

**Public Awareness of Environmental Laws in Khartoum State;  
Case study of four neighbourhoods**

**By**

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## **Dedication**

*To my parents*

*To my brothers and sisters*

## **Acknowledgments**

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## **APSTRACT**

This study investigated the level of environmental awareness in four neighbourhoods in Khartoum city. The study compared the level of awareness in first class, second class, third class and one squatter area. Different methods for data collection were used.

The study found that the level of awareness is influenced by the level of education and exposure to media channels. There is lack of awareness about the environmental laws, but there is willingness to participate in environmental protection activities to improve the environmental conditions in the neighbourhood.

The study provided a number of recommendations to help in raising awareness and consequently change behaviour.

## الخلاصة

أجريت هذه الدراسة في أربع مناطق سكنية في مدينة الخرطوم لتمثل أربعة مستويات سكانية مختلفة (درجة أولى، درجة ثانية، درجة ثالثة، عشوائية) بغرض معرفة الوعي البيئي لدى المواطنين في مختلف الأحياء السكنية .

أستخدمت في هذه الدراسة طرق مختلفة لجمع المعلومات منها الملاحظات و المقابلات بالإضافة الي الإستبانة المصممة لهذا الغرض.

أظهرت الدراسة أن مستوى الوعي البيئي يتأثر بالمستوى التعليمي والثقافي لدى الفرد. أيضا أشارت الدراسة الى إنعدام الوعي بالقوانين البيئية، إلا أنه توجد لديهم رغبة حقيقية للمشاركة الفاعلة في الأنشطة البيئية المختلفة الهادفة لتحسين الظروف البيئية في الأحياء السكنية.

خلصت الدراسة للعديد من التوصيات التي من شأنها رفع و تعزيز الوعي البيئي لدى المواطنين، وهذا بالتالي سيساهم في تطور تنمية السلوكيات الإيجابية باتجاه المحافظة على البيئة.

## CHAPTER (1): RESEATCH STRATEGY

### 1.1 Introduction:

**As humanity moves into the final decades of the 20<sup>th</sup>, century, one issue looms as a central challenge that we face; can our planet be saved for human and other forms of life? Many experts believe that the next few years will be the turning point. All around the world, there are signs that people are beginning to heed that message, triggering the environmental public concern (Abdellatif, 1999).**

**Air and water pollution, noise, lack of green areas and improper land use, all these become the major social and economic issues in late decades. The public should be aware about this problem .Pollution stories and excessive use of chemicals were featured on the front pages of newspapers and in TV specials about -DDT, mercury, asbestos, dioxins and potassium bromides (Tier, 1998). The concern about the environment and its problems led to concerns about the environmental protection which took two important directions: firstly desire towards scientific research to increase the knowledge on the environmental components and their interrelationships, and building up environmental legislation that forces individuals and companies to behave in acceptable manner with the environmental resources. Secondly; “which is the most important” the environmental awareness or the environmental education, for the enlightenment of all population sectors, on the environment and the problems resulting from misuse of the natural resources and irresponsible human activities and misbehaviours ( Mohamed, 1983 ).**

**An important outcome of such concern was the evolution of a large and rapidly growing of so-called Green Movements non-governmental organizations (NGOs), which are scrambling to play a considerable role in**

forming public opinion and attitudes and also provoking these attitudes into participation in environmental decision-making. The lack of environmental awareness seems to be the main cause of the environmental problems (Abdellatif, 1999).

#### 1.2 Statement of the Problem:

The third world cities are suffering from a spectrum of environmental and health problems, due to the lack of basic sanitation, mismanagements of the disposal of wastes which result in pollution of water sources/ atmosphere /land, malnutrition, bad housing conditions and over crowding, beside the lack of awareness of the capacity natural environment in the settlement to the extent that people living in towns and cities are prevented from enjoying and experiencing the benefits that the natural environment provide.

These problems can be solved by providing the basic sanitation, clean water supply, efficient sewage and garbage disposal system, drains, and other forms of infrastructures and services, through implementation of comprehensive environmental laws. So the Sudanese cities are faced with a wide range of environmental problems, this can be clearly observed in Khartoum city.

In this study Khartoum city is taken as case study, because it is, the largest and most populated city in the Sudan. Over population is leading to an extensive use of the environmental resources. Population increase were paralleled by comparable increases in needs such as urban housing, infrastructures and services, lack of these caused congestion in industrial areas, in transportations, and in water utility supplies ...etc, which had led to general breakdown of the physical and socio-economic environment of the state.

Hence there were federal legislations as “Environmental Health Act, 1975” which deal with the institutional responsibilities towards the environment, and the “The Environmental protection Act, 2001”, the Khartoum state legislation and the project of Khartoum state cleaning, which imposes duties on local councils to preserve and improve the environmental health condition for human being and fauna and flora. These legislations also included punishments and compensations. But the urban sanitation problems and the environmental health problems are still rapidly increasing in Khartoum city and it would become very serious if no action is taken. We can refer these problems to two fundamental factors; firstly the high rate of the population growth and the lack of public awareness of environmental laws. Secondly, the socio-economic aspects especially those related to the cost of social services and infrastructures.

In this study we focus in the lack of public awareness, which appear in the misbehaviours of the citizens towards the environmental resources and the cultures of immigrants leading to the deterioration of the environment and putting pressure on the natural resources and the ecosystems.

Many studies were carried to assess and resolve the urban sanitation problems, but progress towards permanent solution was slow and not effective. Plans for effective solution and implementations needed a multidisciplinary approach involving many government officials, non-government organizations, private sector, local communities and environmentalists. This study will try to analyze the level of public awareness of environmental laws and its impact on environmental degradation.

### 1.3 Objectives:-

The main objectives of this study are:-

- 1- To review the main environmental laws in Sudan.**
- 2- To assess the level of awareness among the public about environmental laws in Khartoum state.**
- 3- To identify sources of information about these laws.**
- 4- To identify institutions and their roles in public awareness.**
- 5- To examine public behaviour and respect to these laws.**
- 6- To recommend approaches and programmes to increase awareness and promote positive attitudes towards the objectives of these laws.**

**1-4 Hypotheses:-**

**In order to achieve the objectives of this study the following hypotheses are put for testing:-**

- 1-The public in Khartoum city have poor knowledge of environmental laws.**
- 2-The public do not respect the laws because of the lack of awareness.**
- 3-Lack of awareness of environmental laws is the result of poor communication and participation of the public.**
- 4-Institutions involved in the implementation of environmental laws lack capacities to reach the public.**

**1. 5 Method of Data Collection:-**

**In order to achieve the objectives of the study, the following methodology and materials for data collection and analysis were adopted;**

**1-5-1- primary sources;**

**These include interviews, questionnaires, group discussion, and observations. These provided the main information on which this thesis is based.**

**1-5-1-1 Questionnaire;**

**This is the main method used to collect data from the study area. The selected respondents are chosen randomly to cover all sectors of the**

population in the state (men, woman, young). The respondents were visited and interviewed by the researcher.

**(i)- Form of the questionnaire:-**

The designed questionnaire included four sections:-

**Section 1:-**included information on personal characteristics such as sex, age, education level...etc.

**Section 2:-**included information about the house and the surrounding area such as type of dwelling, water supply, ventilation, latrines...etc. to shed some light on the living condition of respondent.

**Section 3:-** included information about awareness and behaviours, such as sources of the environmental knowledge, participation in the environmental protection activities...etc.

**Section 4:-**included information about environmental laws and the desire to participate in environmental protection activities (for more details see appendix (1)).

**(ii) Kind of the question:-**

Closed and few of open questions were designed in simple forms to have limited answers and to be clear to the target group. Hence answers were grouped in three types:-

- (1) Yes or no answers.
- (2) Options answers to select the best one by the respondent.
- (3) Open answers as the respondent report and the researcher recorded it.

**1.5.1.2 The sampling Method;-**

To select representative samples we used the random sampling statistical method, it's the method where every individual within the population has the equal chance to be included in the sample as the following;

- i- From the greater Khartoum (Khartoum, Omdurman, Khartoum North). We selected Khartoum city as the representative the capital complex.
- ii- The town was classified into first, second, and third classes and there were the squatter areas. So we selected one area from each class in additional to the one squatter area.
- iii- From each area we took 5% from the total number of the population and interviewed one person from each house (see table (1)).

**Table NO (1);**

Khartoum	Class	area	Total houses NO	5% of the housing NO
	First	El amarat	717	37
	Second	Jabbra (Hai Al Doha)	900	45
	Third	Burri (Hai Korria)	500	25
	Squatter	Mayo (Hai Galp Alasad)	800	40
Total			2917	147

Source; field work

### **1-5-1-3-Sample size determination;**

A sample size of 5% of total number of houses in each area, it was less than the standard sample size to represent such number of population. It is thought to be quite sufficient for the following reasons;

- 1- There are no significant variations in the life patterns of the population living in one area.
- 2- The population in the area shared the same common environmental problems, which are well known and reported by all residents.

**3- They use the same facilities in dealing with the environmental issues.**

#### **1-5-1-4 Field Work:-**

**The actual data collection from the field was started in the November 2003 and was completed by the end of February 2004. Always we select one person from each house, but in few cases we interviewed two persons from one house. (In case of shared house).**

#### **1.5.1-5 Observations;**

**Direct personal observation and notes were taken during the visits to the study areas on general environment, sanitation situations, standard of living and local authority activities, through attending the public meetings, workshops and other activities in the area.**

#### **1-5-2 Secondary sources; (Documents):**

**The available relevant secondary data had been used to develop a theoretical background regarding the issues of public awareness and the environmental laws in the country and outside the country.**

**The major sources of information consulted include; UN and UNEP publications, relevant thesis's, journals and official reports and documents, related to the field of the study. In addition to the Sudanese regulations, polices, proceedings from public hearing.**

#### **1-5-3 Problems Encountered in Data Collection;**

**The researcher was faced by some problems in collecting both primary and secondary data which can be summarized in the following;**

**1- Survey problems such as; shortage of facilities, financial, transportation, some difficult to get required information from citizens (female).**

**2- Up to date literature (books, journals, laws, regulations workshops papers) it's not available.**

**3- The majority of the population is found at home only after the sunset, so all the field work was carried in Fridays. In spite of all above mentioned obstacles, the researcher was able to collect the required information needed for the research. However, a lot of time and effort has been exerted.**

#### **1.6. Data Analyses;**

**The researcher tabulated the data by using computer programme such as the Statistical Package for the Social Science [SPSS].**

## CHAPTER (2): LITRETURE REVIEW

### 2.1 Introduction:-

In recent years most countries began implementing measures, included steps designed to achieve proper management of the natural resources, and to implement sustainable development plans, to preserve these resources for future generations. The most important step is awareness. People must be aware of the effects of their actions on the environment.

In this chapter we will consider the concepts of the Environmental awareness. This conceptual framework includes; in part one, beside the information about he environmental awareness it discusses the global concern of the environmental issues and the efforts carried by the United Nations and its agencies, since the Stockholm conference in 1972. It also discusses the efforts in developed and developing countries, with special references to the Sudan. Part two discusses how to raise the public awareness, through the roles of the communication, environmental reporting, environmental education, NGOs and the role of the mass media facilities in forming the human behaviours towards the environment.

### 2.2 Public Awareness:

Environmental awareness is difficult to measure; however, its result may be defined as the elaboration, adaptation and implementation of sound environmental policies and environmental behaviour.

With the concern of environmental awareness, it is becoming common to consider harmony between humanbeings and the environment as major goal of human progress. New technologies and new products or facilities can enhance people's quality of life. However, they should be applied with awareness of the capacity of existing environments.

**Mismatches between technologies and environments can cause disputes. It is very important to find a way to resolve this kind of disputes that often occur in the process of planning such public facilities as highways, airports, incineration plants, or waste water treatment plants**

#### **2.2.1 Definition of Environmental Awareness: -**

**William Iltelson, in 1974 defined the environmental awareness as the perception of an individual to his role towards the environment. However, the conference of Tiblisi determined the environmental awareness as the process of the individuals and societies to acquire and understand the environment and its problems, and become sensitive towards the environment,(Dr, Sallah, 2003).**

#### **2.2.2 The Concept of the Environmental Awareness:**

**It could be thought that the concept of the environmental awareness and its development has a strong relation with environmental conception and the way we deal with it. That the environmental perspective is not restricted to the biological and physical issues only, but it expanded to contain the vast range of economical, cultural and social aspects of the environment and their interaction. Therefore, the goal of the environmental awareness is the knowledge of the influences of various environmental factors on the living and non-living organisms, which could reflect positively or negatively to the ecosystem,(Dr, Sallah, 2003).**

#### **2.2.3 Environmental Ethics;**

**Ethics seek to define fundamentally what is right and what is wrong, regardless of cultural differences. Morals differ from ethics, because they reflect the predominant feeling in a culture about what is right and what is wrong.**

**Environmental issues also involve a consideration of ethics and**

**morals. For example, because there is currently enough food in the world to feed everyone adequately, it is unethical to allow some people to starve while others have more than enough food.**

**Some individuals view the world's energy situation as serious and have reduced their own consumption. Others do not believe there is a problem, and therefore, have not modified their energy use. Still others do not care what the situation is; they will use energy as long as it is available. Other similar issues are the population problem and pollution. Collective attitudes of the society can also be analyzed from an ethical point of view. Society has long believed that the earth has unlimited reserves of natural resources, an unlimited ability to assimilate wastes, and an ability to accommodate unchecked growth.**

**There are basically three types of environmental ethics. The development ethic, espouses extensive use of the resources, minimal concern for the environmental degradation. The preservation ethics, considers nature to be special and worthy of protection for a variety of reasons. An equilibrium ethics recognizes the practical need of people to use the resources and the importance of using them wisely.(Enger, Kormelink, Smith, Smith,1989).**

#### **2.2.4 The component of the environmental awareness:**

**To reach to an effective programme towards the environmental awareness, there must be integration of three basic components;**

##### **1- Environmental Education;**

**It is the enhancement of the citizen's behaviour towards the sustainable use of the environmental resources.**

##### **2- Cultural Environment;**

**It means the creation of general awareness among all sectors of the society.**

### **3-Environmental Announcement;**

**It is directed to all different social classes to give them certain ideas about the environment. And it must be broad to cover all the population levels in the society,(Dr, Sallah, 2003).**

#### **2.3 Global Concerns of Environment;-**

**The world is confronted with worsening poverty, hunger, ill health, illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being, the disparities between the rich and poor continue. The only way to assure ourselves of a safer, more prosperous future is to deal with environment and development issues together in a balanced manner. We must fulfil basic human needs, improve living standards for all, and better protect and manage ecosystems. No nation can secure its future alone but together we can-in a global partnership for sustainable development (Keating 1993).**

##### **2.3.1 Stockholm Conference 1972;**

**A vital element of the new environmentalism has been the United Nations. It responded quickly to the new mood by holding the Stockholm Conference on Human Environment in 1972. This led to the ‘declaration on the human environment’, which identified a fundamental right to adequate condition of life in non-degraded environment and consequent duties to protect and improve the environment for the future generations, it also led to the established of UN Environmental Programme (UNEP) which initiated a global pollution monitoring and climate change.**

**In the first global environmental meeting held in 1983, the United Nations created the world commission on Environment and Development. Four years later its land mark report “Our common future” (1987) was**

launched and warned that people had to change many of the ways in which they did business and lived or the world would face unacceptable levels of human suffering and environmental damage (Keating, 1993).

The commission considered six challenges; growing population, food security, species and ecosystems, energy, industry and urbanization. They proposed a range of linked policies, legal and institutional changes in their 1987 report "our common future". This document emphasized that development should not only be environmentally sustainable, it should also be equitable. This position was justified not only by appeals of human rights groups but also by analyses which showed that many environmental problems are the result of excessive affluence while others result from grinding poverty. In tackling sustainable development in this way, the commission was reflecting not only the ideas of less developed countries but also those of more developed (Sarre, Smith, Morris, 1991)

In 1989, the United Nations began planning a conference on environment and development to spell out how to achieve sustainable development.

### **2.3.2 The Earth Summit 1992:**

A road map to sustainable development is now taking shape; Agenda 21 is a guide for business and governments policies and for personal choices into next century. The 1992 Earth Summit in Rio de Janeiro – Brazil, was, the largest ever meeting of world leaders. This meeting took place during the United Nations Conference on Environmental and development which brought together the heads or senior officials of 179 governments, business, scientific non-government and other groups. The 92 Global Forum held a series of meetings, lectures, seminars and exhibits on environment and development issues for the public. This drew 18,000 participants from 160

countries, as well as 400,000 visitors. There were 8,000 journalists covering the Rio meetings, and the results were seen, heard and read about around the world.

#### **2.3.2.1 The Five Rio Documents:**

Rio produced two international agreements, two statements of principles and a major action agenda on world-wide sustainable development. These are:

1) **The Rio Declaration: on environment and development which contains 27 principles; define the rights and responsibilities of nations as they pursue human development and well-being.**

2) **Agenda 21, a blueprint on how to make development socially, economically and environmentally sustainable.**

3) **A statement of principles to guide the management, conservation and sustainable development of all types of forests.**

Two major international conventions were negotiated separately and were signed by most governments meeting at Rio.

4) **The United Nation framework convention on climate change; to stabilize green house gases in the atmosphere.**

5) **The convention on biological diversity requires that countries adopt ways and means to conserve the variety of living species (Keating, 1993).**

#### **2.3.3 The world summit on sustainable development 2002:**

The world summit on sustainable development was held in Johannesburg in September 2002, to take stock of the achievement, challenges and new issues since the ground breaking 1992 Earth summit in Rio de Janeiro. But more than that, it was an “implementation” summit, designed to turn the lofty goals, promises and commitment, of agenda 21 into concrete tangible actions.

**Commitments were made on specific time bound targets and goals, including some important new targets related to basic sanitation, the use and production of chemicals, the maintenance and restoration of fish stocks and a reduction in the rate of bio diversity loss. New issues were brought into sharper focus, such as sustainable production and consumption patterns, energy and mining, and the special needs of Africa and Small Island developing states were specially addressed (UN, 2003).**

**Between Rio and Johannesburg, the world's nations have met in several major conferences under the auspices of the UN including the International Conference on financing for development as well as the Doha Ministerial Conference. These conferences defined for the world a comprehensive vision for the future of humanity.**

**At the Johannesburg summit, we have achieved much in bringing together a rich tapestry of peoples and views in a constructive search for a common path towards a world that respects and implements the vision of sustainable development. The Johannesburg summit has also confirmed that significant progress has been made towards achieving a global consensus and partnership among all the people of our planet (UN, 2003).**

#### **2.3.4 Multilateral Agreements on Environment:**

**International laws, on sustainable development need to be developed in ways that observe the delicate balance between the need for development and for environment protection.**

**Current environmental laws should be reviewed and developed to make them more effective. International Laws should also promote the integration of environment and development policies. It should include:**

**-The development of universally negotiated agreements that create effective international standards for environmental protection, taking**

**account of different situation and abilities of various countries.**

**-Measures to avoid or settle international disputes in the field of sustainable development. These measures can range from notification and talks on issues that might lead to disputes to the use of the international court of justice.**

**Developing countries should be given support for their national efforts to implement international agreements, and to participate effectively in the negotiation of new or revised agreements, and this should include: financial support and assistance in building up expertise in international law on sustainable development, support should also include the necessary reference information and scientific and technical expertise (UN,2003).**

#### **2.3.5 Global Environmental Trends;**

**Three global problems still stand in the way of achieving a sustainable world. These include; human- induced climate change, the loss of biodiversity, and expanding human population and consumption levels. As recognized in three separate agreements, the 1992 Framework Convention on Climate Change, the 1992 Convention on Biological Diversity and the 1994 Population Plan of Action are essential to humanity's future prospects. Failure to abide by provisions of these agreements would lead to almost inevitable decline in the human condition (Flavin, 1997)**

**To tackle these problems, the UN created the global environmental facility (GEF) as a mechanism for international cooperation for the purpose of providing new, and additional, grant and concessional funding to meet the agreed environmental measures to achieve agreed global environmental benefits in the areas of biological diversity, climate changes, international waters, and ozone layer depletion, land degradation. In carrying out it**

mission the council concern on public awareness in order to ensure public participation and consultation with stakeholders at appropriate stages of activities.(Al-Ashry,1996).

#### 2.4 Rich countries:

Several actors contribute to the spreading of environmental awareness in a society. In Western industrialized world, all these actors have contributed to growing opposition to the destructive tendencies of technological progress backed up by government regulations. Although this opposition is not yet powerful enough to stop or reverse continuing degradation of the environment, it has had some success in curbing many direct threats to human life and health.

In those countries where development and establishment of a market system are now on the daily agenda, awareness of environmental impacts is not sufficiently widespread to have had significant influence on industrial and political decisions. The prevailing attitude is a loosely conceived determination to “grow now and clean later” little in the way of thorough analysis has gone into this attitude, which relies mostly on “common sense” and wishful thinking. However, different actors in these countries can have considerable impact on the development of effective environmental awareness (Baumgart 1995).

The problems of the environment are now seen to be increasingly complex, requires action which is more integrated and holistic in approach. Many environmental problems are seen to have a trans-national dimension, either in terms of their effects or in terms of their cause. International co-operation and actions are thus recognised as essential to tackle many environmental threats. A wider range of actors now needs to be represented in policy making. Such actors included not only national governments, but

regional and local authorities, industry, commerce, financial institutions, trade unions, research organizations and education, the public and voluntary groups.

(Briggs, 1995).

Debates on environmental legislation often come down to the issue of whether the proposed legislation will harm the economic growth, and how much. Industry representatives typically paint a dire picture of enormous job losses, erosion in international competitiveness, and lower economic growth. On the other side, environmentalists stress the negative consequences of pollution on human well being and some times claim that there is no real trade-off between economic growth and a clean environment. (Wajsman 1995).

#### 2.5 Developing Countries:-

Developing countries have been facing degradation not only in their physical environment but also in their social environment. Degradation of the physical environment result into misuse of natural resources, while reduction in social environment quality results into hunger, poverty, high mortality and morbidity, bad sanitation and migration.

Most developing countries have many similarities in social and political structure; lack of institutional capacity, instability, inarticulateness of demands, and absence of public involvement. In 1987, many developing countries, particularly in Africa were facing prolonged famine and declining stable food production. These conditions created the phenomenon of environmental refugees, and provoked rural-urban migration (Abdellatif, 1999).

It is generally accepted that the degradation of renewable resources in developing countries is deep and widespread. Population pressure has

been frequently suggested as one of the major causes of environmental degradation in developing countries (Soutyate et.al., 1990). RPG, 1992 wrote that; degradation of natural resources as a major cause of the environmental problems due to drought, under-development, civil conflict and political insecurity. (Babu, hassan, 1995).

Environmental problems in developing countries are usually viewed in one of two ways:

- 1- They are looked upon as natural and humanbeings have little control over it.
- 2- An alternative perspective places more emphasis on policy intervention, this approach views environmental problems as the consequence of a failure to “get the prices right”. That is we have failed to assign the real costs of environmental degradation to the development process.(Redelift, 1995).

Developing countries face the problems of poverty and started programmes for poverty eradication where environment is central to these activities. The international community sensed the need of Africa countries for an integrated efforts to combat the problems of poverty and environmental degradation, launched special programme for Africa. The highlight of such programme is discussed below.

#### **2.5.1 Sustainable Development for Africa:**

Since the United Nations Conference on Environment and Development, sustainable development has remained elusive for many African countries. Poverty remains a major challenge and most countries on the continent have not benefited fully from the opportunities of globalization. Africa’s efforts to achieve sustainable development have been hindered by conflicts, insufficient investment, limited market access,

unsustainable debt burdens, historical declining levels of official development assistance and the impact of HIV/ AIDS. The world summit on sustainable development emphasized the commitment of the international community to address these special challenges and give effect to a new vision based on concrete actions for implementation of Agenda 21 in Africa. The New Partnership for Africa's Development (NEPAD) is a commitment by African leaders to the people of Africa. It recognizes that partnerships among African countries themselves and between them and with the international community are key elements of a shared and common vision to eradicate poverty, and furthermore it aims to place their countries both individually and collectively, on a road of sustained economic growth and sustainable development.(UN,2003) .

Africa can benefit from the experience of other areas in implementing environmental impact assessments (EIA), but African countries face a greater challenge in achieving this goal due to such problems as inadequate environmental legislation, inappropriate framework for coordinating and monitoring government activities, shortage of qualified manpower, inadequate financial resources, and absence of public awareness of the need for EIA.(Kakonge, Imerbore,1993.)

#### **2.5.2 Legislation;-**

Available data reveal that formal legislation is one of the major instruments for the effective implementation of EIA. Experience from countries such as Kenya, Malawi indicates that some of the existing environmental legislations date back to the colonial period, (Muslim1983, UNDP1988.). .(Kakonge, Imerbore,1993.)

Brief surveys reveal that only a few African countries, such as Zimbabwe, Ghana, Kenya, Madagascar, Nigeria, the Sudan, and Senegal, have

incorporated environmental considerations into planning process. Since the UN conference on environmental and development held in Rio de Janeiro, a number of countries have now established environmental focal points. Others have also established inter-ministerial committees placed directly under the central planning ministries (Malawi, Madagascar etc). Some have created environmental advisory bodies placed under one sectoral ministry. Generally, experience has shown that when environmental responsibilities are spread over many ministries, they are not easily coordinated,(Kakonge, Imerbore,1993).

2-6 Sudan:-

#### **2-6-1 Sudan Natural Resources and Social Situation;-**

Sudan is the largest country in Africa with area of 2.5 million square kilometers and the ninth largest country in the world. It is primarily an agricultural country with about 65% of the economically active population engaged in agricultural and livestock production,. The ecosystem of Sudan includes stretches of tropical forests, marchlands, and mountains in the north, east, and west. The Nile' with its tow main sources' the White Nile and the Blue Nile' runs through the country. Sudan shares its extensive borders with nine African countries. (Alkhaleefa, 2003).

The diversity of Sudan's geo-social and natural systems reflected in its people, who are sparsely distributed on its vast area and characterized by its multicultural, multiethnic and multilingual. Sudan has experienced many years of political tension and civil war since its independence in 1956. Sudan's population was estimated at about 32 millions in 2002 (with an estimated annual growth rate of about 2.8%), of which the urban population was estimated at 30% and the rural population at 70% (including nomadic groups). In recent decades, Sudan witnessed a

substantial rural-urban migration due mainly to the human and natural disasters. The vast majority of population is conceived to be poor; with an average per capita income of about US\$395 in year 2001. The maldistribution of national income and economic resources has their roots in the historical unequal regional economic and social development that has been reflected in the wide regional disparities and welfare. Despite the fact that Sudan is well endowed with natural resources in relation to its population. (Al Khaleefa, 2003).

#### **2-6-2 Sudan Environmental Resources Degradation:**

The major environmental problems in the Sudan are; depletion and misuse of the natural resources through over cultivation, overgrazing and deforestation; desertification and droughts; environmental refugees and displacement; misuse of agricultural chemicals and wildlife destruction (Abdellatif, 1999).

The rate of exploitation of the natural resource base has become very alarming. If it continues as is happening now, the future of these resources will be alarming and the livelihood of rural communities will be severely damaged.

It is quite evident that the problem lies with the perception of two main actors on the scene; the users of the resources, and the planners. The planners have aggravated the situation by looking for easy solutions for the economic problems of today and completely neglecting the right of future generations in enjoying these resources. Moreover, the intensive use of these natural resources has led to their rapid deterioration, (El Hassan, 2003).

Wastes can cause significant adverse health and environmental impacts if managed badly. Collection, transportation and disposal of these wastes are

one of the major environmental problems facing the urban centers. Since the cost of safe disposal is exponentially increasing and even locating sites for their disposal are becoming more and more difficult. Therefore, in order to approach reduced pollution an integrated waste management approach should be used. (Abdel Galeel2003).

War is a source of instability and also drains material resources that could otherwise be allocated for development. Also war has led to displacement of people. (El Hassan, 2003).

### **2-6-3 Basic Sudanese Environmental and Natural Resources Laws:**

Sudan has promulgated an organic or comprehensive environmental and natural resources legislation. Regulatory measures for environmental management have been effected on apiece-meal, sectoral basis, as needs arose (Tier, 1998). According to an environmental evaluation submitted to Sudanese Government in 1961 by British Environmental Expert, most of these laws were designed mainly to address the effects environmental degradation. The sources of these effects were not tackled by these statutes, because environmental protection and improvement were not treated as a priority.(Morkaz, 2002).

Also according to a report furnished to the government in 1983 by Burhane, a united Nation Environment Programme expert, more than 150 statutes on environmental protection were estimated to be in existence in the Sudan. These include regulation and local council's orders.(Morkaz, 2002). In the following discussion, only the major legislation provision in the identified sectors will be discussed. For the sake of brevity and the type of the research minor provisions will merely be referenced.

(1) Environmental Heath act 1975: -

**The major provisions appear in the public health act and environmental health act, both passed in 1975.**

**After a definition in chapter (1), the rest of the environmental health act deals with institutional responsibilities, in water and air pollution. By far the most noteworthy provision appear in section 4 which imposes a duty on local councils to preserve and improve environmental health defined, rather inadequately, as “health condition of a human being, an animal or a plant and all that is related to human life in the surrounding environment” this of course imposes an obligation to protect the well being of fauna and flora as well- a rather extensive obligation which may unduly tax the manpower resources of the local authorities. These councils are also required to make adequate provision for the installation of public sewers, the disposal of rainwater and untreated waste, the collection and treatment of rubbish, and to take preventive measures against the spread of the epidemic disease. The act imposes considerable obligation on the people's councils.**

**(2) Water supply, water use and water quality;**

**Provisions on water pollution appeared as early as the 1939 Nile Pumps Control Ordinance, although this ordinance did not set out any clearly defined water quality criteria. And then (1939) public health ordinance provision, were designed to ensure that water resources development project were consistent with public health requirements. The most comprehensive treatment of water pollution now appears in the environmental health act 1975, in chapter (3) from section 8-12, section 8 prohibits the discharge, dumping or other disposal of substances into sources of water “in a manner harmful to human or animal health or prejudicial to other water uses”. Under section 9 district health authorities are required to monitor public and private drinking water sources, and to**

carry out periodical medical examination of persons working in contact with drinking water source and systems. Section 10 imposes an obligation on institutions responsible for the storage and supply of drinking water to comply with regulations laid down by the minister. Section 11 makes provision for district health official to tackle the spread of epidemics through drinking water. Finally section 12 lays down condition under which the health authorities may authorize the discharge of treated wastes into public water courses.

**(3) Air :-**

Although this is not a major problem, legislation has been promulgated to regulate it. Chapter (4) of the environmental health act deals with air pollution arising from industrial activities and consequently, prescribes siting requirements and restrictions for industries, chimney heights –etc. it also provides regulation for the incineration of wastes. Section 15 empowers the district health authorities to take action to prevent the emission of gas, smoke, dust etc, from factories, furnaces and vehicles that are likely to cause harm to human health.

**(4) Soil conservation:**

There is no specific legislation on soil conservation in the Sudan although references are made to this subject in the following laws:

- The Rural water and Development Corporation act 1970.
- The allotment of lands for development of the mechanized farming corporation order, under the mechanized farming corporation act.
- The Gezira Scheme Act, 1960.

As an example the 1967 Rural Water and Development Corporation Act, concentrates mainly on the definition of the organizational structure and functions of the corporation one of which is the protection of

**“resources, pastures, Agricultural land, soil and Sudan tree health” from deterioration. Soil conservation is provided for only by implication in other acts such as the Gezira scheme act.**

**(5) Land tenure and land use planning:**

**Ownership and other rights in land are governed partly by written law and partly by customary law and tradition, although government owns most range land, forests and cultivated land. The major uses of land in Sudan are for agriculture (grazing and cultivation) and forestry, while there is no legislation specifically dealing with land use, legislation relating to land are:-**

- The unregistered land act 1970.**
- The Acquisition Act 1970.**
- Taxation of land and Date trees ordinance 1925 and regulation.**
- The town and village planning act, 1961.**
- Road traffic ordinance, 1922.**

**(6) Environmental Laws:-**

**As mentioned earlier, the Sudan has passed many environmental laws covering nearly all environmental elements. These are described as sectoral laws. Among the important sectoral laws we may mention the following;**

**Forestry, wildlife, fisheries, protection of marine resources, control of dangerous substances and many other sectoral laws reaching 150, awareness about these laws is very important for planners and decision-makers. The public in general must be aware of the provisions of the laws that affect their life.**

**In an attempt to bring harmony to the different laws, Sudan's Environmental Protection Act 2001 was passed. This act is a framework**

law that provides guidelines to improve and amend sectoral laws. The act established the Higher Council for Environmental and Natural Resource (HCENR) as a coordinating institution and responsible for raising awareness to ensure compliance with the law.

#### **(7) Constitution of Republic of the Sudan 1998:-**

This constitution is final and proved by National Assembly in 1998 and still it is enforce. There is an article (9) of this constitution provides; "Natural resource under or on the surface of the earth and in the territorial waters are public property regulated by law; and the state shall provide plans and appropriate conditions for the development of the financial and human resources necessary for utilizing such wealth".

### **2.7 How to Raise the Public Awareness**

#### **2.7.1 Awareness Raising :-**

Raising the awareness about environmental laws could encourage local people to be involved in environmental conversation efforts.

The public through their role as users of environmental resources, and as consumers take a wide range of decisions that affect the environment. The essential task is to make them aware of the impacts of their behaviour.

Awareness raising must be based on information reflecting the environmental problems faced and the causes and possible solutions.

Public awareness could be raised through exhibitions, drama, puppet shows, children songs, radio and T.V. broadcasted talks, and films on environmental problems. Environmental festivals such as "World Environmental Day" and "Arab Environmental Day" provide opportunities to carry out different activities such as processions, seminars, news release and poster exhibition (Mohamed, 2000).

#### **2.7.2 Role of Mass Media in Information Disseminations;**

Through the mass media people become able to share knowledge, technology and transmit culture. In fact without the capacity to communicate with one other, man would never have progressed beyond the primarily state. In modern society people transmit information and communicate through language and other codes of human interaction. (Ahamed, 1992).

Mass media which direct messages to the public include: Radio, Television, Newspapers, and National magazines. A newspaper or television programme informs a multiplicity of audience or public. (Aidarose, 1994).

Mass media supports “The process by which information, and directives pass through a social system and the way in which knowledge, opinions and attitudes are formed or modified. So, communication is exchange ideas. It is not the mechanical transfer of facts and figures. It is also not talking to people. It is interactive processes that work in a circular, dynamic and ongoing way.

Such process requires channels to transmit information and mass media become able to ply that role. Hence society became built around these new channels and around centers of information and developed a large number of social institutions to carryout many of the tasks that used to be handled by individuals. (Ahamed, 1992). For mass media to be effective it has to be linked to centers of information that produce research results on environmental problems which are academic then modified in simple language to be diffused to the public by reporters through channels which are available to the public.

The role of a reporter here is to inform people about problems that of crucial importance. Then public awareness will be created as a prerequisite

for changing people's attitudes and outlooks with regard to environment and development. In this regard the mass media plays an important and strategic role in promoting public awareness and shaping its attitudes. The reporter should also have ability to understand the technical and highly specialized scientific information and to re-write or re-edit it in simple style suitable for public. This should be done without loss of any scientific facts. (Aidarose, 1994).

### **2-7-3 Environmental Education;**

Environmental awareness may be raised through environmental education. Many people do not understand the close ties between human activities and the environment because they have inaccurate or insufficient information.

There is a need to increase people's sensitivity to, and involvement in, finding solutions for environmental and development problems. Education can give people the environmental and ethical awareness, values and attitudes, skills and behaviour needed for sustainable development. To do this, education needs to explain not only the physical and biological environment, but the socio-economic environment and human development (Keating, 1993).

Environmental education, as defined by UNESCO and other international agencies, state clearly that, environmental education should aim at creating responsible citizens, who are equipped with skills, and have commitment to solving environmental problems.

The formal environmental education or the efforts in schools and universities has to be supplemented by non-formal environmental education, which takes place through non-governmental organizations and mass media. The people awareness and knowledge of environmental

matters could be greatly enhanced by NGOs, which have proliferated during the last years.(Aidarose, 1994).

#### **2.7.4 The Role of the Environmental Law:**

It is often said that the law reflects society's social values. If that is true excellent environmental legislation must be enacted. Environmental law gears human action on the basis of the principle of prevention, the polluter-pays principle and the principle of cooperation.

Firstly the principle of prevention is designed not only to prevent danger and remove damage, but also to prevent potential negative environment impacts from arising at all – if possible- at source and by means of risk reduction.

The second is the polluter – pays principles must be understood as a fundamental allocation of costs, also as the principle of allocation of the responsibility. Costs incurred must be removed by the party responsible.

The third principle, that of cooperation means, that care of the environment is a common task of both the state and citizens, and requires cooperation between the two.

Environmental law has a three fold functions; the most significant being is existential function in care of the environment. Law is designed to secure the mankind's life, survival and health, and give men and women an existence worthy of human dignity.

On the other hand the existential function is complemented by the social function where by environmental law helps to provide facilities for people to relax in and enjoy the natural environment and landscape.

Thirdly law also has an aesthetic function when it allows us to experience the diversity, uniqueness and beauty of the environment. (Tire, 1998).

#### **2.7.5 Mass Media Facilities in the Sudan:**

#### **2.7.5.1 News Papers;**

The history of news papers in the Sudan goes back to the year 1899, when the Anglo-Egyptian government published the government newspaper “Gazette”. This news paper published mainly governmental laws, orders, advertisements and commercial advertisements, because there were no other news papers in the country at that time. After four years the first Sudanese news paper was published in 1903 and was named ‘Sudan’ (Ahamed, 1992).

How ever, more news papers in the Sudan were added till the country attained independence in 1956. After the new technological equipments in publishing were used, many news papers have been introduced and their number increased largely in the time of democracy.

These news papers were distributed throughout the country by airplanes, trains, buses, lorries, etc. The geographical coverage of the news papers in the Sudan shows their poor spatial distribution, because they cover only the towns and cities and unable to reach the huge numbers of people in the rural areas. The main reasons which helps in the low coverage of the news papers in the country is the lack of good means of communication as well as the high level of illiteracy(Ahamed, 1992). In recent years many newspapers started to assign pages on environmental issues. They started to report on environmental conferences and environmental festivals. However, environmental reporting is still limited but start has been made.

#### **2.7.5.2 Broadcasting Facilities;**

There are two main broadcasting facilities in the Sudan. These include;

a- Radio Omdurman;

**The present premises of radio Omdurman was established in 1958, on the western bank of the Nile in Omdurman**

**In 1985 the Sudan government founded many radio stations in some cities of the country such as Wad Medani, El Obeid, Kassla, Nyala and Atabara. These new stations help to strengthen the national station from Omdurman, and produce local programmes on local problems. They played these roles effectively. However, the level of reporting and programme production is very poor (Ahamed, 1992). Despite this statement Radio Omdurman broadcast a weekly programme on environment.**

**b- Sudan T.V;**

**In the Sudan T.V transmission started in 1962 and it was serving for a limited period of time. It was one of the first T.V stations in Africa. T.V. reporting on environmental matters is still very limited.**

**2.7.6 Sudanese Environmental NGOs;**

**In the Sudan there is a network of NGOs, which have activities in the field of environment; its called Sudan Environmental Net Work (S.ENW) consists of many organizations, local and international. The local NGOs are Sudanese Environmental Conservation Society (SECS), which was formed in 1975, Environmentalists Society (ES). There are also others civil society organizations such as Sudanese Red Crescent (SRC), women and youth organizations.**

**What is important is not how many organizations are there but how free they are to play their role outside the State structures, and influence State decisions in the direction of development. At present, despite the large number of organizations, they are not fully free to function. There is a need to change State-civil society partnership towards more cooperation and understanding of their respective roles.**

## 2.8 Review of Previous Studies:-

**Environmental awareness studies received considerable attention by research center, universities, environmental institutions and NGOs. Vast amount of these studies had been conducted in the developed world, but very few studies have been carried in developing countries. Here we need to give a brief review to some Sudanese studies carried in this field in last two decades:-**

**In May 1982 the Geography Department of U.K, with assistance from staff members of Clark University (USA) carried out an explanatory MAP of the environmental context of development in Sudan. This map was prepared to present a summary record of environmental trends in Sudan. For the purpose of this map the environment is seen as a set of physical, biological and social factors which influence a particular area or community. The result should provide guidelines or warning signals for people who are planning or proposing projects in the high risk areas.**

**In 1985, the Institution of Environmental Studies and IDRC - Canada, within the African Urban Management Project progress report on the “Management of Greater Khartoum Urban Ecosystem” studied population, city administration, finance and urban services. Other issues explored, are water supply, excreta and sewage, garbage collection, electricity and medical care. The research methods adopted involved many ways of data collection, including designing and applying a questionnaires.**

**In 1985, the Institution of Environmental Studies of U.K published the Environmental Monograph series NO 4 on the Problem of Resources Management in the Sudan by Mutasim El Amin, (Msc. degree).**

**In 1988, Sudanese Environmental Conservation Society in cooperation with the Friedrich Elbert, held a workshop on the**

**Environmental Law in the Sudan, intended to specify the environmental aspects which needed to be covered by legislation. The important recommendations of this workshop is; related to raising the environmental awareness among the lawyers, executives administrators such as police, judiciary and the citizens to know their rights and tasks towards the environment.**

**In 1996, high Council for Environmental and Natural Resources in collaboration with United Nations environmental Programme held the “National Seminar on Environmental Legislation in the Sudan” included papers on different issues related to environmental laws.**

**Mrs. Badaria Suliman 1998, in unpublished paper summarized all Sudanese federal environmental laws, and she showed the recent Khartoum State experiment in environmental legislation.**

**In May 2000, the report of “Environmentally Sustainable Development in the Sudan; Capacity 21”. The report stated by given a brief outline of Sudan’s National Strategy for Sustainable Development. In order to implement activities according to the field needs, hence the report outlined the level of existing capacities it also tried to identify areas where future activities are needed.**

**There was some students thesis’s in Institutes of Environmental Studies have studied the environmental awareness issues. Zeinab EL Zubair1991, (Introduction of Environmental Education Programmes into Primary Level of Education in Sudan) in view of the fact that reading materials and instruments of teaching aids pertaining to environmental education are not available for providing adequate instructions, the study recommends that (1) the environmental education should be incorporated in primary syllabi.(2) Environmental education should shed light on local**

environmental problems. Ahamed Hassan 1992, studies “The Reporting of Drought and Desertification Through Sudan’s Mass Media”. The study concluded that; the time and space allocated for the programmes of this disaster is very short, the programmes lack information and real truth, these programmes were not to the level of the incidents and have less effects among the affected population. Wedad Aidaros 1994, studied “The Environmental Awareness by Non-formal Environmental Education Through Broadcasting”. She explained that the non-formal environmental education has a real role in raising the environmental awareness among the people. Abdel Bagi Abdella, 1996. 'The Utilization of Natural Parks as Educational Sites in Sudan'. The study reveals that (1) Environmental issues are now incorporated into various disciplines such as geography and science, but they are dispersed. (2) Both teachers and student emphasize the importance of the environmental information. (3) Natural parks have been established for recreational purposes, they are there for unsuitable for environmental education.

### CHAPTER (3): DESCRIPTION OF STUDY AREA

### 3.1 Introduction:-

**Sudan's capital region straddles the confluence of the Blue and White Niles and cover and area of 28,000 sq. kms or about 1% of the total area of the Sudan. In 1990 this tiny area had a population of over 3.5 million that is 18% of the country's population. In 1904 it was estimated that Khartoum province has 81,000 (4% of total Sudan national population of 2 million people). Considering these figures, it shows that the national population has increased a bout 12 fold and that of capital region has increased 50 fold. At present there are more than 7 millions living in the capital region.**

### 3.2 Physical Aspects:

#### 3.2.1 Geographical location;

**Khartoum, the national capital of the Sudan, lies at the junction of the Blue and White Nile at latitude 15 36 North and longitude 32 33 East. Include Khartoum, East Nile and Omdurman provinces. The scope of this study is mainly within Khartoum , El amarat represent the first class , Jabbra block 18 the second class, Burri (Hai Korya) the third class, and Mayo(Hai Galb El Asad) represent the squatter areas.**

#### 3.2.2 Geomorphology:

**Khartoum region is characterized by flat nature of terrain with occasional isolated hills and sand dunes to the west providing gently undulating topography with Wadis interrupting the relatively flat ground.**

**The White Nile has a gentler gradient than those of the Blue Nile. At the heart of the capital region, Tuti Island is found which is formed from silts, clays and sand deposited by the river.**

#### 3.2.3 Rainfall:

**Rainy season starts at June/July to mid-September. The average rainfall ranges from north to south from 100mm to 200. Khartoum's highest annual rainfall was 420mm in 1988 and it's lowest was 4mm in 1984.**

**The variability of the rainfall is of the greatest significance in the hot desert type climate that characterizes the region of Khartoum. The low totals of rainfall impose a severe constraint on the way of life of the inhabitants. The high totals of rainfall during August/September may lead to flooding. Flooding may occur as the result of Nile overflow its banks or by ephemeral Khors and Wadis. The flooding hazards of this ephemeral water courses are often difficult to assess avoid or control because of the infrequency of flood and lack of records. However, there are suggestions that flows occur after 25mm storms and major wadis flow occur after storm of at least 40mm.**

**Street flooding occurs after every significant rainstorm in Greater Khartoum aided by poorly maintained and inadequate street drainage system and very low relief of the area, more street and house flooding occurring in rainstorms exceeding 15mm. The year 1988 was the wettest year in Khartoum with a total of 420 mm. over 200mm of rainfall was reported in just 24 hours and 320mm in less than a week. The three towns experienced serious flooding leading to destruction of infrastructure and water supply network.**

#### **3.2.4 Temperature:**

**Khartoum metropolitan area lies in semi-arid tropical climate, is characterized by its hot nature, temperature of 32°C to 39°C are common through the year. The main maximum and minimum temperature are 43c during the summer and 18c in the winter.**

The rapid expansion of the urban areas and consequent destruction of vegetation is postulated to affect the albedo of the ground surface. This could have effect on the temperatures. However, there are other factors which point to possible increase in future temperatures. These are urban heat and global warming. Studies suggested that the seasonal temperature increases for these factors in this part of the Sudan between 2°C and 4°C over the next century. (Mohamed, 2004)

### **3.2.5 Soils:**

Studies identified three soil groups, these are; Riverain, high level soil and Nubian series soils, the riverain soils are formed in association with the river alluvia of the White Nile. The high level soils are found along river terraces and gradually merge away from the river into plains forming Gezera formation. They are clays and some sands. Some areas to the west of Omdurman have gravelly soils as the result of erosion.

In an urban situation, the demands made up for soils involve their use as foundation for buildings, roads, and as building materials, for the disposal of waste water, sewage and for lawns, gardens and parks.

### **3.3 Human Aspects:**

#### **3.3.1 Urban Growth;**

Greater Khartoum (Khartoum, Omdurman, and Khartoum North), has suffered from the problems of rapid population growth and urbanization. The population has increased from 460,000 in 1970 to 3.3 million in 1990 (five-fold over a period of two decades). The population of the city will be more than 9 million by 2010 (Bannaga, 1994). Urban population in the Sudan is growing at a rate of 4.5% and in Khartoum even higher 6% approximately (Department of Statistics, 1990). De Tong-Boon (1990) reported about the main causes of the rapid growth of population in

big cities, she wrote; “Growth has been so fast that expansion of jobs, housing and necessary services are already lagging behind. Most of the government offices, industries, and communication and transportation facilities are in big cities. They attract capital investment and growth further. To stop growth it would be necessary to invest elsewhere etc”. (Mohamed, 1998).

The opportunities to be found in big cities attract migrants from rural areas. There are also push factors from rural areas as people flee the countryside because of famine, desertification, lack of health services and education opportunities, also because of war and lack of security. (Mohamed, 1998).

In Khartoum, migration accounted for about 65% of the three town's population. Although natural growth is also rapid, urban dwellers are usually more amenable to family planning. The most rapid growth takes place in uncontrolled squatter settlements where services are absent, and which contain about 40% of the population in greater Khartoum.

El sammani,etal,(1986), attributed the rapid population growth of big cities in Sudan to the influx of rural people and displaced persons.

It is obvious that the main cause of spread of the squatter areas in the urban center is the migration, the migrants settle at marginal areas of the town because of their poverty and their inability to cope with urban life.

### **3.3.2 Population:-**

Khartoum state population grew rapidly from 3,252,410 according to 1993 census to 5,500,000 in 1998 to over 7,000,000 according to estimates of 2003, about 83.1% of its population lives in urban centers of Khartoum, Omdurman and Khartoum North while 16.9% live in rural areas. The Khartoum complex has emerged as the development centre for the country,

attracting industry, trade, capital, raw material, and migrants, leading to this high urban growth. Due to these factors, growth rate of Khartoum state reached 6.2% and most those migrants lives in unplanned settlements at the outskirts of the town and uses the urban services. But in the last two decades by the reasons of war, starvation, drought, non-stability and environmental collapse, all those affected had decided an internal immigration to Khartoum state. See table 2

Table NO (2); Population projection up to the year 2025 for Khartoum region

Year	Khartoum State	Urban	Khartoum Area
1988	5,500,000	4,290,000	1,520,464
2000	6,203,142	5,154,811	1,714,,846
2005	8,369,768	6,963,587	2,316,570
2010	11,320,154	9,407,048	3,129,434
2015	15,292,294	12,707,896	4,227,524
2020	20,658,223	17.166,983	5,710,942
2025	27,907,007	23,190,723	7,714,836

Source; Khartoum State Water Corporation

### 3.3.3 Demographic structure of the sampled population:

From the survey (Table 3) covered 59.3% males and e 40.8% females.

Table NO (3); Sex distribution of the respondents in the study areas

			Dwelling area				Total
			first class	second class	third class	squatter area	
Gender	Male	Count	22	26	17	22	87
							59.2%
	Female	Count	15	19	8	18	60
							40.8%
Total		Count	37	45	25	40	147
							100.0%

Source; field work.

The sample population covered persons of all age groups, most of the respondents are youth of age group between (20-29) 29.9% and (30-39) 32% years old see table (4), the age group (less than 20) is represent only 5.4% from the total, 87.5% of them from the squatter area. The respondent have different educational levels as shown in table(5) , the rate of the illiteracy is only 4.1% and 65.6 have studies in universities but only 11.6% of them live in the squatter area, the table show that the respondent in the planned study area enjoy a high educational level. These population increases were paralleled by comparable increase in the need for urban housing, infrastructure and services.

Table NO (4); Age distribution of the respondents in the study areas

			Dwelling area				Total
			first class	second class	third class	squatter area	
Age distribution	less than 20 Years	Count	1			7	8 5.4%
	20-29 Years	Count	9	18	9	8	44 29.9%
	30-39 Years	Count	7	16	11	13	47 32.0%
	40-49 Years	Count	13	7	4	8	32 21.8%
	more than 50 Years	Count	7	4	1	4	16 10.9%
Total	Count		37	45	25	40	147 100.0%

Source; field work.

**Table NO (5); Educational level of the sampled population**

			Dwelling area				Total
			first class	second class	third class	squatter area	
EducationLevel	Illiterate	Count		4	1	1	6 4.1%
	Khalwa	Count	2		1	7	10 6.8%
	Primary	Count	1	2	1	5	9 6.1%
	Intermediate	Count	2			6	8 5.4%
	Secondary	Count	6	1	2	10	19 12.9%
	University	Count	26	38	20	11	95 64.6%
Total		Count	37	45	25	40	147 100.0%

**Source; field work.**

### **3.3.4 Main economic activities:**

**The economic condition is an important factor which characterizes the urban dwellers in the different neighbourhoods. High income citizens and senior officials in the private or government sector reside in the high standard residential districts. In the second and third class residential areas, there is a wide range of income distribution, the occupation of dwellers vary from ordinary workers with minimum monthly incomes to the high income commercial dwellers.**

**Table NO (6); Occupation of the sampled population in the study areas**

			Dwelling area				Total
			first class	second class	third class	squatter area	
Occupation	Student	Count	7	11	7	9	34 23.1%
	Employee	Count	14	15	11	5	45 30.6%
	Marchant	Count	4	6		3	13 8.8%
	Worker	Count	2	3	1	7	13 8.8%
	House Wife	Count	8	2	2	8	20 13.6%
	Others	Count	2	8	4	8	22 15.0%
Total		Count	37	45	25	40	147 100.0%

**Source; field work.**

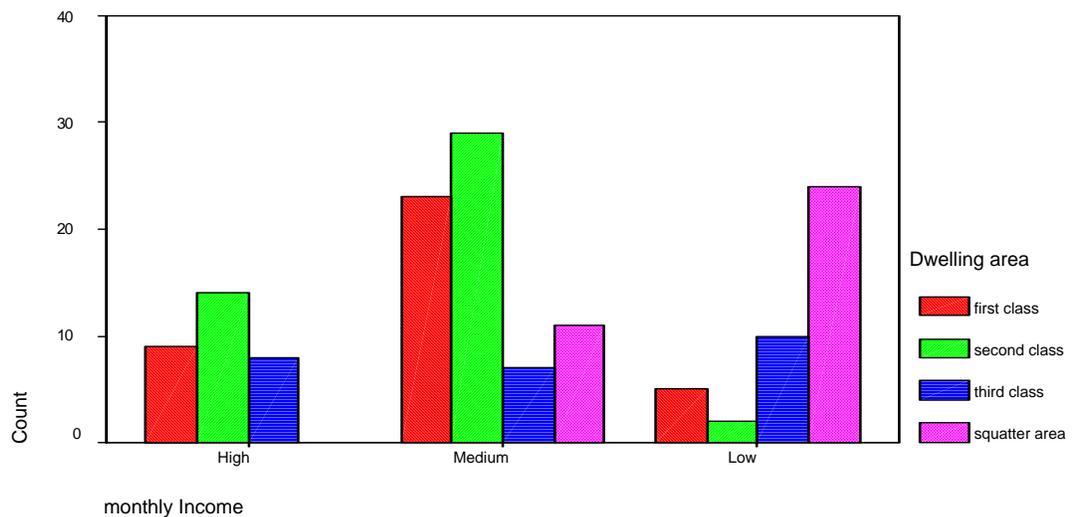
**Table (6) shows the occupation of the respondent, that the majority of them were employee (30.6%) and student (21.8%), most of the employee are from the planned areas 88.8%. Workers represent 8.8% from the total and 53.8% within the workers from the squatter area. The level of the respondent income is reported in table (7) it can be see that almost 50% of the respondents fall within medium income level. Low income represented 28.9% from the total, 58.5% of them lives in squatter area. This indicates that poverty is common in the squatter areas of the state. High income seen in the first and second class see figure (1).**

**Table NO (7); Income level of the respondents**

			Dwelling area				Total
			first class	second class	third class	squatter area	
monthly Income	High	Count	9	14	8		31 21.8%
	Medium	Count	23	29	7	11	70 49.3%
	Low	Count	5	2	10	24	41 28.9%
Total		Count	37	45	25	35	142 100.0%

Source; field work.

**Figure NO (1); monthly income**



Source; field work.

### 3.3.5 Settlement pattern:

#### 3.3.5.1 Layout/planning:

The mechanisms for controlling development in the three towns consist of simple zoning and housing classification systems based on planning standards. Efforts are being made to reduce the planning standards to increase the densities and reduce the services costs.

**Housing areas provided with space for commercial building, and social services including schools. However, the lack of government resources means that frequently basic infrastructure services and social services are not provided. As a result, in many areas of the three towns communities have developed self-help associations with purpose of providing such essential services.**

**The development of housing neighborhoods in the three towns has maintained the four class housing classification systems. This sets out specific standards for plot sizes, housing construction and provision of services, for each of the housing classes. The National Housing Committee has recently recommended that these standards should be lowered to increase densities and reduce costs.**

**In the first class areas current plot sizes are between 600-800m and building have to be build of permanent materials with burnt bricks being the minimum acceptable standards. Similar plot sizes apply in second class areas but semi-permanent materials can be used for construction with the minimum acceptable level being mud bricks walls with a burnt brick facing. The building regulations require that all houses should be kept back 2m from plot boundaries which results in all housing being developed as detached buildings. Both areas should be provided with piped water, electricity supply and sewage connection to the boundary wall. All the roads should be paved with covered rain water drains, street lighting and house to house refuse collection. The Housing National Committee is recommending that plot sizes in first and second class areas should be reduced to 300-400m.**

**Third class areas have plot sizes of 300-400m and traditional building materials are permitted which would normally be mud brick construction.**

**The building regulations are less complex and permit development to take place on the line of the plot frontage and to have a common boundary wall on either east or west frontages. They should again be provided with water and electricity to the site, but roads would be un surfaced with open rain water ditches and refuse collection from common points. Sewage disposal would be on site by means of aqua-privies or pit latrines. One main asphalted road with covered surface water drains would be provided to connect the area to the town center. The National Housing Committee is recommending that plot sizes in third class areas should be reduced to 200m.**

**Four class areas also have plot sizes of between 300-200m and any form of construction is permitted including salvaged and re-cycle materials. They have only the most basic services normally consisting of communal water points and un surfaced roads with open rainwater ditches. The National Housing Committee is recommending that a plot size in fourth class areas also be reduced to 200m.**

**Despite the standards set out in the housing classification system, there is a general deficiency in the provision of services in all housing areas resulting from the shortage of resources. In particular there is very long delay in the provision of main services to the housing development, very few roads are paved. Rain water drains are not covered and refuse collection is irregular. Where services do exist there is very little maintenance undertaken and they are generally in poor condition.**

**Housing areas are developed on a rudimentary neighbourhood basis with space allocated for the provision of shops, open space and some social services. However, the lack of development control polices means that shops occur wherever it is considered there may be a demand, the lack of**

maintenance and refuse collections systems result in open spaces being used as dumping grounds and the lack of resources results in a very poor provision of social services.

**Squatter Settlements;** The ward" squat" means to settle on land without permission, especially publically owned and unoccupied land, in order to a quire ownership.

“A squatter” is a person who takes unauthorized possession of unoccupied premises; consequently “squatter area” refers to illegally occupied land by people for residential purposes. (Mohamed, 1998).

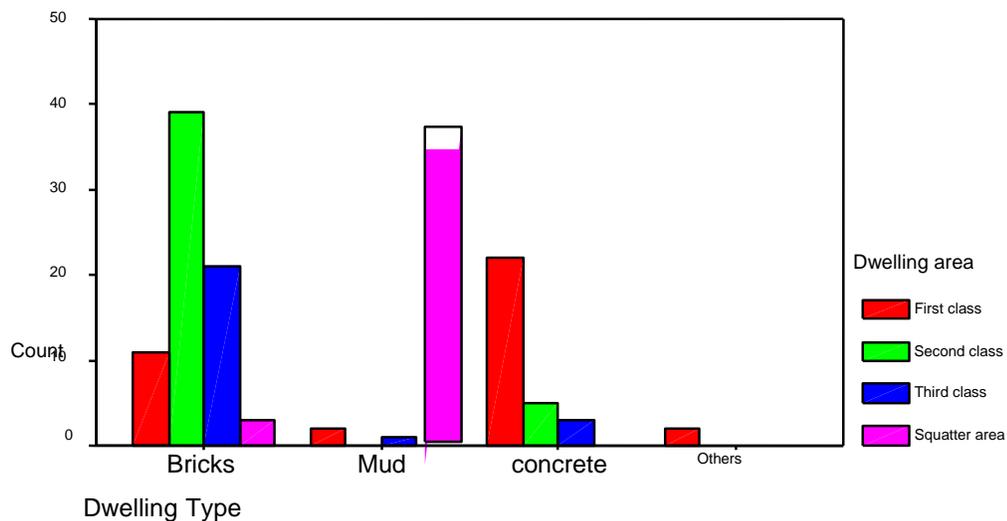
In the study areas the result of the survey revealed that the materials used is closely associated with the class type, the use of the concrete and red bricks are limited to first and second class area, mud as the main form of structure used in the squatter settlement, see table (8) &figure (2).

**Table NO (8); Building materials in the study areas**

			Dwelling area				Total
			first class	second class	third class	squatter area	
Dwelling Type	Bricks	Count	11	39	21	3	74 50.7%
	Mud	Count	2		1	37	40 27.4%
	concret	Count	22	5	3		30 20.5%
	others	Count	2				2 1.4%
Total		Count	37	44	25	40	146 100.0%

Source; field work.

**Figure NO (2); Building materials**



Source; field work.

### 3.3.5.2 Housing condition:

Housing and health services quality for majority of people is very poor in respect to sanitation and water supply. So the situation according to the United Nations is "Unsanitary housing and water supply and absent of adequate means for safe disposal of waste matter, provide a common source of contamination with organisms that may cause illness"(WHO, 1991).

The living environment can be judged by the housing conditions of the residents. There is a direct relationship between housing class and condition, reflecting both level of income, house ownership and requirement of the building regulations.

Availability of the sanitary facilities (pitlatrines and bathroom), all affect the health of population and determine the awareness of people in the area. Table (9) & (10) illustrates the distribution of the housing amenities in the study areas as reported by the sampled population. Table (9) show that

**68% of respondents have available bathroom all in the planned study areas only 2% of them in the squatter area, and 25.9% have shared bathroom 92.1% of them in the squatter area see figure (3).**

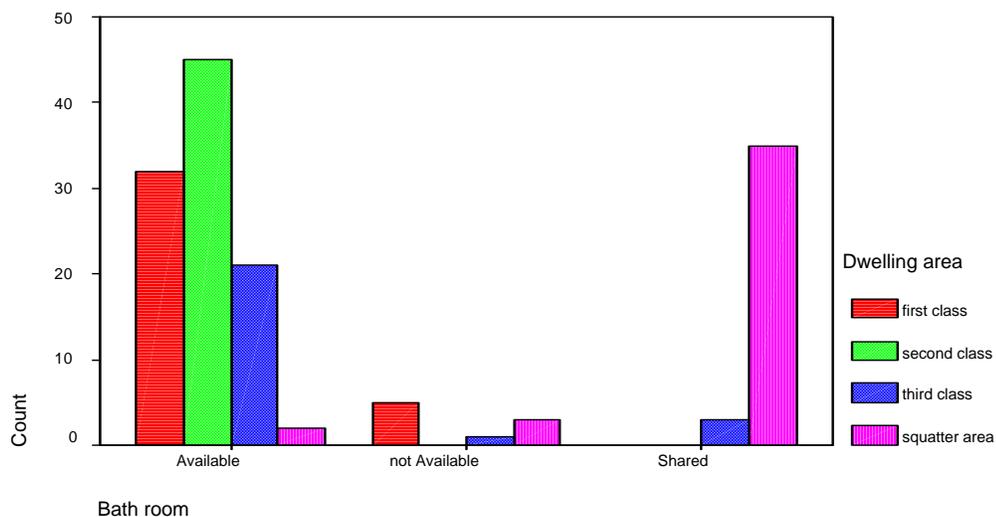
**Table (10) shows that all respondents in the planned areas have available kitchen, 27.9% of the respondents do not have available kitchen 95.1% of them from the squatter area.**

**Table NO (9); Respondents reporting houses with bathroom**

			Dwelling area				Total
			first class	second class	third class	squatter area	
Bath room	Available	Count	32	45	21	2	100 68.0%
	not Available	Count	5		1	3	9 6.1%
	Shared	Count			3	35	38 25.9%
Total		Count	37	45	25	40	147 100.0%

**Source; field work.**

**Figure NO (3)**



**Source; field work**

**Table NO (10); Respondents reporting houses with kitchen**

	Dwelling area				Total
	first class	second class	third class	squatter area	
Kitchen available Count	37	45	23	1	106 72.1%
not available Count			2	39	41 27.9%
Total Count	37	45	25	40	147 100.0%

**Source; field work.**

### 3.4. Services:

#### 3.4.1- Water Supply;

**There are five waterworks in Khartoum state two of them in Khartoum province located at Mogren and Burri. Surface water is the main source of supply in Khartoum state, under ground water from deeporeholes contributes largely to public water supply network.**

**Adequate water supply may not be available for large number of settlements in and around Khartoum area. The town is experiencing a real water shortage both in terms of the capacity of the treatment plants and the distribution system, to the extent that the quality of distribution water is endangered. During the last few years, tremendous increase in concentration of suspended matter has been observed during the rainy season. The quality and quantity of water are both essential, skin diseases can be caused by lack of water for washing.**

**From the field survey we found that most of the water goes to the first and second class areas where most people use pumps and have storage tanks, so they have high level of sanitation. In the third class areas there are water taps in each house, but without water in the peak hours which leads the people to store water in open barrels or other containers which are exposed to contamination, in the squatter areas they buy water from**

vendors carts at high prices they could not afford to buy enough water for good hygiene, see tables (11) & (12) and figures (4) & (5).

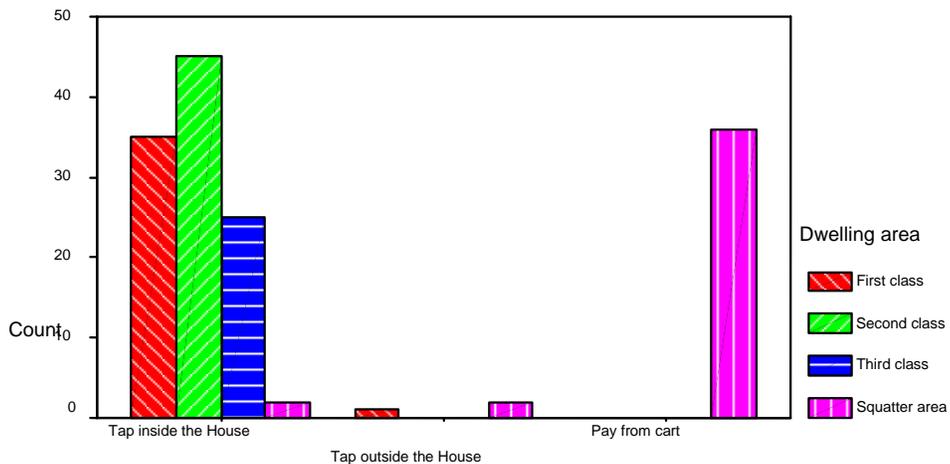
The water production is increasing but the demand is also increasing at a faster rate, the water pipes are over loaded in the attempt to serve the expanding population of the capital areas.

Table NO (11); Drinking water supply System

	Dwelling area				Total
	first class	second class	third class	squatter area	
Drinkingwater tap inside the House Count supply System	35	45	25	2	107 73.3%
tap outside the Hous Count	1			2	3 2.1%
pay from cart Count				36	36 24.7%
Total Count	36	45	25	40	146

Source; field work.

Figure NO (4); drinking water supply system



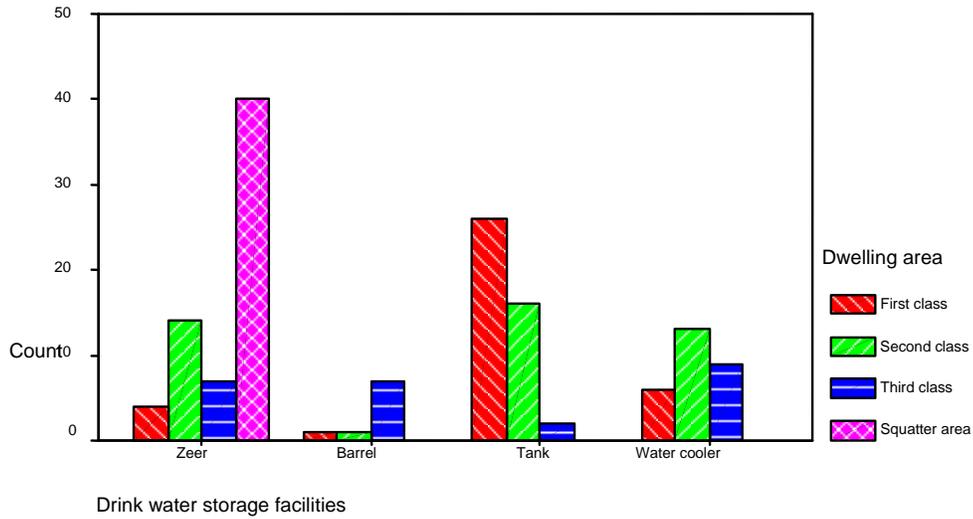
Source; field work

**Table NO (12); Drinking water storage facilities as reported by the respondents**

			Dwelling area				Total
			first class	second class	third class	squatter area	
drink water storage facilities	zeer	Count	4	14	7	40	65 44.5%
	barrel	Count	1	1	7		9 6.2%
	tank	Count	26	16	2		44 30.1%
	water cooler	Count	6	13	9		28 19.2%
Total		Count	37	44	25	40	146

Source; field work.

**Figure NO (5); drinking water storage**



Source; field work.

### 3.4.2. Waste water disposal:-

The amount of the waste water was noted to be small and have no serious environmental problems. But the problems arise during the rainy seasons, as there was no drainage ditches in the streets. Water is stagnant in the streets and provides a suitable ground for the breeding of flies and mosquitoes.

It is very important from an environmental point of view that drainage water should not be allowed in the street for more than a week, surface drainage must be improved.

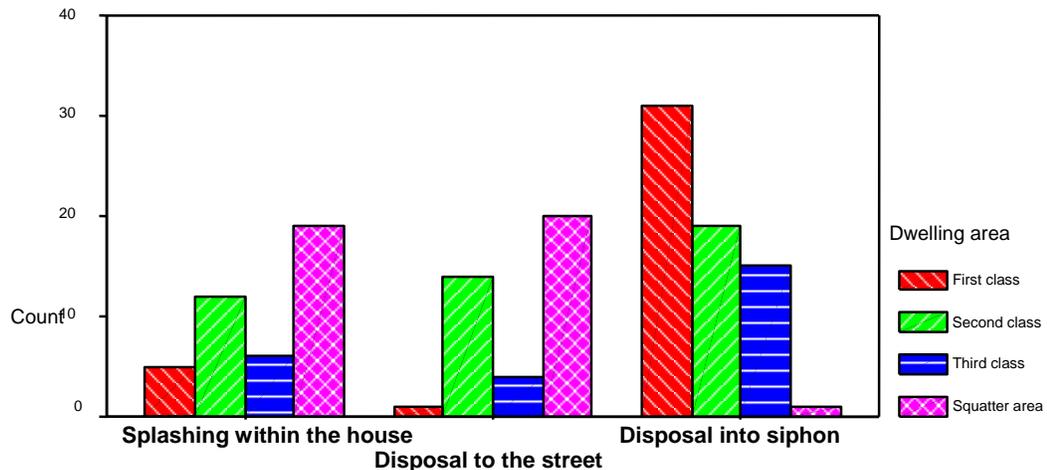
The survey revealed that about 44.5% of the respondents dispose their waste water in the sewage or siphon, while 26.6% splashed the Bath and waste water within the house and 26.5% dispose their waste water to the street see table(13) and figure (6).

Table NO (13); Waste water disposal methods as reported by sampled population

		Dwelling area				Total
		first class	second class	third class	squatter area	
waste water disposal	splashing within the house	5	12	6	19	42 28.6%
	disposal to the stree	1	14	4	20	39 26.5%
	disposal into siphon or sewerage	31	19	15	1	66 44.9%
Total	Count	37	45	25	40	147 100.0%

Source; field work.

Figure NO (6); waste water disposal



Source; field work.

### 3.4.3. Excreta and Sewage;

Technologies used for this purpose are pit-latrines, septic tanks, sewerage system, and aqua privy.

The sewage system is equally inadequate to respond to demand brought about by the rapid urbanization of the town areas. The system handles only parts of the first class residential zones and industrial areas. It can effectively handle only 1/3 of the present daily load, as it was designed for population less than 100,000 people. The system is over loaded and often breaks down.

Another consequence of the over loaded condition is that the authorities are unable to connect the new first and second class residential areas to the system. Residents of these areas have dug their own wells without supervision or regard to the under ground water quality.

The septic tank is used in the first and second class areas, and also used in many plots in the third class areas where it is gradually replacing the pit-latrines. This phenomenon of extensive use of septic tanks and pit-latrines is subjecting the ground water to pollution risks.

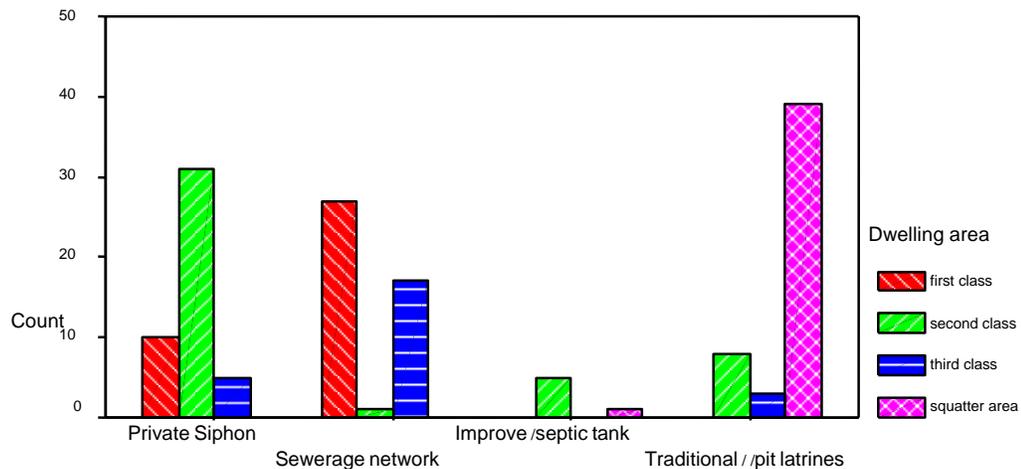
From the field survey table (14) shows that the respondents using different types of toilet facilities, range from private siphon make up 31.3% which is common in the second class, siphon connected with the sewage network represent 30.6%, 97.8% of them in the first and third class where sewage service is existing. Only 4.1% using improved toilet like septic tank 83.3% of them in the second class, and 34% of the total respondents using traditional toilets most of them in the squatter area, majority of them using shallow or deep pit-latrines. See figure (7).

**Table NO (14); Sanitary facilities as reported by sampled population**

			Dwelling area				Total
			first class	second class	third class	squatter area	
Kind of WC	Private Siphon	Count	10	31	5		46 31.3%
	Sewerage network	Count	27	1	17		45 30.6%
	improve /septictank	Count		5		1	6 4.1%
	Tradional/pitlatren	Count		8 5.4%	3 2.0%	39	50 34.0%
Total	Count	37	45	25	40	147 100.0%	

Source; field work

**Figure NO (7); kind of WC**



Source; field work.

### 3.4.4 Waste management:

The main systems employed in collection are;

- a) The system of house to house collection.
- b) The “primary collection” systems where people bring their refuse to a communal waste container placed at specific places in an area.
- c) Plastic bags are used as a means of collection by a few citizens

Transportation of waste range from carts to vehicles, the final disposal takes two forms;

(1) Regular to control tipping which means digging a large hole, then disposes the waste.

2) Open dumping and burning, which happen out side the town in unplanned areas.

From the field survey in the study area 63.9% of the respondents said that the town council collects and dispose their solid waste, all of them live in planned areas. In squatter area were this services is not available, burring the solid waste 11.6%, throw it outside the house 17.7% and only 6.8% of the respondents said that they throw their solid waste in the dustbin 50% of them from the first class see table (15), figure (8).

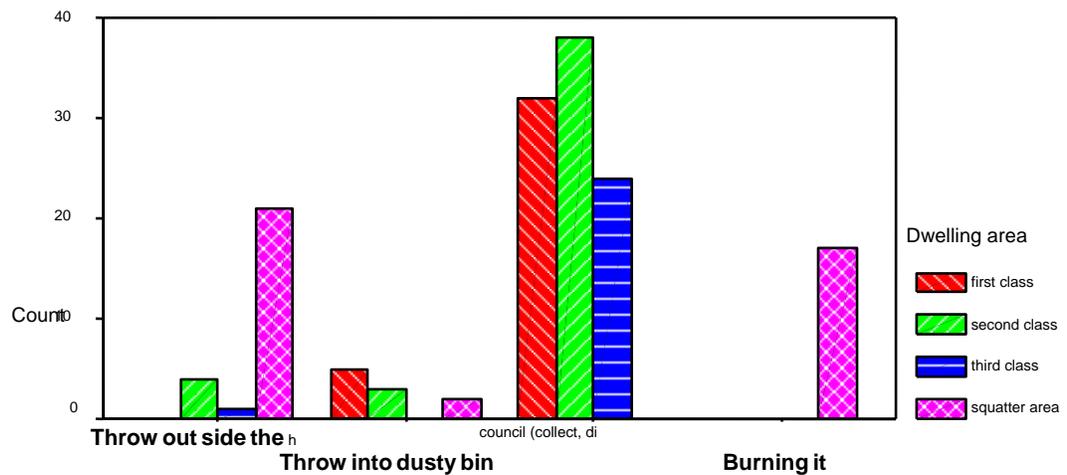
Table NO (15); Solid waste disposal method as reported by sampled population

	Dwelling area				Total
	first class	second class	third class	squatter area	
solid waste disposal method					
throw out side the house		4	1	21	26
Count					17.7%
throw into dusty bin	5	3		2	10
Count					6.8%
council (collect, disposal	32	38	24		94
Count					63.9%
burning it				17	17
Count					11.6%
Total	37	45	25	40	147
Count					100.0%

Source; field work.

The present waste disposal system is extremely inadequate to serve the expanding needs of the capital complex. Solid waste disposal systems are only partially effective, in the first and second classes residential areas. In the rest of the town the system does not work and the streets and drains have become dumping ground.

**Figure NO (8); solid waste disposal**



Source; field work.

### 3.5 Impacts of Uncontrolled Urban Growth;

#### 3.5.1 Poor Services;

It has been observed that the city expansion is faster than the rate of provision of services, both in terms of planning as well as implementation. This is not only application to illegal settlements and squatter areas at the out skirts of the town, but also to the planned legal expansion. From the field survey, table (15) shows that the service which received by the respondents from the town council in the study areas, we find that garbage collection represents 60.9% (all of in the planned areas) from the total service, which include; waste containers 15.6%, preventive measures 11.7%. clean water supply, implemented a comprehensive environmental law, punishment

**Table NO (16); services offered by council as reported by the respondents**

			Dwelling area				Total
			first class	second class	third class	squatter area	
town council services	waste containers	Count	3	5	11	1	20 15.6%
	rubbish disposal	Count	32	33	12	1	78 60.9%
	drain rain water	Count		1			1 .8%
	preventive measures	Count	1			14	15 11.7%
	clean water supplies	Count	1	2	1	2	6 4.7%
	punishment	Count				8	8 6.3%
<b>Total</b>		<b>Count</b>	<b>37</b>	<b>41</b>	<b>24</b>	<b>26</b>	<b>128 100.0%</b>

Source; field work.

### **3.5.2 Poor Environmental Health;**

The dense population and over crowding of slums and squatter areas where people live under poor living conditions with the lack of proper ventilation, environmental health, lack of awareness and other social amenities, are the major causes for the prevalence of infectious, “epidemic” and communicable diseases.

Malaria is the most serious health problem in Khartoum state. Statistical records of the ministry of health showed that in 1993 malaria was top on the list of ten major diseases which were treated in the health centers and dispensaries of Khartoum. The statistics also showed that malaria was the fourth cause of death in health institutions of Khartoum state (Mohammed, 1995).

Other health problems are the malnutrition due to poverty under which people lives, as well as the lack of proper health knowledge and hygienic habits. (Mohamed, 1998).

Some of the occupied sites are unsuitable for residential purposes. For examples fringes of the desert, along water courses and valleys which are exposed to the seasonal flooding, near the sewage treatment plants, and \or industrial areas, and in refuse disposal sites, (Ghandour, 1998).

So it is clear from the above that the major health problems in the region are related to the environment, poor standard of health knowledge as well as low living standards.

### **3.5.3 Pollution;-**

Sewage and water supply break down pollutes Khartoum water, as sewage can be sucked into water pipes when water pressure falls. Boreholes are at risk from contamination by septic tanks and pit latrines. The inadequacy of the water supply entail, that inhabitants of Khartoum province also use shallow wells or Nile water, which may be contaminated by human and animal excreta. Record cases of water related disease is very high in Khartoum state, (Ghandour, 1998).

Sewage system is over loaded and after breaks down causing street flooding which resulting in standing contaminated water in many areas with bad smells.

Street flooding also results from the break down of water mains, especially in the old part of the city. Conditions resulting from the breaks down in the water supply pipe and sewage systems, are unhealthful and will provided suitable conditions for mosquito, flies, and other pests to grow which increase the chances of malaria, typhoid and cholera to outbreaks,(El Arifi, 1982).

The industrial sector is an important user of natural resources and is the most energy consuming end-user sector. Therefore, it is the major contributor to the pollution load.

**The industrial waste is either solid or liquid or gaseous wastes which causes pollution of land, water, and air.**

**There are three major sources of air pollution; industry, solid waste disposal and motor vehicles. The limited evidence which exists suggest that citywide air pollution is not serious due to the small scale of industrial complex and the type of industries which are light industries with low level of pollution emissions which can be dispersed by air.(Abubaker, 1998).**

**Refuse burnt within the residential areas is dangerous to health because smoke obstruct smooth breathing, pollutes air and irritates eyes and noses. Also the fire from open burning may be hazards.**

**In Khartoum there are two waste water treatment plants. The Khartoum North works, which at present receive waste-water from the industrial area, and Soba work which treat mainly domestic sewage.**

**Khartoum sewage system is adversely affected by two problems, the hydrogen sulphide involved when the sewage turns its specific operations because of the high ambient temperature of the sewage. And the uncontrolled discharge of industrial waste-waters. The hydrogen sulfide is hazard to the health of sewer workers (several have suffered from HS poisoning), and results in the rapid deterioration of cement and concrete pipe and work. The uncontrolled discharge of industrial wastes causes problems in the sewage systems (blocking of sewers and pumps) and has adverse effects at the treatment of plants.(Abd El Galil,1998)**

### **3.6 Efforts to Control Environmental Degradation:**

**The question of environment in Khartoum state had become one of problems of great importance of its authorities, the real fact is that the rapid population growth in Khartoum state will automatically damage and**

**misuse the environmental resources and cause sort of environmental unbalance.**

**All these raised the necessity for hard work to achieve some sort of balance between the increasing needs and demands of the new coming population and environment.**

**These situations make the state authorities to look for a solution, so they agreed to adapt legislation to protect and secure the environment and its component, and punishment for those who break its rules. Moreover the state authorities applied to the Sudan judiciary to establish special court for the trial of environmental cases.**

### **3.6.1 The most important laws issued by Khartoum state:-**

**There are several acts, regulation and laws covering the main elements of environment in Khartoum State.**

#### **1- The Environmental Protection and Promotion Act 1997:**

**It is one of the important laws enacted in Khartoum State; it would be the first serious attempt to protect and promotes the environment on its expanding concept.**

**After the definitions article it's consider some orders to protect the main roads, rainwater drainages, trees for cutting, soils, garbage, water supplies, and waste water disposal. At last it's included some penalties to punish any one who contravene.**

**The importance of this law is stop performing any environmentally harmful activities without licenses.**

#### **2- The Public Health Protection Act 1997:**

**It's issued to constitute the state environmental health board which includes all sectors related to the environmental and public health, to look for the conservation of the environmental health. Its also give the state**

ministry of health some task which lead to health conservation. It's also state that any person must have a health license to work in the field of human food, drinking water ... etc.

### **3- Khartoum State Water Corporation act, 1995:**

This law was issued to constitute corporation specialized in exploitation of the available drinking water resources in Khartoum state to provide its need from pure water for the use of human, animals and other different uses.

The importance of this law is to protect water resources from pollution.

### **4- Sewage service fees Act, 1995:**

By this law all duties of the extending sewer services retain to the state ministry of engineering affairs, such as sewage information, during maps and links to the residential areas, factories, In addition to investigation of technical advices. It's included the technical advices fees, linking fees and utilization of the sewage network fees. The state used these financial resources in providing basic sanitation and treatment of pollution and maintainer.

### **5- Services Fees ordinance 1995 (as amended):**

This act consider all sanitary services that must be provided by the authorities and local councils, to improve the sanitary condition, such as agriculture services, animal protection services, garbage collection, disposal services ... etc.

### **6-Khartoum centre development board act 1998.**

This board was constituted to work for development and promote the area of Khartoum centre to be at the high rate of clearance and beauty.

### **6- Some others environmental laws include:**

-The freshwater fisheries regulation act, 1995.

**-Industrial development, management and regulation act, 1996.**

**-The animal's diseases fighting act 1997.**

**-The meats hygienic act 1997.**

**-The building control act 1997/**

### **3.6.2 Implementation of Laws;**

**Environmental policy is clearly tied to the formulation of appropriate laws, regulation and ways of implementation. With sufficient knowledge of scientific, economic and social aspects of the environment, so it's agreed that legal, technical and economic experts must collaborate if there is to be effective environmental laws. Such collaboration will ensure that laws and regulations to be adopted will include ecological, economic and social aspects. It is also expected that it will clarify the policy objective and avoid setting conflicting goals.**

**The process of developing environmental legislation must be based on scientific principles, such as problem identification and data collection, followed by developing of policy options for the decision makers to formulate the law and its enforcement methods.**

**The formulation of a comprehensive environmental legislation is required to give effect to environmental policy, to establish environmental quality standards and to institutionalize the environmental impact assessment procedures. But, for legislation to be successful the need for it must be understood by those it affects. So, appropriate legislation must be backed by educational measures of various kinds, designed to reach all sectors of the community (El Tom, 1984).**

**The existing planning and management at all levels of the health systems is weak, both in terms of trained personnel as well as in terms of planning and management process and methods. (Tire, 1998) wrote that**

**“many environmental laws are outdated and attempts to revise these laws have been piece-meal and in most cases, have met with little success”.**

**These laws are not only fragmented but also some times conflicting. They are more conservation and less development oriented and they don't take modern resources management principles in consideration. The following legal constrains related to these inconsistencies are identified as;**

- Lack of an overall comprehensive environmental policy act.**
- Penalties in the laws are general light and not compatible with offense and the resulting damage.**
- The legislation only deals with offenses and not with obligations of the person towards the environment.**
- Little reference is made to environmental issues and obligation in contracts implemented by the private sector such as inroad construction, provision of drainage systems in building ...etc**

**The implementation of local orders formulated by the city councils, in its capacity as a legislative body at the local level is like wise seriously jeopardized by the lack of appropriate, or instrumental implementing machinery. According to Mohamed, (1984), such an administration or institution would require an environmentally aware planner and highly qualified staff to carry out interrelated activities addressed to it.**

**3.7 Public awareness with respects to the environmental problems:**

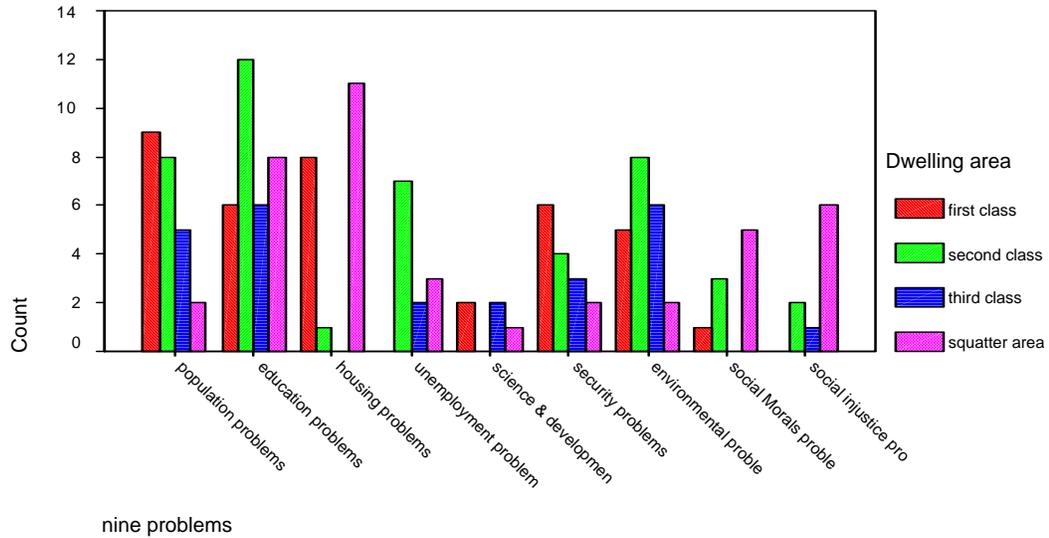
**The respondents showed some awareness about the urgency of environmental problems that from the field survey among 9 problems the sampled population in the study areas ranked the environmental problem at the third (14.3%) after education problems (21.8%) and population problems (16.3%). See table (17), figure (9).**

**Table NO (17);Most common problems as reported by the respondents**

	Dwelling area				Total
	first class	second class	third class	squatter area	
nine population problems	9	8	5	2	24 16.3%
education problems	6	12	6	8	32 21.8%
housing problems	8	1		11	20 13.6%
unemployment problem		7	2	3	12 8.2%
science & development problems	2		2	1	5 3.4%
security problems	6	4	3	2	15 10.2%
environmental problem	5	8	6	2	21 14.3%
social Morals problems	1	3		5	9 6.1%
social injustice problem		2	1	6	9 6.1%
Total	37	45	25	40	147 100.0%

**Source; field work.**

**Figure (9), Nine problems**



Source; field work.

In the state of the responsibility of the environmental degradation in the study areas, table (18) showing who should be responsible for deterioration of environmental health from the respondent's point of view, 12.2 % of the respondents said that population, 15.6% said government, and 72.1% retain the degradation to both population and government.

Table NO (18); Responsibility of the environmental degradation as reported by sampled population

		Dwelling area				Total
		first class	second class	third class	squatter area	
population	Count	5	4	7	2	18
						12.2%
government	Count	4	3	6	10	23
						15.6%
both	Count	28	38	12	28	106
						72.1%
Total	Count	37	45	25	40	147
						100.0%

Source; field work.

## CHAPTER FOUR: RESULTS AND DISCUSSION

### 4.1 Introduction:-

**This study is carried to understand the differences in environmental attitudes of Khartoum state population, as well as to assess the level of public environmental awareness. The study is mainly within Khartoum, El amarat representing the first class. Jabbra block 18 the second class, Burri (Hai Korya) the third class. All these are the planned areas while Mayo (Hai Galb El Asad) represents the squatter areas. Altogether 147 persons were interviewed.**

**Levels of environmental awareness, education, incomes or the occupation were found to be the most important factors that affect the health of the residents. The prevalence of all type of diseases in the area is due to poor sanitary conditions compounded by poverty, over crowding, limited basic services and wrong choice of relocation. A short discussion on the major issues that explaining the lack of environmental awareness can be as following:**

**4-2 Environmental Awareness;**

**4.2.1 Meaning of Environment;**

**The survey started by assessing respondent's views about the word environment and national resources. A series of questions were asked. The results are reported in table 19 &20. Table (19) shows that 72.8% of the respondents know the meaning of the word environment and 27.2% did not know. The table also shows that the majority of the respondents who know the meaning of the word environment live in planned areas.**

**Also table (20) shows that the respondents have some knowledge about the natural resources. It is clear that 67.1% of respondents know the concept of the natural resources and 32% didn't know.**

**Table (19); Meaning of environment as reported by sampled population**

	Dwelling area				Total
	first class	second class	third class	squatter area	
environment Do not know	6	7	6	21	40 27.2%
Things around us	31	38	19	19	107 72.8%
Total	37	45	25	40	147 100.0%

**Source; field work**

**Table NO (20): The concept of natural environmental resources as reported by the respondents**

	Dwelling area				Total
	first class	second class	third class	squatter area	
the concept of natural Do not know environmental resour	9	14	8	17	48 32.9%
land, water, soil: etc	27	31	17	23	98 67.1%
Total	36	45	25	40	146 100.0%

**Source; field work**

#### **4.2.2 Description of the Present Environmental Situation:**

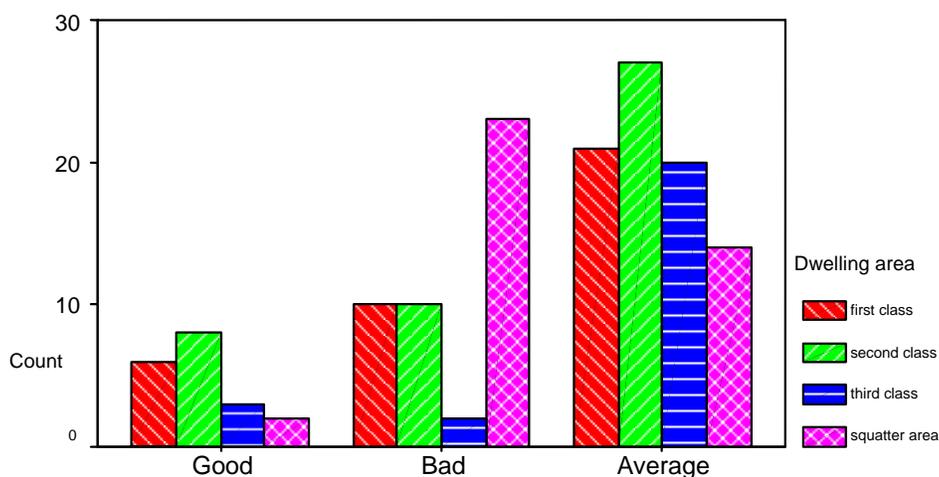
The survey also assessed the attitudes of the inhabitants towards the present situation. Table (21) shows the situation of the environmental health as reported by the respondents. It is clear that only 13% of the respondents were satisfied with their local environmental health situation while 56.2% consider it average and 30.8% consider it bad. It also shows that 89.5% of the respondents who were satisfied with their local environmental situation live in planned areas and 51.2% of the respondents who were dissatisfied live in squatter areas (figure (10)).

**Table NO (21); Situation of the environmental health as reported by the respondents**

			Dwelling area				Total
			first class	second class	third class	squatter area	
situation of the environmental health	good	Count	6	8	3	2	19 13.0%
	bad	Count	10	10	2	23	45 30.8%
	average	Count	21	27	20	14	82 56.2%
Total		Count	37	45	25	39	146 100.0%

Source: field work

**Figure NO (10); situation of the environmental health**



Source: field work

The causes of the dissatisfaction with environmental situation are diverse. However air pollution caused by vehicles represents one of the main causes (Table 22).

**Table NO (22); Vehicles gases problems cause problems**

			Dwelling area				Total
			first class	second class	third class	squatter area	
Vehicles gases problems	yes	Count	12	27	20	31	90 62.5%
	no	Count	22	7	3	8	40 27.8%
	no opinion	Count	3	8	2	1	14 9.7%
Total		Count	37	42	25	40	144 100.0%

Source: field work

As table (22) above shows, about 62.5 of the respondents said that vehicles gases causes problems to them, while 27.8% said no and 9.7% have no opinion. On the other hand table (23) shows the different attitudes of the respondents in the study areas if there was a case of air pollution. That 34.7% will leave the polluted area while 25% try to solve the problem and 23.6% say that they will stay.

**Table NO (23); Air pollution problems in your area**

			Dwelling area				Total
			first class	second class	third class	squatter area	
air pollution problems in your area	to leave	Count	19	14	8	9	50 34.7%
	to stay	Count	13	6	3	12	34 23.6%
	do not care	Count		15	4	5	24 16.7%
	try to solve the proble	Count	5	8	9	14	36 25.0%
Total		Count	37	43	24	40	144 100.0%

Source; field work

#### 4.2.3 Awareness of Causes of Environmental Deterioration;

Environmental problems may be caused by level of economic development and technology. The inhabitants have their views about such development as reported in (Table 24) as most of the respondents (88.5% ) think that economic development must be in harmony with the environment while 6.5% think to encourage investment without looking to the environment and only 5% feels that investment must be stopped for environmental reasons.

Table NO (24); Level of economic development from the respondents point of view

	Dwelling area				Total
	first class	second class	third class	squatter area	
economical harmony investment development with the environment must be:	36	35	23	29	123 88.5%
incourage investmen without looking to the environment	1	3	1	2	7 5.0%
stop investment for environmental reasor		4	1	4	9 6.5%
Total	37	42	25	35	139 100.0%

Source; field work

#### 4.2.4 Awareness of Global Environmental Problems;

Environmental awareness at the local level is also linked to global environmental problems. Hence an attempt was made to assess the awareness regarding global environmental problems (Table 25).

Table NO (25); Awareness of global environmental problems

	Dwelling area				Total
	first class	second class	third class	squatter area	
global worming-ozone layer depletion	28	34	19	15	96 65.8%
Not aware	9	10	6	25	50 34.2%
Total	37	44	25	40	146 100.0%

Source; field work

From the field survey table (25) revealed that about 65.8% of respondents heard about the global warming, Ozone layer depletion, biodiversity reduction, and fresh water resource depletion. Most of the respondents who heard about these global problems live in the planned areas while those who have no such knowledge live in squatter areas.

Table NO (26); Environmental resources as reported by sampled population

			Dwelling area				Total
			first class	second class	third class	squatter area	
environmental resources are:	scarce	Count	2	9	14	22	47 32.6%
	plenty	Count	14	19	4	9	46 31.9%
	deplenty	Count	20	15	7	9	51 35.4%
Total		Count	36	43	25	40	144 100.0%

Source; field work

Environmental resources are becoming scarce and the inhabitants must be aware so as to start conservation and protection. Table (26) shows that only 32.6% of interviewed persons in the study areas know that environmental resources are scarce, and 67.35 think that environmental resource are plenty. Despite the above result, there is a general feeling that there is widespread environmental deterioration. The causes of such deterioration are diverse as reported in table 27.

**Table NO (27); Environmental deterioration reasons as reported by the respondents**

	Dwelling area				Total
	first class	second class	third class	squatter area	
environmental pollution deterioration is related to:	10	6	8	5	29 20.7%
Urbanization	1	2	2	8	13 9.3%
agriculture	1	1			2 1.4%
pollution & urbanization	13	15	5	14	47 33.6%
all above	12	20	10	7	49 35.0%
Total	37	44	25	34	140 100.0%

Source; field work

Table (27) shows the respondents reporting environmental deterioration in their areas and reasons. It is clear that 20.7% of respondent's relate it to pollution, 9.3% to urbanization, 33.6% to both pollution and urbanization, and 35% to all above.

As reported earlier, environmental awareness at local levels must be related to global environmental problems. Hence, global warming is caused by green house gases. To what extent the inhabitants know about these gases and their impacts on global and local environment. The level of awareness about these gases is reported in table 28.

**Table NO (28); Effects of the green house gases as reported by the sampled population**

	Dwelling area				Total
	first class	second class	third class	squatter area	
effects of the green house gases	33	40	21	34	128 87.1%
Serious effects	4	5	4	6	19 12.9%
Total	37	45	25	40	147 100.0%

Source; field work

From The table (28) it clear that 87.1% of the interviewed persons did not know the effects of the green house gases, and 12.9% have some knowledge.

#### 4.2.5 Source of Environmental knowledge;

There are different channels for raising environmental awareness such T.V. programmes, radio, newspaper and personal contacts. T.V. programmes and newspapers in Khartoum may have greater impacts in raising awareness. The survey tried to assess the level of watching such T.V. programmes or reading articles in newspapers.

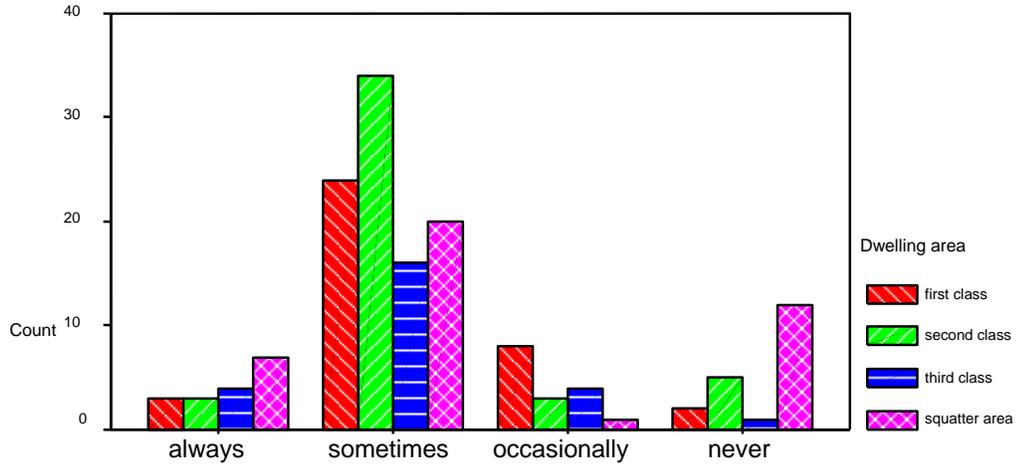
le NO (29); Watching environmental programme in T.V or reading newspapers as respondents repor

		Dwelling area				Total
		first class	second class	third class	squatter area	
environmental programmms in TV or newspaper	allways	3	3	4	7	17 11.6%
	sometimes	24	34	16	20	94 63.9%
	occasionally	8	3	4	1	16 10.9%
	never	2	5	1	12	20 13.6%
Total		37	45	25	40	147 100.0%

Source; field work

Table (29) and figure (11) shows the respondents answers of the question of have you seen the environmental programs in T.V or reading about the environment in newspaper. It is clear that 11.6% always read or view programmes and 74% sometimes or occasionally view such programmes only 3.6% reported read or viewed T.V. programme on environment.

Figure NO (11); Environmental programmes in T.V or newspaper



Source; field work

#### 4.2.6 Attitudes towards Contaminated food:

Table (30) shows the different attitudes of the respondents towards the bakery that uses potassium bromide to enhance the bread. It is clear that 45.6% of the respondents will call the police to punish him, 18.4% tell him to stop use this chemical, 55.4% can not buy from him. Table (31) below shows that 29.3% of the interviewed persons do not eat eggs contaminated by dioxin, and 70.1% of the respondents will dispose it.

Table NO (30); The respondents reported about using potassium bromide in bread

		Dwelling area				Total
		first class	second class	third class	squatter area	
using potassium bromide in food	buy from him		1			1 .7%
	call the police or council authorities	23	16	8	20	67 45.6%
	tell him to stop using this chemica	8	10	4	5	27 18.4%
	do not buy from hir	6	18	13	15	52 35.4%
Total		37	45	25	40	147 100.0%

Source; field work

**Table NO (31); The respondents reported about eggs contaminated by dioxin**

	Dwelling area				Total
	first class	second class	third class	squatter area	
eggs contaminated eat them by dioxin would you	Count			1	1 .7%
do not eat them	Count	7	16	3	17 43 29.3%
dispose it	Count	30	29	22	22 103 70.1%
Total	Count	37	45	25	40 147 100.0%

Source; field work

#### 4.2.7 Attitudes towards Polluting Companies:

Table (32) shows that, 45.5% of the respondents will agree to close the company where they work if it causes environmental pollution, 39.3% agree if they will have other work and 11% disagree

**Table NO (32); The respondents report if their company pollute the environment**

	Dwelling area				Total
	first class	second class	third class	squatter area	
your company agree to closed it do pollute the for environmental environment reasons	21	16	7	22	66 45.5%
disagree	1	4	4	7	16 11.0%
agree if they will find other work for you	12	23	11	11	57 39.3%
others	2	1	3		6 4.1%
Total	36	44	25	40	145 100.0%

Source; field work

#### 4.2.8 Knowledge of Environmental laws:

Environmental awareness alone is not enough to achieve environmental protection. People must be aware of the different laws so

that they abide by its provisions. Hence it is important to assess the level awareness about these laws

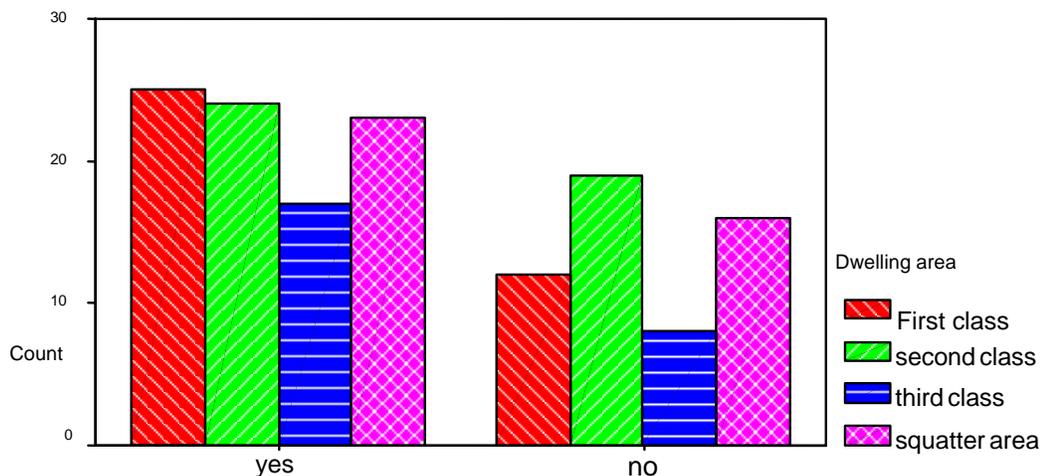
**Table NO (33); Knowledge of environmental protection law as reported by the sampled population**

		Dwelling area				Total
		first class	second class	third class	squatter area	
environmental protection law	Some knowledge	25	24	17	23	89 61.8%
	No knowlede	12	19	8	16	55 38.2%
Total		37	43	25	39	144 100.0%

Source; field work

From the survey table (33) and figure (12) shows that, 61.8% of the respondents in the study areas heard about the environmental laws while 38.2% did not hear about these laws.

**Figure NO (12); Responds hear about the environmental protection laws**



Source; field work

Awareness and knowledge about these laws may be the result of radio or T.V. programmes or other sources. It is clear that the radio and other

**sources play important roles in informing the respondents about environmental laws table 34 & figure 13**

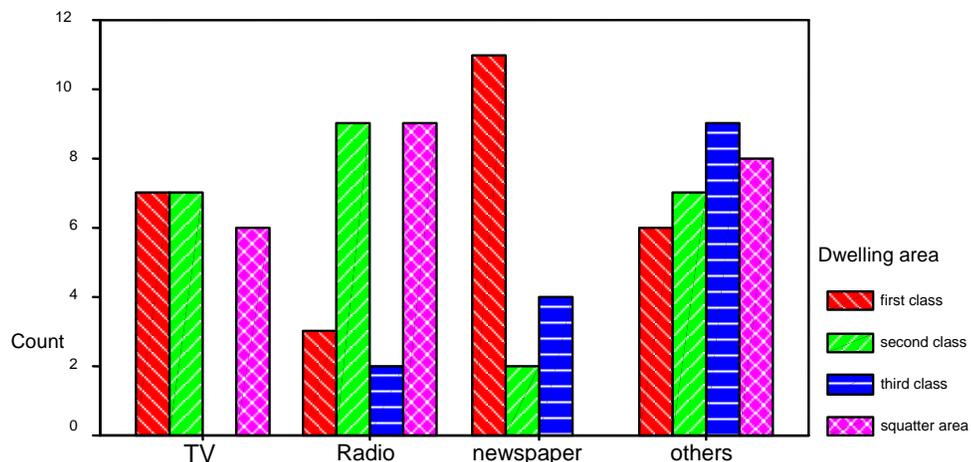
**Table NO (34); The source of the environmental law knowledge as reported by the respondents**

	Dwelling area				Total
	first class	second class	third class	squatter area	
the source of the environmental law knowledge					
TV	7	7		6	20 22.2%
Radio	3	9	2	9	23 25.6%
newspaper	11	2	4		17 18.9%
others	6	7	9	8	30 33.3%
Total	27	25	15	23	90 100.0%

**Source; field work**

From Table (34) and figure (13), It is clear that T.V and radio represented 47.8% of environmental laws knowledge , newspaper represents only 18.9% and 33.3% for the other sources which include (both T.V, radio, schools book, ...etc),

**Figure NO (13); source of the environmental law knowledge**



**Source; field work**

#### 4.2.9 Functions of Environmental Laws:

An environmental law has three fold functions. First is protection function in care of environment to secure the man's kind survival and health, complemented by the social and ethics functions.

Table NO (35); Knowledge of the functions of the environmental laws as reported by the respondents

	Dwelling area				Total
	first class	second class	third class	squatter area	
the function of the environmental law	8	20	9	23	60 40.8%
To conserve the environment	29	25	16	17	87 59.2%
Total	37	45	25	40	147 100.0%

Source; field work

Table (35) explains that 40.8% of the respondents, who heard about the environmental law, did not know its function while 59.2% of them know the function of environmental law and its importance to conserve the environment.

#### 4.2.10 Council services:

The absence of the sanitary services (clean water, waste collection, drainage...etc) which is provided by the local councils can cause serious problems to the inhabitants. This service is the responsibility of the town councils.

Table NO (36); Right to ask for council services as reported by the sampled population

	Dwelling area				Total
	first class	second class	third class	squatter area	
right to ask for council services	37	34	19	38	128 88.9%
Not ask		8	6	2	16 11.1%
Total	37	42	25	40	144 100.0%

Source; field work

Table (36) shows that 88.9% of the interviewed people in the study areas think that they have a right to ask for the town councils services and only 11.1% think they have not. Table (37) explains that 71.2% of the respondents think that they have a right to ask for council service and have strong reasons for asking these services while 28.8% didn't give strong reasons.

Table NO (37); The reasons for asking council services as reported by sampled population

	Dwelling area				Total
	first class	second class	third class	squatter area	
the reasons for No reasons asking council services	8	15	9	10	42 28.8%
Have the right reasons	29	29	16	30	104 71.2%
Total	37	44	25	40	146 100.0%

Source; field work

#### 4.2.11 Role of Environmental laws in Environmental protection:

To day environmental laws are designed to protect natural base of human life. Hence table 38 shows that 57.3% reported that environmental protection is achieved by respecting laws, while 17.55 think that it depend on individual behaviour and 25.2% reported that the state must formulate the appropriate laws and implement them.

**Table NO (38); Environmental protection depends: as reported by the respondents**

		Dwelling area				Total
		first class	second class	third class	squatter area	
environmental legal regulation	Count	20	29	11	22	82
protection depend on :						57.3%
individual efforts or behavior	Count	7	9	3	6	25
						17.5%
state to formulate law	Count	9	5	10	12	36
						25.2%
<b>Total</b>	<b>Count</b>	<b>36</b>	<b>43</b>	<b>24</b>	<b>40</b>	<b>143</b>
						100.0%

**Source; field work**

#### 4.3 Public Behaviour:-

##### 4.3.1 Vaccination of the children:

Table (39) revealed that the majority of the respondents 98.6% vaccinated their children and only 1.4% did not. The people that vaccinated their children half of them live in the squatter areas and the others in the third class. Table (40) below, explained the reasons under which children were not vaccinated as reported by the respondents. It is clear that 33.3% of cases according to mothers being lazy to go to clinic while 66.7% said that father think that it has side effects.

**Table NO (39); Vaccinated of the children as reported by the respondents**

	Dwelling area				Total
	first class	second class	third class	squatter area	
vaccinated of the children	37	45	24	35	141
Count					98.6%
not vaccinated			1	1	2
Count					1.4%
Total	37	45	25	36	143
Count					100.0%

**Source; field work**

**Table NO (40); Why child did not vaccinated as reported by the respondents**

	Dwelling area		Total
	third class	squatter area	
not vaccinated reason		1	1
mother lazy to go to clinic			33.3%
Count			
father refuse to do it because it has side effects	2		2
Count			66.7%
Total	2	1	3
Count			100.0%

**Source; field work**

#### **4.3.2 Cleaning of Street:**

**Streets are becoming as dumping places in many areas. That some of the inhabitant's throw their domestic waste and waste water to the streets which causes bad conditions. The survey tried to assess the respondent's attitudes towards the streets; this was reported in table 41.**

**Table NO (41); Interest in cleaning as reported by the sampled population**

			Dwelling area				Total
			first class	second class	third class	squatter area	
street clean	interested	Count	37	13	23	34	107 92.2%
	disinterested	Count				3	3 2.6%
	not concern	Count		2	1	3	6 5.2%
Total		Count	37	15	24	40	116 100.0%

Source; field work

Table (41) shows that 92.2% of the respondents in the study areas were interested to keep the streets clean, and only 2.6% are disinterested, while 5.2% have no concern for the street.

#### 4.3.3 Paying monthly fees for domestic waste collection:

The waste disposal is rapidly being recognized as one of the important environmental policy issues. The safe disposal of waste represents an important budget and costs financial resources. The survey tried to assess the inhabitant's payment for waste disposal (table 42)

**Table NO (42); Pay monthly for garbage services as reported by sampled population**

			Dwelling area				Total
			first class	second class	third class	squatter area	
pay monthly for garbage services	Always pay	Count	33	36	18	6	93 63.3%
	some times pay	Count	2	7	5	5	19 12.9%
	never pay	Count	2	2	2	29	35 23.8%
Total		Count	37	45	25	40	147 100.0%

Source; field work

From the field survey table (42) shows the monthly payment for garbage disposal as reported by the respondents in the study areas. It is

clear that 63.3% of the respondents always pay while 12.9% some times pay, and 23.8% of the respondents never paid for garbage collection. We see that, most of the people that always pay live in planned areas while 82.9% of people that never paid live in squatter areas.

More over table (43) below shows that 66.4% of respondents said that they have desire for more pay to have a good service of garbage disposal, 20.5% said no and 13% said perhaps they will pay.

Table NO (43); Desire for more pay to have good services as reported by sampled population

			Dwelling area				Total
			first class	second class	third class	squatter area	
desire for more pay to have good services	yes	Count	24	30	13	30	97 66.4%
	no	Count	5	11	7	7	30 20.5%
	perhaps	Count	7	4	5	3	19 13.0%
Total		Count	36	45	25	40	146 100.0%

Source; field work

#### 4.3.4 Participation in environmental protection activities:

Other indicator of environmental awareness is the participation in environmental protection activities which include; clean-up campaigns, tree planting, and streets rallies and so on. Respondent's attitudes are reported in table 44.

**Table NO (44); Participate in environmental protection activities**

			Dwelling area				Total
			first class	second class	third class	squatter area	
participate in environmental protection activities	yes	Count	29	32	24	32	117 80.7%
	no	Count	3	2		4	9 6.2%
	not concern	Count	4	11	1	3	19 13.1%
Total		Count	36	45	25	39	145 100.0%

Source; field work

From the survey table (44) shows the willingness of the respondents to join any activities concerning environmental conservation. It is clear that 80.7% of the respondents reporting that they have interest to participate in environmental protection activities in their areas, while 6.2% disinterested and 13.1% have no concern to participate.

#### 4.3.5 Attitudes towards Environmental slogans:

In an attempt by the environmental authorities to raise environmental awareness, they used to put written slogans on the streets. The inhabitants have different attitudes towards such slogans (Table 45).

Table (45) shows the attitudes towards the environmental slogans as reported by the sampled population in the study areas. It is clear that 37.8% of the respondents obey the slogans always, 54.1% sometimes, 2.2% occasionally, and 5.9% did not obey the environmental slogans.

**Table NO (45); Obeying the environmental slogans as reported by the respondents**

			Dwelling area				Total
			first class	second class	third class	squatter area	
obeying the environmental slogans	allways	Count	6	11	9	25	51 37.8%
	sometimes	Count	24	24	14	11	73 54.1%
	occasionally	Count	1	2			3 2.2%
	never	Count		4	1	3	8 5.9%
Total		Count	31	41	24	39	135 100.0%

Source; field work

#### **4.3.6 Satisfaction with respect of Neighbourhoods towards the Environment:**

The survey tried to assess the respondent's attitudes to their neighbourhoods with respect towards the environmental conditions as reported in table 46

**Table NO (46); Neighbourhood's behavior towards the environment as reported by the respondents**

			Dwelling area				Total
			first class	second class	third class	squatter area	
Neighbourhood's behavior towards the environment	satisfied	Count	30	28	17	17	92 62.6%
	not satisfied	Count	5	12	6	18	41 27.9%
	no opinion	Count	2	5	2	5	14 9.5%
Total		Count	37	45	25	40	147 100.0%

Source; field work

According to the result of the survey table (46) above shows that 62.6% of the respondents in the study area reported that they were satisfied about their neighbourhood's environment, while 27.9% were not satisfied and 9.5% have no opinion.

### 4.3.8 Willingness to Stop Others from Polluting the Environment:

Environmental protection is a social concern. So the survey tried to assess the inhabitant's desire to stop others from polluting the natural resources (Table 47).

Table NO (47); Throwing polluters in the drinking water resources

			Dwelling area				Total
			first class	second class	third class	squatter area	
throwing polluters in the drinking water resources	stop him only	Count	3	5	7	6	21 14.4%
	tell him the danger of this material	Count	17	31	14	15	77 52.7%
	call the police or authorities	Count	16	9	2	14	41 28.1%
	do not care	Count			2		2 1.4%
	others	Count				5	5 3.4%
Total	Count		36	45	25	40	146 100.0%

Source; field work

Table (47) shows that the respondents in the study areas have different attitudes towards the person who pollutes the environment, as 14.4% said stop him only, 52.7% tell him the dangers of this actions, 28.1% call the police or the authorities.

4.4 Conclusions:-

This chapter reported the results and discussion of the study of assessing the level of Khartoum population awareness about the environment, environmental laws and their behaviour. It is possible to conclude the main findings as follows

- People lack of environmental knowledge especially in squatter areas

- The main source of environmental knowledge is radio, T.V and schools. This media lack adequate environmental programmes to raise the public awareness
- 60% of the respondents heard about the environmental laws but they didn't know its functions.
- Local councils lack facilities to reach all the areas, so there was shortage of sanitary services.

The discussion can be concluding as following:

As general from the study the respondents have shown some knowledge about the environment. It is clear that from the survey 75% of the sampled population knows the simple meaning of the word environment, and 67.1% understanding the concept of the natural environmental resources. But about 30% of the sampled population did not know the word environment and natural resources, and we are in the globalization era and the environment have no boundaries. So the government and its educational institutions and NGOs, must be active in improving this situation.

From the study we find that only 13% of the sampled populations were satisfied with their living environment most of those live in planned areas, which has good environmental and health services and good housing condition. While the respondents who live in the squatter areas where all the services are absent and sanitary condition is very bad, think that the environmental situation is bad. It is clear that the respondents valued the environment according to the services and houses structure.

It is also clear that there is concern that environment and development must be in harmony. The respondents being close to media sources, have some knowledge about the main global environmental problems as global warming and ozone depletion. However, it is clear

**protection of the environment is a social priority but it needs laws to support. From the field survey 61.8% of the sampled population heard about the environmental protection law.. But about 40.8% of the respondents who heard about the environmental laws did not know their function. The study also revealed that despite the awareness about these laws, there is reluctance to go to courts in order to punch those who commit environmental offences.**

**The study found the high level of vaccination of children. This is so because of the intense mass media involvement in raising mother's awareness about the dangers of not vaccinating children.**

## **CHAPTER (5): CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Conclusions:-**

**In general it is possible to state the main findings of this study in four categories:-**

#### **5.1.1 Population Growth;**

**Population growth in Khartoum was during the last two decades. The reasons for this high population growth rate are both the high level of natural growth and high rate of in-migration. The recent influx of people is the result of drought and famine conditions and civil strife in Southern Sudan.**

#### **5.1.2 Urban Utilities and Services Delivery:**

**The system of water supply, sewage disposal, refuse collection are all inadequate both in coverage of the urban areas and the maintenance of the services. The service deficiencies which are clearly of the greatest concern are those related to sewage and refuse disposal. Without adequate collection and disposal system they pose a very serious threat to both public health and the environment. The system also suffers from lack of manpower both in numbers and skills and shortage of financial resources. Adequate operation and maintenance are probably very expensive.**

#### **5.1.3 Environmental laws;**

**-The capital region Lacks clear environmental policy to provide a base for positive and concrete actions.**

- As federal state there are inadequate consideration of the environment and natural resources in planning process.

-Add to this the absence of co-ordinating structure to organize the work of the ministries and departments involved in environment and natural resource management.

- There is absence of legislative support to deal with environmental issues. All existing legislation is of sectoral nature.

- Where there are laws and legislations, there is lack of will to implement these rules.

#### **5.1.4 Environmental Awareness;**

- The study found that there is lack of environmental awareness to the extend that the citizens did not know the impacts of their behaviour in harming the environment. This is also reflected in poor knowledge about the local and global environmental problems.

-Poor environmental knowledge is the result of poor communication and the mass-media facilities failed to respond positively.

-Add to this the institutions involving in the implementation of environmental laws lack capacities to reach the people

#### **5.2 Recommendations:**

**Consequently the following is recommended:**

##### **5.2.1 Population;**

-Significant changes in the population growth rate of Khartoum are only likely to occur. Population growth rate will be the key element determining the demand for land, housing, employment and related social and welfare facilities. Therefore much greater emphasis should be given to developing predictive population models which could serve as a basis for assessing the

**future demand likely to be put on the urban management system to provide appropriate facilities.**

**-Consideration also needs to be given to the problems of stabilizing population movement in the country and reducing the migratory pressures on Khartoum. Such a policy would need to include a regional development strategy to increase regional economic and social opportunities.**

**-Consideration also needs to be given to efforts of reduce the effects of drought and famine and stop the war in the east and south, and encourage the peace.**

#### **5.2.2 Urban Utilities and Services Delivery;**

**-There is an urgent need to up-grade and expand all the urban utility service, highest priority must be given to improve the sewage system and refuse collection and disposal.**

**-Develop and implement efficient sanitation system.**

**-Improve sanitation in public institution, especially schools.**

**-Provide capacity-building and training to assist relevant authorities with regard to the implementation of local orders.**

#### **5.2.3 The Adoption of Environmental Laws and Legislation;**

**-In order to satisfy the objectives of environmental protection, a unified comprehensive environmental law is recommended. This law should be management-oriented based on environmental criteria.**

**-Revision of the existing laws and reinforcing them with new laws to fill the gap.**

**-Use of environmental impact assessment procedures**

#### **5.2.4 The Adoption an Environmental Education and Training Programmes:**

**-In order to achieve full understanding of environmental issues and citizens be aware of their living environment, it is recommended that environmental education and training programmes be provided in each sector and level of development planning and implementation.**

**-Environmental education should be included in the curriculum of schools at all levels to motivate the youth to work together to save the environment.**

**-Participation of the mass-media and other information services in environmental affairs must be further developed, extended and strengthened.**

**-Develop awareness-raising programmes on Environmental issues particularly among youth, through, education, advertising and other media.**

**-Encourage programmes such as exhibitions, drama, children songs, and films on environmental problems. Through environmental festivals such as "World Environmental Day" and "Arab Environmental Day"**

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## APPENDIX

Institute of Environmental Studies

Public Awareness of Environmental Laws in Khartoum State

Questionnaire

Section (A) Personal Characteristic :

(1) Address:-----



2- Connected with sewage network <sup>1</sup>

3- Improved <sup>1</sup>

4- Traditional <sup>1</sup>

(11) Availability of the kitchen

1- Available <sup>1</sup>

2- Not available <sup>1</sup>

(12) Water supply system :

1- Tap inside the house <sup>1</sup>

2- Tap outside the house <sup>1</sup>

3- Buy from vender cart <sup>1</sup>

4- Other (specify) \_\_\_\_\_

(13) Drinking water storage facilities :

1- Zeer <sup>1</sup>

2- Barrel <sup>1</sup>

3- Tank <sup>1</sup>

4- Other (specify) \_\_\_\_\_

(14) Bath and waste water disposal method :

1- Splashing within the house <sup>1</sup>

2- Disposal to the street <sup>1</sup>

3- Other (specify) : \_\_\_\_\_

(15) The solid waste disposal method :

1- Throw outside the house <sup>1</sup>

2- Throw into dusty bin <sup>1</sup>

3- Council (collect, disposal) <sup>1</sup>

4- Other (specify): \_\_\_\_\_

(16) Vaccination of the children :

1- Vaccinated <sup>1</sup>

2- Not vaccinated <sup>1</sup>

(17) If not the reason for that:

1- Mother do not know its importance <sup>1</sup>

2- Mother lazy to go to clinic <sup>1</sup>

3- Father refuse to do it because of the fear of the side effect of vaccination<sup>1</sup>

4- Other \_\_\_\_\_

(18) what do you consider about the situation of the environmental health in your area?

1- Good <sup>1</sup>      2- Bad <sup>1</sup>      3- Average <sup>1</sup>

(19) Who is responsible for the degradation of the environment in your area?

1- Population<sup>1</sup>

2- Government<sup>1</sup>

3- Both 1 and 2<sup>1</sup>

(20) Are interested to keep the street clean?

1- Interested <sup>1</sup>

2- Disinterested <sup>1</sup>

3- Not concern<sup>1</sup>

Section (C) Public awareness and behaviours:

(21) Do you pay monthly for garbage collection, storage and disposal?

1- All ways<sup>1</sup>      2- Sometimes <sup>1</sup>      3- Never <sup>1</sup>

(22) Do you have desire for more pay to have a good services?

1- Yes <sup>1</sup>      2- No <sup>1</sup>      3- Perhaps<sup>1</sup>

(23) Did the vehicles (cars, machines) gases causes any problems to you?

1- Yes <sup>1</sup>      2- No <sup>1</sup>      3- No opinion<sup>1</sup>

(24) If there was problem of air pollution in your area would you like :

1- To leave <sup>1</sup>      2- To stay <sup>1</sup>

3- Do not care <sup>1</sup>      4- Other \_\_\_\_\_

- (25) Have you heard about; global warming, Ozone layer depletion, biodiversity reduction, fresh water resource depletion?  
1- Yes  2- No
- (26) Do you think that environmental resources are:-  
1- Scarce  2- Plenty  3- Deplenty
- (27) From this (9) environmental problems choose the most important one as you think:  
1- Population problems  2- Education problems   
3- Unemployment problems  4- Housing problems   
5- Science and Technology Development problems   
6- Security problems  7- Environmental problems   
8- Social Morals problems  9- Social injustice problems
- (28) Do you think the economic development must be:  
1- In harmony investment with the environment   
2- Encourage investment without looking to the environment   
3- Stop investment for the environmental reasons   
4- Other: \_\_\_\_\_
- (29) Do you think that the environmental deterioration is related to :  
1-Pollution  2-Urbanization   
3-Agriculture  4-1 and 2   
5-All above
- (30) Are you interested to participate in environmental protection activities?  
1-Yes  2- No  3- No concern
- (31) Do you see environmental programs in T.V or read papers:-  
1-All ways  2-Some times   
3-Occasionally  4-Never

**(32) What are the effects of the (green house gases)?**

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**(33) Would you like to obey the environmental slogans?**

- 1- All ways <sup>1</sup>                      2-Some times <sup>1</sup>  
3-Occasionally <sup>1</sup>              4-Never <sup>1</sup>

**(34) Are you satisfied about your neighbourhood's behaviour towards the environment ?**

- 1-Satisfied <sup>1</sup>                      2-Not satisfied <sup>1</sup>              3-No opinion <sup>1</sup>

Section (D) Environmental Laws:

**(35) If you find some one throw polluters (poisons or toxic) in the drinking water resources would like to:-**

- 1-Stop him only <sup>1</sup>      2-Tell him the dangers of this materials <sup>1</sup>  
3-Call the police or the authorities to punish him <sup>1</sup> 4-Don't car <sup>1</sup>  
5-Others:.....

**(36) If you know that the bakery in your area uses (Potassium Bromide) in making the bread do you:**

- 1-Buy from him<sup>1</sup>      2-Call the police or council authorities <sup>1</sup>  
3-Tell him to stop use this chemicals<sup>1</sup> 4-Do not buy from him<sup>1</sup>

**(37) You know that dioxin killed some people in Japan by cancer and your friend gives you some eggs contaminated by dioxin would you:-**

- 1-Eat them<sup>1</sup>      2-Do not eat them<sup>1</sup>  
3-Dispose it <sup>1</sup>      4-Give it poor people<sup>1</sup>  
5-Others.....

**(38) If you had to work in company that pollutes the environment**

1- Would you agree to close it down for environmental reasons?

2- Disagree

3- Agree if they will find another work for you

4- Others:.....

(39) Do you know the word (environment)?

.....

(40) What is the concept of the natural environmental resources?.....

(41) Do you hear of the environmental protection law?

1- Yes

2- No

(42) If yes from where?

1- TV

2- Radio

3- News papers

4- Others:.....

(43) What is the function of the environmental law?

.....

(44) Does the town council provide you with the following services:-

1- Waste containers

2- Collect, transport and disposal of the rubbish

3- Provision of drain rain water and sewer system

4- Take preventive measures to fight the spread of epidemic diseases

5- Clean water supplies

6- Designed and implemented a comprehensive environmental law

7- Punished any person or company who contravenes

(45) Do you think that you have a right to ask for this service?

1- Yes

2- No

**(46) If yes, why?.....**

**(47) Do you think that environmental protection depend on:**

**1- Legal regulation                      1**

**2- Individual efforts or behavior    1**

**3- State to formulate laws            1**