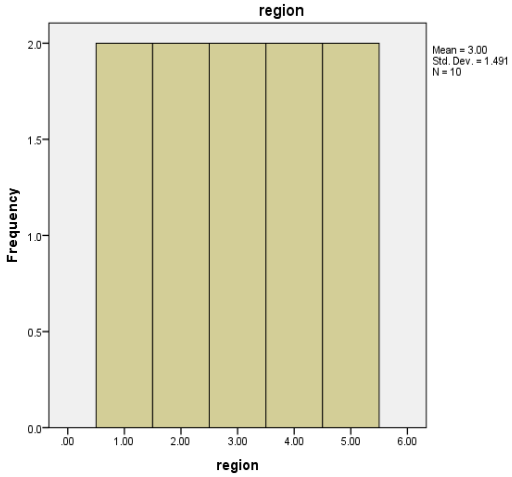

Figure 4.3 showing the frequency in region

Table 4.7

Level of chromium in the samples

Chromium		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	152.55	1	10.0	10.0	10.0
	155.11	1	10.0	10.0	20.0
	165.99	1	10.0	10.0	30.0
	170.13	1	10.0	10.0	40.0
	176.54	1	10.0	10.0	50.0
	178.01	1	10.0	10.0	60.0
	450.23	1	10.0	10.0	70.0
	469.63	1	10.0	10.0	80.0
	520.56	1	10.0	10.0	90.0
	566.89	1	10.0	10.0	100.0
	Total	10	100.0	100.0	

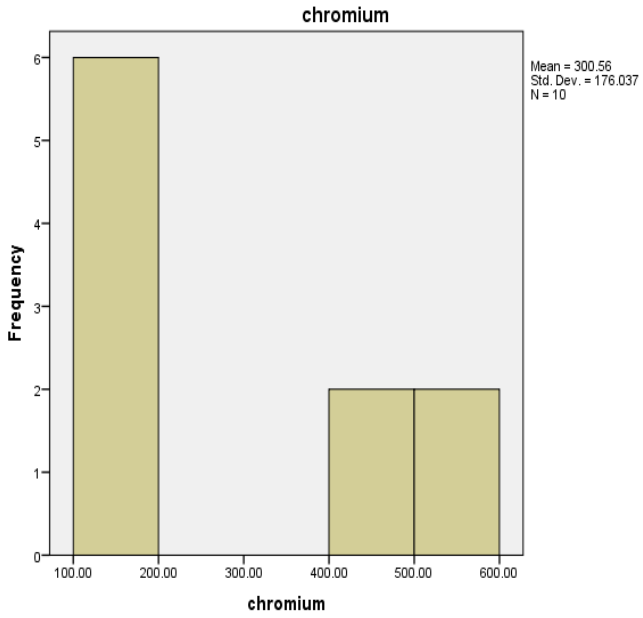

Figure 4.4 showing frequency selected region

Arsenic testing

Arsenic was not detected in the soil samples taken from the respective areas. The non-detection of arsenic was indeed a good sign as it proves the fact that a land away from the urbanization is more fertile and better in quality as compared to soil of a city that has been contaminated and effected by the processes of urbanization or industrialization i: e Lahore city.

CHAPTER V

5. DISSCUSSION

After the results of test through soil sampling, it was seen that the soil of city Kasur which was near the leather tanneries were more effected by it and had alarming amount of Cr present in it. The farther we moved away from the city the soil showed decline in the amount of Cr. Sultan shah Wala being the last stop of soil sampling had the least amount among all the other samples. Proving the fact that poorly managed leather tanneries is the reason behind this chromium toxicity. Water is the channel through which Cr spreads in the soil. To save the soil from the contamination then the water discharge from the tanneries should be managed in a way that it stays away from the soil. Proper sewage system must be built for the protection of agricultural soil. If not underground, then a place should be specified where the water discharge is taken out level the majority soil unharmed. Open discharge of contaminated water will lead to multiple health concerns in the future.

If Kasur is to consider the focal point of urbanization soon, the issue or lack of the city should be kept in mind and that is sewerage system. Kasur being an old city does not have any proper urban planning and sewerage system which is why the overcrowding of the city is leading it towards sewerage failure. Such conditions we need to thoroughly plan a proper sewerage system for Kasur, and it adjoins rural areas which will surely get effected by soil contamination at this pace.

Soil pH indicates the acidity or alkalinity of soil that is measured in pH units. pH of a soil is defined as the negative logarithm of the hydrogen ion concentration. The scale of pH goes from 0 to 14and pH 7 is considered as the neutral point. No problem of soil nordicity was found in the analyzed soil samples. The pH of the sample nearest to the tanneries were slightly higher than other samples. Other than that there was no abnormality regarding the pH.

The level of chromium was also tested from the selected samples. The highest and alarming was found in city sample and the least was found in the village sample. High level of chromium in an agricultural land is very dangerous as it can easily contaminated the crop that has been cultivated on it. The purpose of this study and sampling was to highlight the fact that urbanization may cause concentration of high-level metals pollutant in its adjoining rural areas. As the matter of fact rural

areas are not dumping station of cities and nor should they be treated as one. They are the producers of our staple food.

5.1 statistical analysis

For the comparative assessment **t-test** was applied.

Table 5.1

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Region	10	3.0000	1.49071	.47140
Ph	10	7.7700	.80836	.25563
Chromium	10	300.5640	176.03681	55.66773

Table 5.2

Interpretation and computation

	Test Value = 0					
	T	**Df**	**Sig. (2-tailed)**	**Mean Difference**	**95% Confidence Interval of the Difference**	
					Lower	**Upper**
Region	**6.364**	**9**	**.000**	**3.00000**	**1.9336**	**4.0664**

One-Sample Test

From the SPSS analysis it was detected that the p-value came out to be 0.000 which was lesser than the level of significance α i.e., 0.05. Thus, null hypothesis $\boldsymbol{H0}$ was disapproved stating that the concentration of metals in rural soil is not high due to urban industries and pollution.

5.2 For experimental data

Using subscript 1 (μ1) for high level of metals in soil due urban industries and subscript 2 (μ2) for soil standard for the better soil fertility.

*H*0= the concentration of metals in rural soil is not high due to urban industries and pollution.

*H*1= the concentration of metals in rural soil is high due to urban industries and pollution.

OR

*H*0= μ1 ≠ μ2

*H*1= μ1 = μ2

Level of significance: α = 0.05

Table 5.3

Test statistic applied: **Independent samples t test.**

	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Region	6.364	9	.000	3.00000	1.9336	4.0664
Ph	30.396	9	.000	7.77000	7.1917	8.3483
Chromium	5.399	9	.000	300.56400	174.6348	426.4932

The independent samples T test was used as it compares the mean values of two independent groups on a single representative and checks if there exists a significant statistical difference between the average values of both groups.

From the SPSS output, we found that we had to choose between two options i.e., whether to undertake that the population variances remain equal or not. For that the p-value for Levene's test was checked and if the answer was higher than 0.05 the data in equal variances were assumed and the top row was used and if less than 0.05 the data in equal variances were not assumed and the bottom row used.

For **pH equal** variances were assumed and the p-value came out to be **0.000/2=0** which is less than 0.05 thus, agreeing to the alternative hypothesis which states that the concentration of heavy metals in rural soil is not high due to urban industries and pollution.

For **chromium** equal variances were assumed and the p-value came out to be **0.000/2=0** which is less than 0.05 thus, agreeing to the alternative hypothesis which states that the concentration of heavy metals in rural soil is not high due to urban industries and pollution.

Arsenic was not detected from any of the samples taken from Kasur and its adjoining rural areas.

From the interpretations mentioned above it was observed that pH, arsenic, and chromium had all values within the permissible range. This proves that $H1$ is rejected and H0 was accepted which stated that the concentration of heavy metals is not high in rural soil due urban industries and pollution.

6. CONCLUSION

The main purpose of soil sampling in the adjoining rural areas of Kasur was to determine that whether the soil of rural area is getting contaminated or not because of urban industries and pollution. As in much research on Kasur soil it was concluded that its soil was contaminated due to tanneries waste and water to an alarming extent. I wanted to run a comparative analysis through sampling between urban soil and rural soil.

The result of this comparative analysis states that soil of city Kasur have alarmingly high level of chromium in its soil but the amount of chromium in rural soil was not dangerous. Looking into the broader prospect the rapid growth in population and the need for urban necessities can pose a threat to rural areas in the coming future. Being an agricultural country, our priority should be our soil and it health. This indeed the job of government sector to make sure that no urbanization or its process is harming the agricultural sector.

7. RECOMMENDATIONS

- The government should initiate a soil sampling program for farmers in Remote rural areas of Kasur where the soil is only used for cultivation.
- Must educate the farmers and landowners about the condition of their land soil.
- Governments should not allow any small industry to be built without making sure that its waste will not contaminate the soil of any agricultural land.
- Agricultural lands and soil must be protected from the rapid growth of urbanization.

8. LIMITATIONS

- The main hurdle was that there was no laboratory in Kasur that could perform the test of metal detection in soil.
- Due to high expense of testing only limited metals were detected.
- The landowners were hesitant in giving their land's soil for testing purpose which means that there was lack of awareness in the remote areas.

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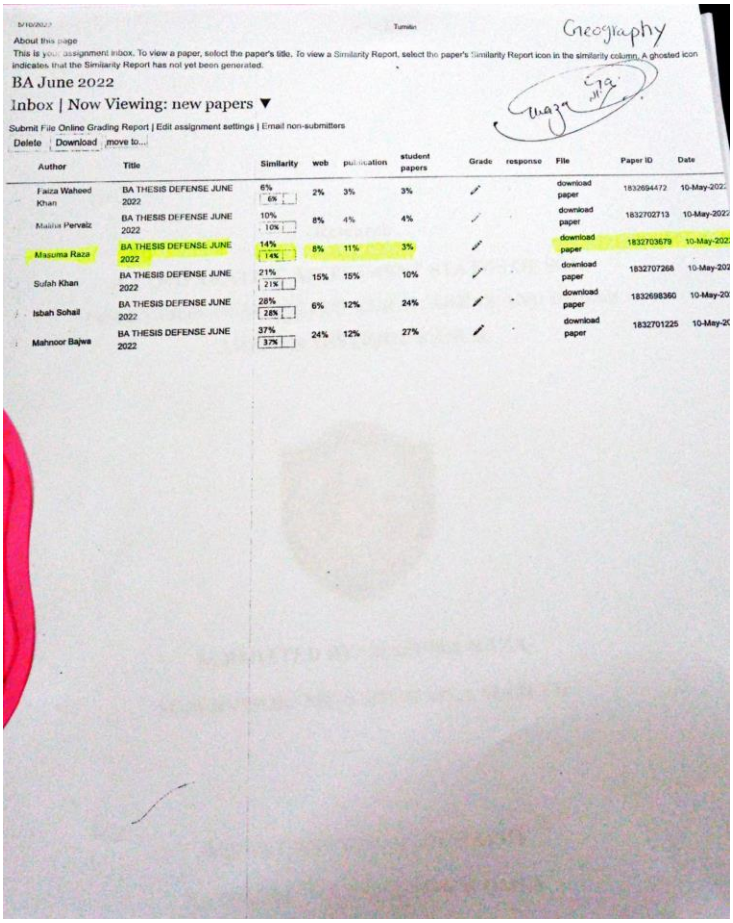

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