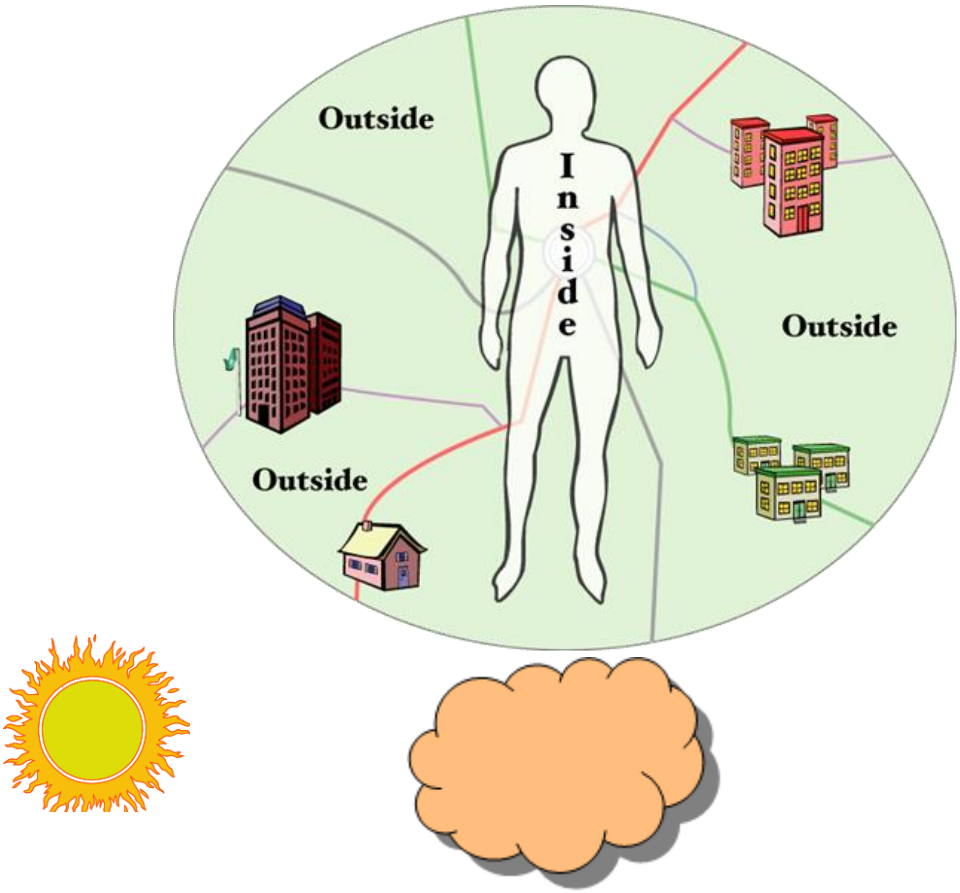
NATIONAL OPEN UNIVERSITY OF NIGERIA

SCHOOL OF HEALTH SCIENCES



NATIONAL OPEN UNIVERSITY OF NIGERIA

COURSE GUIDE

NSC 206 – ENVIRONMENTAL HEALTH

COURSE CODE: NSC 206

COURSE TITLE: Environmental Health

COURSE UNITS: 2 Credit units (24 hours of instruction online 10 hours of practical;)

YEAR: 2 **SEMESTER:** 2nd Semester

PRE-REQUISITE COURSES: NONE

CON-CURRENT COURSES: NSc 202, 203, 204, 208, 210 and 212

SESSION: 2015/2016

COURSE WEBSITE: *www.noun.edu.ng/*

COURSE WRITERS

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Course Facilitators:

As provided by the Department

COURSE EDITOR: Dr O.O. Irinoye

COURSE COORDINATOR: As provided by the Department.

Course Guide

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COURSE GUIDE

GENERAL INTRODUCTION

Welcome to the course on Environmental Health. Our environment are sources of health in terms of tangible and non-tangible things that we get to help us stay healthy or to have ill-health. Florence Nightingale was the first environmental health nurse. She identified the canons of nursing care in her "Notes on Nursing" as pure air, clean water, warmth, noise control, light and waste management. She wrote that the nurse should monitor and improve these environmental elements to promote health. These environmental elements form the basis of components of environmental health today. Nurses are thus core to ensuring that people understand and manage their environment to attain, maintain and restore health. It is important that you read the course guide to have insight about the nature and process of doing this course and how to make the best of it. All the best..

COURSE AIM

The aim of this course is to enhance your understanding of the dynamic contributions of the environment to health and ill health as to help you take decisions to help clients make maximum use of what the environment has to offer to achieve optimal health, prevent and control diseases.

COURSE OBJECTIVES

At the completion of this course, you should be able to:

i. Discuss environment considering types and components in the context of environmental health

ii. Discuss the mechanisms of how environmental agents exert adverse effects and influence environmental or public health.

iii. Describe current legislation and regulation regarding public health and environmental issues

iv. Design programmes/interventions to ensure adequate and appropriate response to the problems.

COURSE IMPLEMENTATION – WORKING THROUGH THE COURSE

This course will adopt the blended learning approach with most of the learning activities (70%) done online and 30% of face-to-face during laboratory and practical sessions. You are expected to register for this course online before you can have access to all the materials and have access to the class sessions online. You will have the hard and soft copies of course materials, you will also have online interactive sessions, face-to-face sessions with instructors

during practical sessions in the laboratory. The interactive online activities will be available to you on the course link on the Website of NOUN. There are activities and assignments online for every unit every week. It is important that you visit the course sites weekly and do all assignments to meet deadlines and to contribute to the topical issues that would be raised for everyone's contribution.

You will be expected to read every module along with all assigned readings to prepare you to have meaningful contributions to all sessions and to complete all activities. It is important that you attempt all the Self Assessment Questions/Tutor marked assignments (SAQ) at the end of every unit to help your understanding of the contents and to help you prepare for the in-course tests and the final examination. You will also be expected to keep a portfolio where you keep all your completed assignments.

COURSE MATERIALS

Course Guide

Course Text in Study Units

Textbooks (Hard and Electronic)

Other reading materials listed with each unit

Assignment File/Portfolio

STUDY UNITS

MODULE I - STAYING HEALTHY IN THE ENVIRONMENTAL HEALTH

Unit 1: Human activities and the environment
Unit 2: Healthy housing
Unit 3: Food safety and hygiene
Unit 4: Air hygiene
Unit 5: Adequate and safe water supply

MODULE 2 – MANAGING THE ENVIRONMENT

Unit 6: Waste management and disposal
Unit 7: Vector control
Unit 8: Role of environmental health professionals
Unit 9: Disaster management
Unit 10: Public and environmental health laws

REFERENCE TEXBOOKS

Hester, R.E and Harrison R.M., (2002). Environmental and Health Impact of Solid Waste Management Activities

Mba H.C, Uchegbu, S., N., Udeh, C., A., and Muoghalu, L. O. (eds) (2004). Management of Environmental Problems and Hazards in Nigeria. Ashgate Pub Ltd

Best Ordinioha (2015) - Priniciples *and* Practice of Environmental Health in Nigeria ... DOI: 10.13140/RG.2.1.4332.5280
https://www.researchgate.net/profile/Best_Ordinioha/publication/280711965_Priniciples_and_Practice_of_Environmental_Health_in_Nigeria/links/55c1db7b08aeb2864581be8b.pdf/download?version=vrp

Sattler Barbara and Lipscomb Jane (2002). Environmental Health and Nursing Practice. New York: Springer Publishing Company.

Environmental Control Measures http://jica-ri.jica.go.jp/IFIC_and_JBICI-Studies/english/publications/reports/study/topical/health/pdf/health_08.pdf

c

COURSE REQUIREMENTS AND EXPECTATIONS OF YOU

Attendance of 95% of all interactive sessions, submission of all assignments to meet deadlines; participation in all Computer Marked/Tutor Marked Assignments, attendance of all laboratory sessions with evidence as provided in the log book, submission of reports from all laboratory practical sessions and attendance of the final course examination. You are also expected to:

1. Be versatile in basic computer skills
2. Participate in all laboratory practical up to 90% of the time
3. Submit personal reports from laboratory practical sessions on schedule
4. Log in to the class online discussion board at least once a week and contribute to ongoing discussions.
5. Contribute actively to group seminar presentations.

EQUIPMENT AND SOFTWARE NEEDED TO ACCESS COURSE

You will be expected to have the following tools:

1. A computer (laptop or desktop or a tablet)
2. Internet access, preferably broadband rather than dial-up access
3. MS Office software – Word PROCESSOR, Powerpoint, Spreadsheet

4. Browser – Preferably Internet Explorer, Moxilla Firefox
5. Adobe Acrobat Reader

NUMBER AND PLACES OF MEETING (ONLINE, FACE-TO-FACE, LABORATORY PRACTICALS)

The details of these will be provided to you at the time of commencement of this course

DISCUSSION FORUM

There will be an online discussion forum and topics for discussion will be available for your contributions. It is mandatory that you participate in every discussion every week. You participation link you, your face, your ideas and views to that of every member of the class and earns you some mark.

COURSE EVALUATION

There are two forms of evaluation of the progress you are making in this course. The first are the series of activities, assignments and end of unit, computer or tutor marked assignments, laboratory practical sessions/field experiences and report that constitute the continuous assessment that all carry 30% of the total mark. The second is a written examination with multiple choice, short answers and essay questions that take 70% of the total mark that you will do on completion of the course.

Students evaluation: The students will be assessed and evaluated based on the following criteria

- **In-Course Examination:**
  In line with the university's regulation, in-course tests will come up in the middle of the semester. These would come in form of Computer Marked Assignment. This will be in addition to 1 compulsory Tutor Marked Assignment (TMA's) and three Computer marked Assignment that comes after every module. .
- **Laboratory practical:** Attendance, record of participation and other assignments will be graded and added to the other scores form other forms of examinations.
- **Final Examination:** The final written examination will come up at the end of the semester comprising essay and objective questions covering all the contents covered in the course. The final examination will amount to 60% of the total grade for the course.

Learner-Facilitator evaluation of the course

This will be done through group review, written assessment of learning (theory and laboratory practical) by you and the facilitators.

GRADING CRITERIA

Grades will be based on the following Percentages

Tutor Marked Individual Assignments	10%	
Computer marked Assignment	10%	
Group assignment	5%	40%
Discussion Topic participation	5%	
Laboratory practical	10%	
End of Course examination	60%	

GRADING SCALE

A = 70-100

B = 60 - 69

C= 50 - 59

F = $\leq$ 49

SCHEDULE OF ASSIGNMENTS WITH DATES

Every Unit has activity that must be done by you as spelt out in your course materials. In addition to this, specific assignment will also be provided for each module by the facilitator.

SPECIFIC READING ASSIGNMENTS

To be provided by each module

COURSE OVERVIEW

Your health depends on the environment around you. Environmental health is the study of how the environment affects human health. It differs from the study of how humans affect the environment, because it focuses on people's health. There is a clear distinction between an environmental scientist and the environmental health scientist, the former might study how water pollution is hurting fish while an environmental health scientist would study what

happens to the health of people when they catch and eat those fish. Environmental health is not just about the health of the environment but whether the environment is helping you stay healthy, or making you sick.

Mans' ill health can be traced to adverse environmental factors such as water pollution, soil pollution, air pollution, food contamination, poor housing conditions, , presence of animal reservoirs and insect vectors, among others. These factors pose constant threat to man's health. Man is often responsible for the degradation of his environment through urbanization, industrialization and other human activities. The health problems posed by environmental hazards vary from place to place. In developing countries, the areas of water supply, sewage and solid waste disposal will be of great priority followed by food hygiene and vector control. In industrialized countries, control of air pollution is of great importance. The effective control of environment depends on the hazard in question. Generally it is through health education, technology and legislation. Environmental health control is the responsibility of the Ministry of Environment and Local Government Authorities but health care professionals must work with the agencies and the people to get the best out of the environment for the health of the people

Therefore knowledge and skills in environmental health is crucial. Environmental health refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that can potentially affect adversely the health of present and future generations.

All the principles and techniques taught in the module will be reinforced in field trips and blending the theory and field trips will enable the learners to support sustainable nursing practice and development in the country.

HOW TO GET THE MOST FROM THIS COURSE

1. Read and understand the context of this course by reading through this course guide paying attention to details. You must know the requirements before you will do well.
2. Develop a study plan for yourself.
3. Follow instructions about registration and master expectations in terms of reading, participation in discussion forum, end of unit and module assignments, laboratory practical and other directives given by the course coordinator, facilitators and tutors.
4. Read your course texts and other reference textbooks.
5. Listen to audio files, watch the video clips and consult websites when given.

6. Participate actively in online discussion forum and make sure you are in touch with your study group and your course coordinator.
7. Submit your assignments as at when due.
8. Work ahead of the interactive sessions.
9. Work through your assignments when returned to you and do not wait until when examination is approaching before resolving any challenge you have with any unit or any topic.
10. Keep in touch with your study centre, the NOUN, School of Health Sciences websites as information will be provided continuously on these sites.
11. Be optimistic about doing well.

COURSE MATERIAL

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Module One

Introduction

This module has five units covering human activities and the environment, healthy housing, food safety and hygiene, air hygiene and safe water supply. These are essential components of the environment that has great implications for the health of people.

Module Objectives

At the end of this module, you should be able to explain how human activities and environmental hazards could contribute to the wellbeing or could endanger human beings. You should also be able to explain the contributions of good housing, safe food and water and healthy air to the health of the population.

UNIT ONE: HUMAN ACTIVITIES AND THE ENVIRONMENT

CONTENT

1.0 Introduction

Environment is the circumstances, objects, or conditions by which one is surrounded
Or the complex of climatic, edaphic (soil-based), and biotic factors that act upon an organism or an ecologic community. Human environment includes what man occupies now including land and water forms. It is broken into six systems- climate, hydrological, edaphic, plant, animal and saprophyte. Man is included in animal system

Public Health Definition of the Environment - all that which is external to the individual host. It can be divided into physical, biological, social, and cultural factors, any or all of which can influence health status in populations. In modern concept, environment includes not only the water, air and soils that form environment but also the social and economic conditions under which we live.

In Nigeria, as in many countries, the environment is influenced by human activities. Understanding the human activities in the community is important in ensuring a safe environment for present and future generations. In this unit, the environment is defined, components of environment highlighted and environmental hazards which human are exposed to and the health effects.

2.0 Objectives

At the end of this unit, you should be able to:

i. define environment
ii. briefly discuss the components of the environment
iii. describe changes in the environment as a result of human activities.
iv. explain the importance of environmental hazards
v. describe how you would establish an interaction between environmental hazards and human health

3.0 Main Content

3.1 What is environment?

All that which is external to man is the environment broadly speaking. The concept of environment is complex. The external environment or the Macro-environment is said to be

responsible for millions of preventable diseases originating in it. "All that is external to the individual human host, living and non-living, and with which he is in constant interaction constitute the environment".

Micro-environment is the domestic environment in which man lives. The term internal environment is some time used for the environment inside the body.

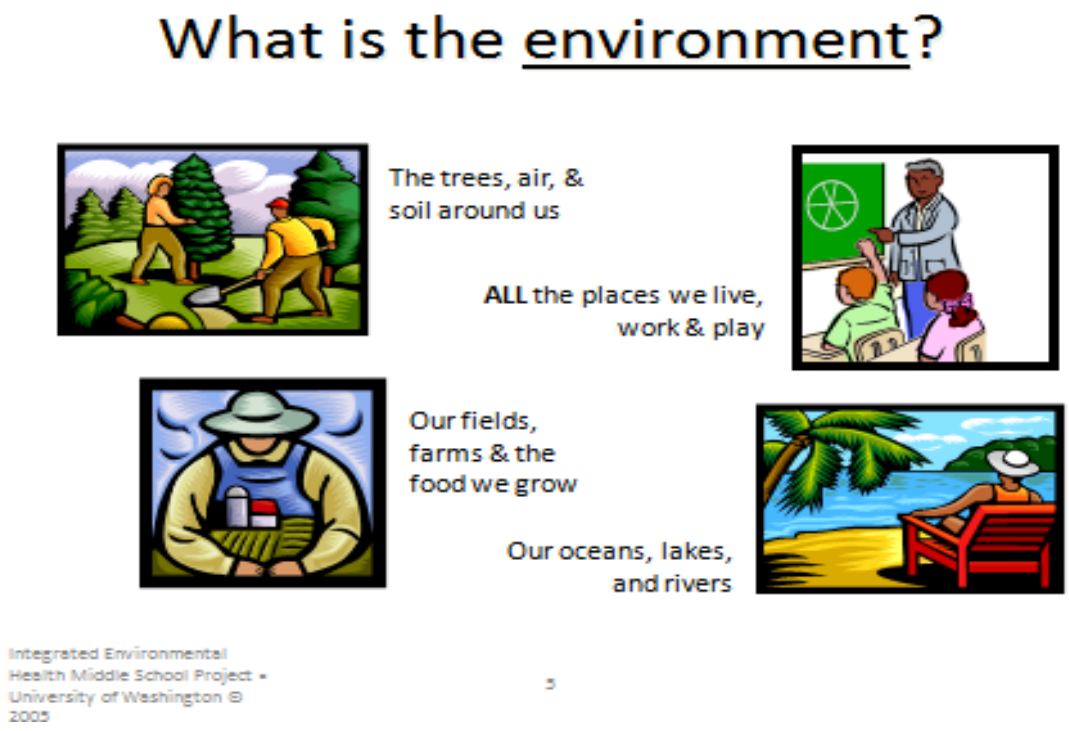


Fig. 1.1 Components of the environment

Human activities that influence the environment and human health

In the attempt to survive, human beings continue to involve themselves in activities which continue to bring them in contact with those environmental forces and influences, some of which result into health problems and even death.

Among activities of man in his endeavour to survive are:

1. Food and Agriculture

Agriculture, forestry and fishing provide not only the food and natural resources on which human society depends but also the livelihood of about half of the world's population. Their output can only be sustained if the ecological systems on which they draw are not overexploited. While the output of food producing systems continue to increase in the

developed world, food shortage remains a major problem in the developing world where under nutrition and the infections associated with it are the main cause of ill health and premature death because they do not have enough land to grow the food they need or the income to purchase it.

Food borne diseases are among the most common disease especially in the developing countries. Most disease agents that contaminate food and water are biological and they come from human or animal excreta (although there can be problem from toxins produced by plants and moulds).

Occupational health risks associated with agriculture, fishing and hunting.

(a) Accidents (farmers and injuries)
(b) Infections with diseases, zoonosis spread by animal
(c) Exposure to agricultural chemicals – pesticides, herbicides, fertilizers
    - Construction of water reservoirs and canals for agricultural purposes is often accompanied by vector-borne disease such as malaria and schistosomiasis.
    - Agricultural chemicals are widely misused, most seriously in developing countries where pesticide regulations and their enforcement are less strict and products that have been banned or restricted in developed countries are still widely available.
    - Agricultural chemicals damaging water resources.

Health and its environmental determinants are closely related to land tenure. Farmers with secure tenure of adequate amount of fertile land usually avoid extreme poverty and the ill health that accompanies it. Those with insecure tenure of adequate amount of land will face poverty and poor health.

2. Water

Another man's activity involves his need and search for water. Fresh water is considered a renewable source, but there are limits on the supplies available. In many countries or regions, shortages of water are the main obstacle to agricultural and industrial production. Some of the shortages (or second or annual variations in supplies) lead to poverty and soil degradation. Fresh water is essential to health not only for its part in production, but also for domestic consumption and use (drinking, cooking, washing, laundry). However a high proportion of life-threatening infections are transmitted through contaminated water or food. Nearly half the world's population suffers from diseases associated with insufficient or contaminated water, mostly the poor and virtually all in developing countries. Among the diseases are

diarrhoea, schistosomiasis, guinea worm (dracunculiasis), malaria, filariasis, onchocerciasis, typhoid fever and dengue fever.

3. Energy

Energy is known to be very important for economic and social development. Hence nations continue to search for means of developing technologies for the extraction, production and use of all types of energy. The aim has always been to reduce costs and make systems more efficient. Part of the aim is also to reduce the adverse environmental and health effects caused by energy source.

Wealth is dependent on the availability of energy; hence the wealthiest countries have the highest per head (caput) levels of energy consumption.

(a) Biomass fuels: In the poorer societies, biomass fuels such as wood, dung and crop waste or saw dust are the common sources of energy. In the richer societies sources of energy commonly in use are fossil fuels such as coal, oil and natural gas.

Indoor air pollution from the combustion of biomass fuels (e.g. crop waste, dung, wood) represents the largest energy-related source of ill health. They are often burnt in open fires or inefficient stores in poorly ventilated houses, and give off smoke and chemicals that contribute to respiratory disease, with long-term cardiovascular effects. Lung cancer may occur because of the presence of carcinogens in the indoor air.As women are generally responsible for cooking and looking after children in the home, they and their children are at greatest risk.

(b) Fossil fuels: These are the single largest source of atmospheric pollution. When burnt, they release in the air particulate matter, carbon monoxide and dioxide, oxides of nitrogen and sulphur and metal compounds resulting into high levels of air pollution. High levels of sulphur dioxide and particulates in urban areas have been associated with respiratory disease and increased mortality.

Vehicle exhausts pollute the air in large cities with carbon monoxide and with lead (except where lead additives to petrol are no longer used). Exposure to lead may impair mental development in children. Vehicle emissions also contribute to the formation of ozone and photochemical smog, which may decrease lung performance.

Alternatives to fossil fuels and unprocessed biomass fuels are Hydropower, Nuclear Energy & Solar Energy.

(c) Hydropower: Hydropower (dams) can bring extra benefits such as electricity, flood control, and increased supply of water for drinking and irrigation. However, dams can cause environment changes that can affect health: Among health costs are:

i. People living in the area must be resettled having been displaced by the dam. This will cause psycho-social problems among the people.
ii. Accidents, illness and deaths among dam construction workers
iii. Disruption of food supply
iv. Spread of water-borne diseases (schistosomiasis & malaria)
v. May affect wells around.

(d) Nuclear Power

Nuclear power is another option as energy source. Normal operation of nuclear power plant produces environmental pollution of less consequence than that of many other fuel cycles. However, the risk of accidents, and the difficulty of safely disposing of high-level radioactive waste are major concerns of public (Chernobyl (1986), Fukushima (Japan) – March 2011 accidents.

4. Industry

Industrialization has made many positive contributions to health. Among these are

- Increased personal incomes (employment)
- Greater social wealth
- Improved services, particularly transport and communication

However, industrial activities carry the risk of adverse health consequence for the workforce and the general population, either directly, through exposure to harmful agents or practices or indirectly, through environmental degradation. Industrial emissions and products also threaten the global environments. Industrial practices produce adverse environmental consequences through the release of air and water pollutants and the generation of hazardous wastes.

Occupational diseases include silicosis, pneumoconiosis, lead and mercury poisoning, hearing loss, and skin diseases .Industrial emissions have polluted many rivers, lakes, and coastal environment especially in developing countries where pollution control is rarely enforced. Another problem is that associated with disposal of hazardous industrial and commercial wastes resulting into human exposure and leakage into the environment. There is also the problem of locating potentially dangerous industries close to population concentrations.

3.2 What is environmental health science?

Environmental health science is the study of those factors in the environment that affect human health. The factors could be ”pollutants "or “toxicants” in air, water, soil, or food, ttransferred to humans by inhalation, ingestion, or absorption and result in adverse health effects.

WHO definition of environmental health talks about those aspects of human health including quality of life that are determined by interactions with physical, *biological* and social factors in the environment

Fig. 1.2:

3.3 Environmental hazards

A hazard is anything in the environment that can hurt you or make you sick

Environmental hazards may be biological, chemical, physical, psychological, sociological, or site and location hazards.

Biological Hazards

These are living organisms or their products that are harmful to humans. Water-borne diseases are diseases that are transmitted in drinking water. Examples are polio virus, hepatitis A virus, Salmonella, Shigella, cholera, amoebic dysentery, Giardia, and Cryptosporidium. These disease organisms are shed into the water in feces, and can produce illness in those who consume untreated, contaminated water. Municipal water treatment facilities are usually able to purify water by removing these agents or killing them by disinfecting the water.

Food borne diseases-are diseases transmitted in or on food. Examples of food-borne agents are the bacteria Salmonella, serotype enteritidis, Escherichia coli 0157:H7, as well as other agents. To protect against food-borne diseases, environmental health officers from local health departments routinely inspect food service establishments (restaurants) and retail food outlets (supermarkets) to verify that food is being stored and handled properly.

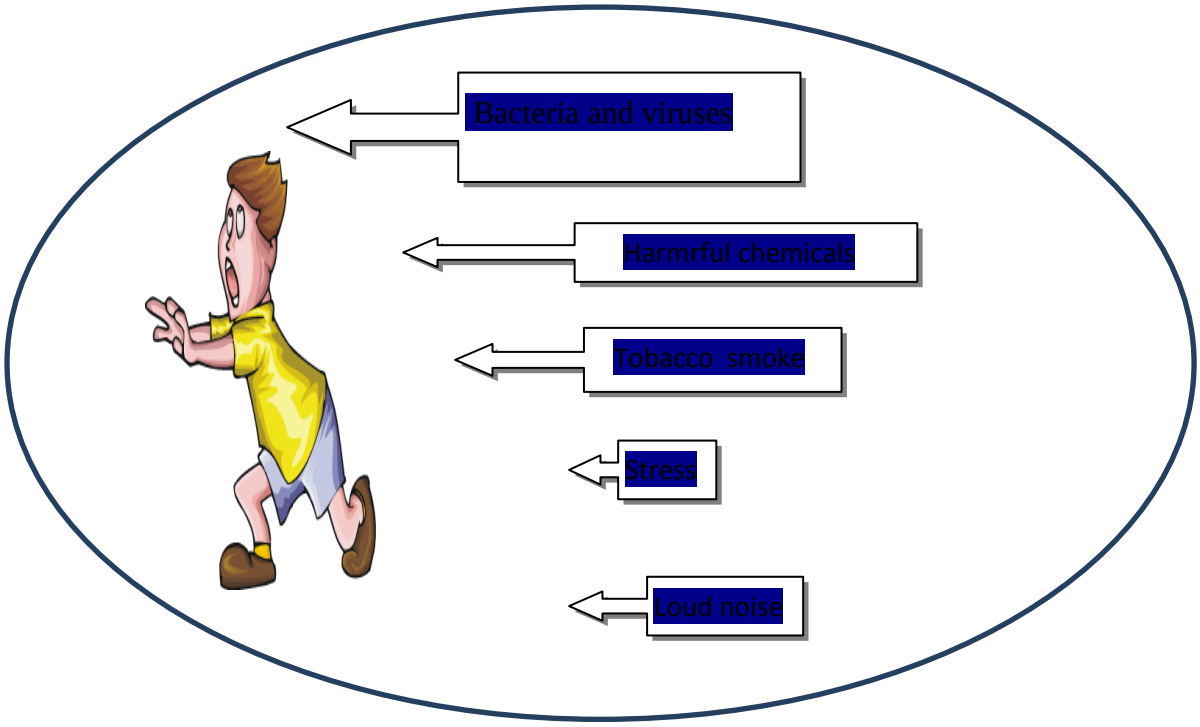


Fig. 1.3: Sources of Hazards from the Environment

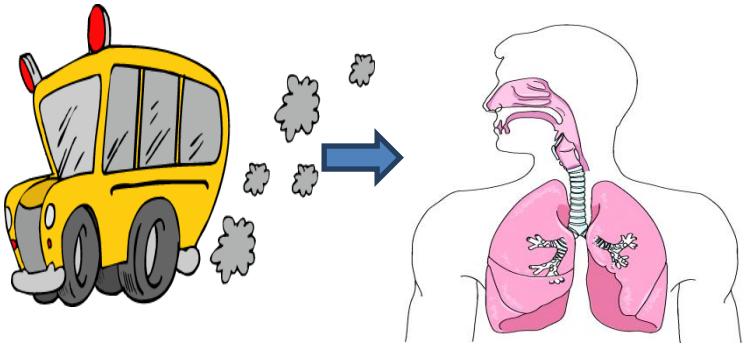
Vector borne diseases are those transmitted by insects or other arthropods. Examples are St. Louis encephalitis and La Crosse encephalitis transmitted by mosquitoes and plague and murine typhus transmitted by fleas. Improper environmental management can cause vector-borne disease outbreaks.

Chemical Hazards

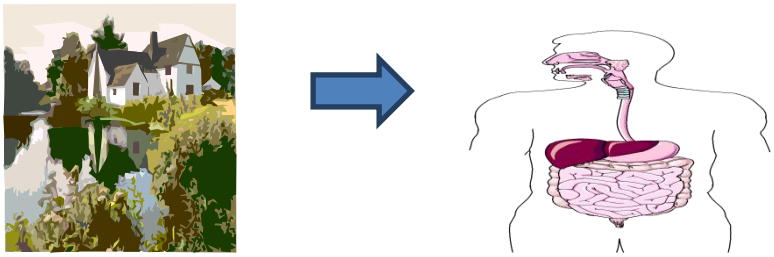
The common exposures to chemical hazards and their pathways to human body are as shown in the pictures shown below.

Examples are shown below

- car exhaust > air> inhalation
- Lead > water> ingestion



Inhalation:
Breathing. When chemicals enter the body through this route of exposure, they can get stuck in the lungs and/or be taken up into the bloodstream.



Ingestion:
Swallowing (usually by eating or drinking). When chemicals enter the body through this route of exposure, they can easily be taken up into the bloodstream.

Environmental tobacco smoke (ETS) is environmental hazards produced by millions that smoke. Diseases associated with ETS include lung cancer and perhaps heart disease. ETS contains 4, 000 substances. The Environmental Protection Agency has classified ETS as a Class A carcinogen. Smoking has been increasingly restricted from public buildings and from many private work sites. Regulation of smoking seems to be the best approach to controlling this pollutant.

Physical Hazards include airborne particles, humidity, equipment design and radiation Ultraviolet radiation reaches humans as short wave length energy that can damage cells by ionization. ionization. One result of over exposure to UV radiation is skin cancer.

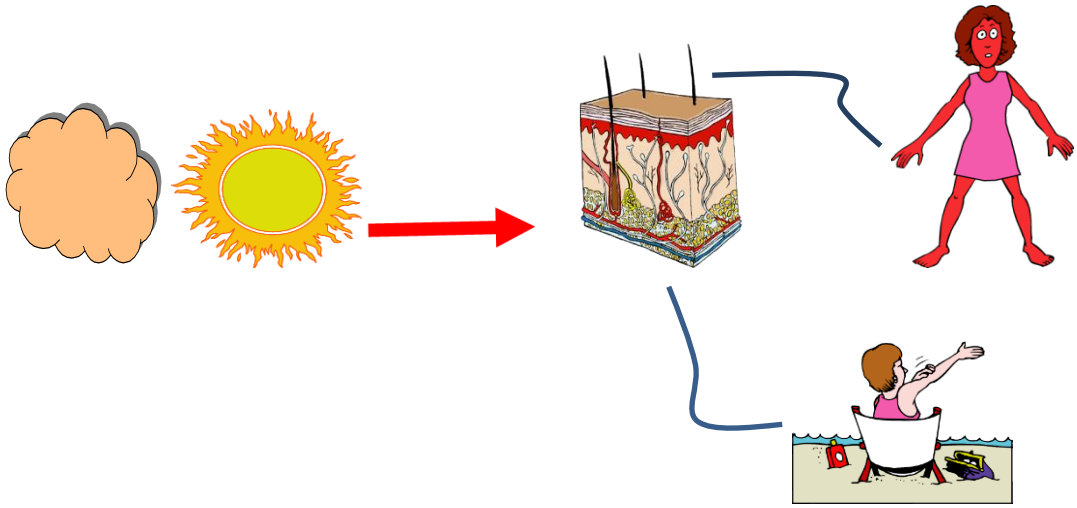


Fig. 1.4: Dermal Absorption: Light, radiation, heat, cold etc directly affect the skin, eyes. Chemicals /particles can sometimes enter the bloodstream through this route of exposure.

Psychological hazards are environmental factors that produce psychological changes expressed as stress, depression, hysteria.

Sociological hazards are those that result from living in a society where one experiences noise, lack of privacy and overcrowding.

Natural disasters and exposure to hazards: Natural disasters are geographical and meteorological events of such magnitude and proximity to communities that they produce significant damage and injuries. Examples are cyclones, earthquakes, floods, hurricanes, tornadoes, typhoons, and volcanic eruptions. The magnitude of devastation of these events can sometimes be great. Biological, psychological and sociological hazards may increase following a natural disaster.

3.4 Need for environmental sanitation.

The World Health Organisation defined environmental sanitation as the control of factors in the environment that exercises, or may exercise harmful effect on the physical development, health and survival of humans. The traditional environmental hazards have been controlled by developed countries but still cause problem in developing countries. The 2002 World Health Report indicated that 5.5% of global disease burden is due to inadequate water and sanitation.

One of the principles of healthy housing which is protection against communicable diseases can be achieved through safe water supply, sanitary disposal of liquid and solid waste. Food can be contaminated by human faeces as a result of unsanitary disposal of liquid and solid waste and poor hand washing practices. Similarly vectors breed in unsanitary disposal of solid waste and water related disease such as water impounding and water arthropod reflected the importance of water in life cycles of these vectors. All bodies of water stand the risk of being polluted if adequate measures are not taken. They are often polluted by untreated sewage, industrial and agricultural wastes.

One of the guiding principles of Primary Health Care is protection of the environment and production of health through integrated management of water resources as well as solid and liquid wastes. The importance of safe water and improved sanitation is reflected in their inclusion as one of the millennium development goals, a framework that has been widely accepted for the worldwide improvement of health and welfare

The work of the Medical Officer of Health since inception has in addition to its administrative duties, included environmental sanitation because all diseases are considered to be from filth

Box 1.1 Components of Environmental health

1. Air hygiene and safety
2. Provision of safe and adequate supply of water
3. Proper management of solid waste
4. Proper sewage managementt
5. Safe guarding of food
6. Provision of good housing
7. Control of insect vectors and other pests
8. Control of animal reservoirs of infection & Disinfection
9. Elimination of other hazards e.g. noise , radiation, climate change, global warming, acid rain

To successfully manage the challenges of the environment the environmental health officers and sanitary inspectors need to effectively perform their roles and should not fail in their responsibilities.

4.0 Conclusion

The environment is everything external to the body of a person. It has the physical, chemical, psychological and sociological dimensions that could also pose as hazards to people. Human

activities contribute to alterations of the environments. Environmental hazards contribute to ill health. There are nine components of environmental health that environmental health officers and sanitary inspectors have roles and responsibilities for quality management for human health.

5.0 Summary

In this unit, you have learnt about that:

i. Health depends on the environment. There are important things that keep people healthy and hazards in the environment.
ii. Human ill health can be traced to adverse environmental factors such as water pollution, soil pollution, air pollution, poor housing conditions, presence of animal reservoirs and insect vectors.
iii. Human beings are often responsible for the pollution of the environment through urbanization, industrialization and other human activities.
iv. Environmental health is the study of how the environment affects human health. It differs from the study of how humans affect the environment, because it focuses on people's health
v. About 5.5% of global disease burden is due to inadequate water and sanitation
vi. The medical officer of health should have environmental health officers/sanitary inspectors as foot soldiers, public health engineers to provide solutions to environmental hazards, scientists working in laboratories and government writing regulations for effective performance of his responsibilities.

6.0 Tutor Marked Assignments

6.1 Activity:

(1) Interact with the Environmental Health Officer in a Primary health care Centre and document the activities of the officer over a period of three months. Share your experiences on the group forum.

(2) Download, read (and keep in your portfolio) the following reading materials on the Nurse and environmental health:

ANA's Principles of Environmental Health for Nursing Practice with Implementation Strategies at http://www.nursingworld.org/MainMenuCategories/WorkplaceSafety/Healthy-Nurse/ANAsPrinciplesofEnvironmentalHealthforNursingPractice.pd

Nurses and Environmental Health at https://www.cna-aiic.ca/~/media/cna/page-content/pdf-en/ps105_nurses_env_health_e.pdf?la=en

Why Nursing and Environmental Health? At http://envirn.org/pg/pages/view/1785/why-nursing-and-environmental-health

Principles of Environmental health for Nurses at http://envirn.org/pg/pages/view/1784/principles-of-environmental-health-for-nursing

6.2 Please answer the following questions:

i. define environment
ii. briefly discuss the components of the environment
iii. describe changes in the environment as a result of human activities.
iv. explain the importance of environmental hazards and describe how you would establish an interaction between environmental hazards and human health

7.0 References and other resources

Mba H.C, Uchegbu, S., N., Udeh, C., A., and Muoghalu, L. O. (eds) (2004). Management of Environmental Problems and Hazards in Nigeria. Ashgate Pub Ltd

Other resources as listed in 6.1

UNIT TWO - HEALTHY HOUSING

CONTENT

6.2 Tutor Marked Tests

7.0 References and other resources

1.0 Introduction

In this unit, we are going to learn about housing as an element in the environment. A house is a man made physical structure which is designed to offer shelter. Quality of housing in broad context of dwellings is highly significant as determinants of health. Housing protects against the stresses of physical environment, satisfy psychological requirements and the need for a locus of primary social group- family. Rapid urbanization and population growth has created a great need for additional housing units, amenities and other facilities. In most African cities, between 50-75% of the population live in grossly inadequate housing conditions. Most deficiencies are in the size, and stability of the house structures, security of occupants' tenure, piped water, sanitation, drainage, electricity and collection of house hold wastes.

As a public health nursing officer, you are required to share information about building regulations and bye laws to assist and ensure that building does not endanger lives after construction. You are also expected to educate and guide people in their decisions about housing. This unit focuses on types of housing, building codes and regulations and in particular how housing influences health of the people.

2.0 Objectives

At the end of this unit, you should be able to:

i. describe the expected needs of good housing
ii. explain what advice you will give to people during construction of their buildings.
iii. discuss the link between housing and health
iv. provide critical appraisal of local and international responses to housing problems.

3.0 Main Content

3.1 Housing and Settlements

A house provides shelter which among others is a basic need in life. We describe the different types of settlement/housing and focus on what can be referred to as good housing

Traditional village settlements

Traditional village settlements are the oldest form with varying degree of self–government. Rural population lives in dwellings built according to traditional patterns from locally available materials such as mud, bamboos and thatch roofing.

http://www.africanspicesafaris.com/kenya_cultural_tour_nairobi.html

Temporary Settlements

Lack of infrastructures such as transportation, recreation facilities and opportunities to work has resulted in the recent rural–urban migration. In majority of African towns and cities, illegal settlements to accommodate the rural–urban influx are growing. Temporary settlements such as construction camps, slums, squatters and other forms of spontaneous settlements resulting from emergencies are inevitable. Substantial portions of urban population live in these settlements often under the worst environmental conditions.

Permanent Settlements

Permanent housing in most cases conform with town plans and building codes, are categorized according to age of construction and the use to which the house is subjected. The different types of housing are described below:

i. Sound housing – no defects or slight defects correctable by regular maintenance.
ii. Deteriorating housing – needs more repairs than would be provided by regular maintenance and has one or more defects which must be corrected to ensure safe and adequate shelter.
iii. Dilapidated housing – would not provide safe and adequate shelter because it needs extensive repairs or rebuilding due to one or more critical defects

Basic needs provided by good housing.

A house should be built to meet the physiological and psychological needs of human beings and sited in suitable environment that enable its occupants to live a healthy and reasonable life. Good housing should provide basic physiological needs, basic psychological needs, protect against contagious diseases and accidents.

Housing Codes and Standards

It is sometimes difficult to establish acceptable housing standards since conditions affecting housing are different within and outside countries. Human requirement for space differ depending upon climate, socioeconomic standards and cultural values of the groups. Space requirement is not only measured by area, but also volume which vary with such parameters like floor areas, height of ceiling, rate and means of ventilation, thermal and illumination requirements and structural standards. There are minimum standard for construction that are outlined in building codes - all matters relating to space, sanitary arrangements, light, ventilation, safety, fire protection, plumbing, heating, materials for construction, construction features (which relate to rodent and insect control).

But frequently these building codes do not include standards for water, sanitary facilities, plumbing, wiring and some other elements of residential environment. These codes are taken care of in other special codes such as public health acts and water regulation. Building regulations and bye laws are meant to ensure that building does not endanger lives after construction and that they promote health and provide environment aesthetics. While regulations are of general application, bye-laws are often restricted to the town planning authority.

Box 2.1 Building Codes and Regulations

The setback of the building should be at least 6 meters from the fence, and the fence should be at least 1.2 meters from the public drain

- Size- building should occupy a maximum of 50% of the plot size for high density area, 45% medium density area and 35% low density area.
- Room size- at least 12 sq meters. Width of the room not less than 2.4 meters
- Height of room- at least 2.7 meters
- Ventilation- total area of window or ventilation opening- at least ⅛ the size of total floor area.

A good housing must ensure access to safe water, facilities for management of solid and liquid wastes, control of pests and the ventilation and lighting must be optimal for health of the family members

3.2 What is the link between housing and Health?

The link between housing and health: The structure, design and location of housing and population density can influence health both physical and mental in many ways.

One aspect of housing of obvious relevance to health is water- its accessibility and quality. Contaminated water is responsible for transmission of many diseases- typhoid, cholera, hepatitis, dysentery, amebiasis and giardiasis.

Availability of sanitary facilities relating to disposal of solid and liquid wastes - Human feaces is a principal source of waste harboring pathogenic organisms causing many communicable diseases especially infections of gastrointestinal (GI) tract.

Quality of air in a dwelling place is also important. Cross ventilation allows for free flow of oxygen A large proportion of chronic respiratory disorders in rural areas have been related to burning of fossil fuels indoors. Actual structure of the housing can also be important for health in many ways. Make shift structures almost invariably fail to guard against extreme temperatures of heat and cold which can increase morbidity and mortality.

Responses to housing problems

Concept of healthy housing embodies the physical structures including all necessary facilities, services and equipment needed for the physical and mental health and social welfare of the individuals, family and community. Government and developmental agencies have responded in variety of ways to the enormous demands for extension of infrastructure, expansion of services and facilities and growth of illegal settlements. These are done through:

i. Development of low cost low cost building and construction techniques
ii. Provisions of loans and credit schemes.
iii. Rented accommodation
iv. In Site and service schemes
v. Employee housing scheme.

4.0 Conclusion

A house that meets specific standard in terms of the location, construction, facilities and services is essential to sound health. It is important that houses meet the standard building

codes, standards for water, sanitary facilities, plumbing, wiring and some other elements of residential environment for people living in such houses to be in optimal health.

5.0 Summary

In study unit, you have learnt that:

i. a house is not just a physical structure that is designed to provide shelter but should include facilities and services that will ensure physical, social and mental wellbeing of the occupants.
ii. the type and quality of housing depends on site and location i.e traditional settlements in rural, temporary settlements in slums and permanent settlements in urban.
iii. there are minimum standard for construction are outlined in building codes- all matters relating to space, sanitary arrangements, light, ventilation, safety, fire protection, plumbing, heating, materials for construction, construction features(which relate to rodent and insect control)
iv. the structure, design and location of housing and population density can influence health both physical and mental in many ways.
v. government and developmental agencies have responded in variety of ways to the enormous demands for extension of infrastructure, expansion of services and facilities and growth of illegal settlements

6.0 Tutor Marked Assignments

6.2 Activity

Download this reading assignment:

Howard, G., (2002) Healthy Villages: A guide for communities and community health workers. Geneva: World Health Organization at http://www.who.int/water_sanitation_health/hygiene/settings/hvintro.pdf accessed on 20 March 2016. Chapter 7, Housing Quality, http://www.who.int/water_sanitation_health/hygiene/settings/hvchap7.pdf

In the class discussion forum online, explore your views on diseases vector control in the homes and the challenge of overcrowding for health of family members in your local government area. Keep the summary of the discussions in your portfolio.

6.2 Please answer the following questions:

i. What are the qualities of a good house?
ii. What advice will you give to people during construction of their buildings.
iii. Discuss the link between housing and health
iv. Provide critical appraisal of local and international responses to housing problems.

7.0 References and other resources

As provided in 6.2

UNIT THREE - FOOD SAFETY AND HYGIENE

CONTENT

1.0 Introduction

Food is as important to man's welfare as water and air. Food problems transect the entire chain of events from food production on land and sea, processing, storage, distribution, and marketing right down to actual cooking and serving of meals and the disposal of waste. Food hygiene deals with the prevention of contamination of foodstuffs at all stages of their production i.e from time the foods are produced to the time they are served for consumption the fundamental health consideration in food processing are in the sanitary provision of good

and portable water supply, solid and liquid wastes disposal methods at processing plant. The other considerations are attainment of good physical and chemical cleaning procedures of processing equipment and education of food handlers in simple habits of personal hygiene

2.0 Objectives

At the end of this unit, you should be able to:

i. define and use key terms correctly (food safety, food contamination, food pathogens and contaminants etc).
ii. describe how the wholesomeness of food can be altered
iii. list food pathogens and diseases caused.
iv. discuss the role of food handlers in food borne illnesses
v. critically appraise the role of environmental health officers and the public health nurse in food safety, food hygiene and food control administration in the country.

3.1 Food safety

Food safety is the totality of everything done involving the arrangements for growing; processing, preserving, packaging, storing and distribution of foods to ensure safety of everyone that consume the food. Food safety has tremendous impacts on the safety, nutritional value, wholesomeness and palatability of food.

Food hygiene according to the World Health Organization "are the conditions and measures necessary to ensure the safety of food from production to consumption. Food can become contaminated at any point during slaughtering or harvesting, processing, storage, distribution, transportation and preparation. Lack of adequate food hygiene can lead to foodborne diseases and death of the consumer" (WHO, Food Hygiene http://www.who.int/foodsafety/areas_work/food-hygiene/en/ accessed on 05 March, 2016). Food hygiene deals with the prevention of contamination of foodstuffs at all stages of their production i.e from time the foods are produced to the time they are served for consumption

- It covers proper handling and storage of foodstuffs and drinks, all utensils and equipment for preparation, service and consumption.
- It also involves care and treatment of foods known to be contaminated with poison or pathogenic organisms.

Food processing- this begins with raw materials which are subjected to series of unit operation before attaining the finished product.

- Some of the common unit operations are material handling, cleaning, mixing, packaging and storing.
- Many steps involved in chemical process include fermentation, hydrolysis, cooking, roasting, brewing and denaturing

3.2 Food contamination and pathogens.

Contamination can occur during the various stages of food processing which include:

i. raw stage
ii. cooking
iii. service
iv. storage

Diseases transmitted through food

Most of the diseases transmitted through food are known to be those of the respiratory and the intestinal tracts. Important among these are: common cold, septic sore throat, pneumonia, trench mouth, diphtheria, tuberculosis, influenza, typhoid and paratyphoid fevers, the dysenteries, cholera and infections hepatitis. The organisms causing the diseases are bacteria, protozoa (parasites) or viruses. Respiratory diseases are commonly transmitted through discharges from mouth and nose while coughing and sneezing. Hands and handkerchiefs soiled with discharges from mouth and nose are also sources; so also are taste spoons used more than once without cleaning. Displayed foods can be contaminated by the hands, sneezes and coughs of customers as well as those of personnel.

Disorders of the intestinal tract and infectious hepatitis may be transmitted to food and thereafter to other persons, if the handler does not thoroughly wash his/her hands after visiting toilets.

Besides the immediate transmission of pathogens from food handler or customer/consumer to prepared food and from there to the next person or person's additional routes of transmission are possible. These include sewage and sewage-polluted water, soil and food. Others are rodents (rats and mice); insects (flies and cockroaches); and pathogen-contaminated work surfaces, cooking utensils and equipment; china, flat wares and glasses.

Box 3.1 Agents of Food Contamination

(1) Animal parasites, such as tape worms (Taenia saginata or Taenia solium) and trichinella worms (trichinosis – trichinella spirallis). These gain entrance to the human body through consumption of beef, meat, pork or fish (fish in tape worm) which has not been cooked sufficiently to kill the immature worms.

(2) Microorganisms which enter foods in various ways and then infect the consumer such as (1) the bacteria which cause typhoid fever, dysentery, and samonellosis; (2) rickettsial which causes fever; and (3) the virus which causes infectious hepatitis. There is also Lassa fever which is caused by virus. This occurs through contamination of food (e.g. beans, rice, gari, powdered yams) by wine and faeces of multimammate rates).

(3) Toxins given off by bacteria growing in the food. Botulism organisms and some of the staphylococci are important in this regard.

(4) Food poisoning from harmful substances illegally or ignorantly used in foods for preserving purposes, colouring or adulteration or those entering by accidents, such as insect poison mistakenly used for flour or sugar, poisonous spray residues left on fruits or vegetables, or poisons from containers or utensils plated/coated with metals such as cadmium resulting into cadmium poisoning.

(5) Poisoning caused by vegetables, often caused as a result of mistaken identity of a poisonous fungus for non-poisonous type such as the mushroom. Poisonous weeds may be mistaken in the garden for edible vegetables.

Contaminants	**Sources**
Pathogenic microbial agents	bacteria, worms, protozoa, fungi, viruses, and (in certain cases) toxins from such organisms
Chemically related food borne hazards	Marine toxins, mushroom toxins, Heavy metals, Pesticides, herbicides, and fungicides ,Preservatives and additives
Residues of medicines administered to food animals	Antibiotics, growth-promoting hormones
Foreign objects and other physical contaminants	Natural components: bones, shells, seeds, Other: glass and metal fragments, stone
Materials used in packaging	Residues of plastic, Waxes
Miscellaneous contaminants	Debris from insects (insect parts, ova) and from rodents (faecal material, fur) &Cleaning agents used in the food processing environment

Table 3.2: Listing of Food borne Pathogens and Diseases

Types of Organisms	**Diseases**
Bacteria: Pathogenic Bacteria *Salmonella* *Clostridium botulinum* *Clostridium perfringens* *Staphylococcus aureus* *campylobacter jejuni* *Shigella* *Listeria moncytogenes*	Salmonellosis Botulism *Clostridium perfringens* food intoxication Staphylococcal food intoxication Vibrionic enteritis Shigellosis Listeriosis
Bacteria: Enterovirulent *Eschericia Coli* Group (EEC Group) *Escherichia coli* O157:H7 enterohemorrhagic (EHEC) serotype	*E.coli* O157:H7 infection
parasites: Worms *Trichinella spiralis* *Taenia solium, Taenia saginata*	Trichinellosis, trichinosis Taeniasis, cysticercosis (*T. solium)*
Viruses Norovirus (formerly called Norwalk virus group)	Epidemic viral gastroenteropathy
Other Pathogenic Agents *Prions*	Bovine spongiform encephalopathy (BSE), commonly referred to as mad cow disease

3.3 Measures for Food Safety

Measures for maintaining high standards of food hygiene and control of food poisoning involves individual (health education, prompt refrigeration and medical examination of food handlers) and community measures (inspection of slaughter houses, proper cleaning and maintenance of utensils, provision of good sanitary facilities , pasteurization of milk and discourage use of chemicals for preservation).

Box 3.3

1. Control of primary food sources (e.g. avoid the use of human manure as fertilizer).
2. Inspection of premises (e.g. industries, bukateria, abattoirs, e.t.c.).
3. Supervision of food handlers (e.g. carriers)
4. Ensuring annual physical examination of food handlers (e.g. chest x-ray)
5. Health education
6. Laboratory examination of food (e.g. raw and cooked meat)
7. Legislation for administration of laws governing foods that are meant for public consumption.

Box 3.4 Health Education in Food Hygiene

1. Do not prepare foods too far in advance
2. Do not undercook meat (especially poultry)
3. Do not cook meat that is not fully thawed
4. Do not keep perishable foods within the danger zone (10-60^{o}C)
5. Do not under-heat already cooked foods
6. Do not allow contamination from raw to cooked foods (e.g. on kitchen surfaces, chopping boards or in the food stores)
7. Wash hands before handling or cooking foods
8. Wash hands after visiting toilets, before handling foods
9. Keep kitchen surfaces and utensils clean always
10. Make sure that sores and cuts on fingers or hands do not come in contact with foods.
11. Sick people should not handle food preparation until they fully recover

Food Control Administration

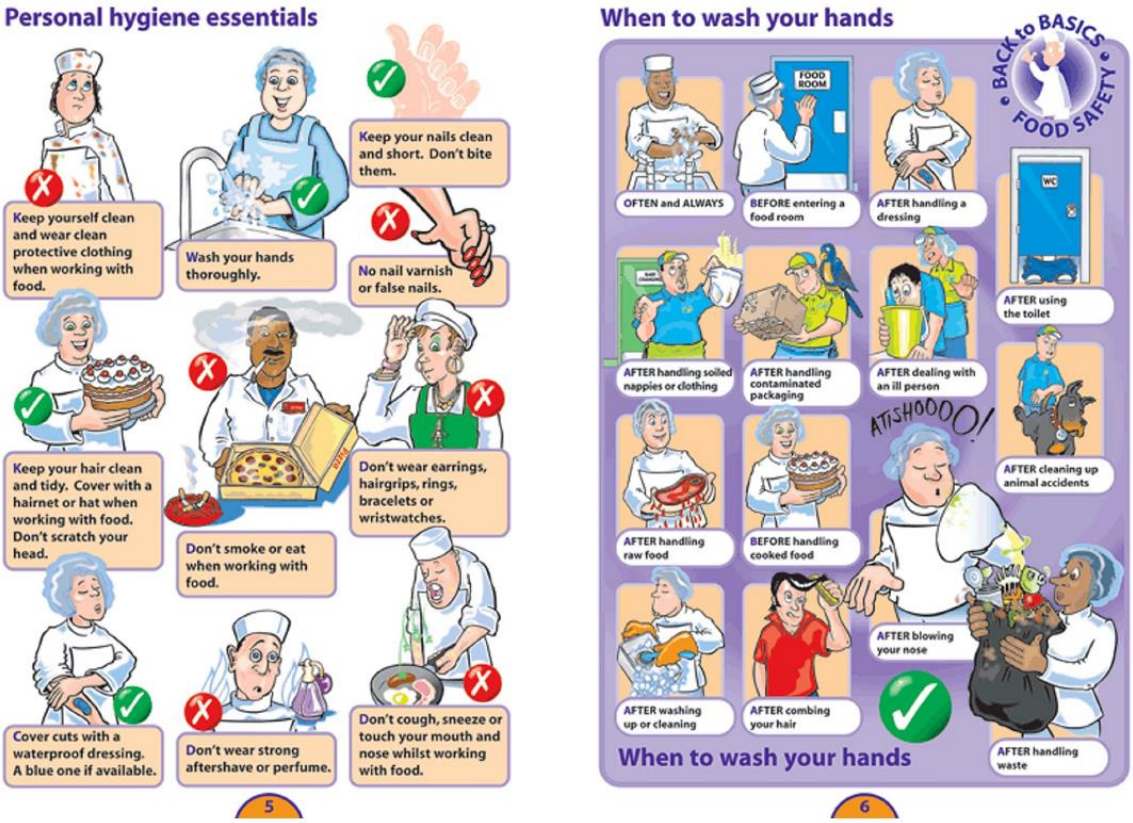
Food laws

Food laws were borne from desires of government to remedy abuses and to protect consumers from fraud and deceit. Early food laws dealt largely with adulteration while recently, increasing attention is paid to hazards of disease causing micro organism and toxic chemicals .The implementation and regulations of food laws may be responsibilities of an inspectorate that is organized through national body or local government agency.

Food administration

Administration of food hygiene rest largely on Ministry of Agriculture and Ministry of Health. Ministry of Agriculture is responsible for the inspection of all meat and food products as well as research into agriculture and food technology. Ministry of Health is responsible for

food quality control, inspection of food handling facilities and practices. Self inspection is a cooperative activity supported by industry as a modern and effective means of correcting and preventing insanitary conditions in food establishments



http://www.highfield.co.uk/x/i/_db/books/previews/ESSFH.gif

4.0 Conclusion

Food problems-transect the entire chain of events from food production on land and sea, processing, storage, distribution, and marketing right down to actual cooking and serving of meals and the disposal of waste. Any kind of arrangements for growing, processing, preserving, packaging, storing and distribution of foods have tremendous impacts on the safety, nutritional value, wholesomeness and palatability of food. The sources of contamination are use of manure, human fecal matter and sewage sludge for fertilizing crops, use of chemical fertilizers and irrigation of crops with waste water effluents. Food hygiene deals with the prevention of contamination of foodstuffs at all stages of their production i.e from time the foods are produced to the time they are served for consumption

5.0 Summary

In this unit, you have learnt about:

i. Food safety and food hygiene
ii. Food contamination and pathogens.
iii. Measures for Food Safety

6.0 Tutor Marked Assignments

6.1 Activity

Identify a food vendor in your community and informally interact with/visit the person. Use the contents of Box 3.4 (Health Education in Food Hygiene) as a basis of exploring current practices and to educate the vendor. Document your interactions with the food vendor using pictures, audio and video recordings with appropriate permission. Share your recordings with your colleagues on your group forum and keep your document in your Portfolio.

6.2 Please answer the following questions:

i. What is food safety?
ii. List at least 5 food pathogens and diseases caused.
iii. Discuss the roles of food handlers in controlling food borne illnesses.
iv. What roles can you as a nurse play in food safety?

7.0 References and other resources

WHO (2016). Food Hygiene http://www.who.int/foodsafety/areas_work/food-hygiene/en/ accessed on 05 March, 2016)

UNIT FOUR - AIR HYGIENE

CONTENT

1.0 Introduction

Normal air consists of about 70% of nitrogen, 21% of oxygen , 0.03% of carbon dioxide and the remaining include argon, helium, krypton, methane and others in trace concentration. Air pollution signifies the presence of excess gases, mixture of gases and particulate matter of various sizes in the ambient air which is harmful to man and other living organisms in the environment.

Air pollution is contamination of the air by noxious gases and minute particles of solid and liquid matter (particulates) in concentrations that endanger health. Most artificial impurities are injected into the atmosphere at or near the Earth's surface. The lower atmosphere (troposphere) cleanses itself of some of these pollutants in a few hours or days as the larger particles settle to the surface and soluble gases and particles encounter precipitation or are removed through contact with surface objects. Removal of some pollutants (for example, sulfates and nitrates) by precipitation and dry deposition results in acid deposition, which may cause serious environmental damage. Also, mixing of the pollutants into the upper atmosphere may dilute the concentrations near the Earth's surface, but can cause long-term

changes in the chemistry of the upper atmosphere, including the ozone layer. Indoor air pollution is a problem in developed countries, where efficient insulation keeps pollutants inside the structure

Air pollutants are CO, CO_2, SO_2, NO_x, Lead, hydrogen sulphide, hydrochloric acid, poly aromatic hydrocarbons, ozone and particulate matter. Sources of air pollution can be grouped into automobiles, industries, domestic sources, miscellaneous. The best indicators are SO_2, smoke and suspended particulate matter. Hazards of air pollution include acute effects, chronic, photo oxidants, green-house effect, thinning of ozone layer and socio economic effects.

The Clean Air Act Amendments of 1970 gave the Environmental Protection Agency (EPA) the authority to establish and enforce air pollution standards and to set emission standards for new factories and extremely hazardous industrial pollutants. The states were required to meet "ambient air quality standards" by regulating the emissions of various pollutants from existing stationary sources, such as power plants and incinerators, in part by the installation of smokestack scrubbers, electrostatic precipitators, and other filters. The result has been limited progress in reducing the quantities of sulfur dioxide, carbon monoxide, nitrogen oxide, ozone, particulate matter, and lead in the air.

2.0 Objectives

i. Define air pollution.
ii. Discuss the different sources of air pollution and the pollutants involved.
iii. Describe the effects of air pollution?
iv. Describe the local, national and international efforts towards reducing pollutants and their effects.

3.0 Main Content

3.1 Air Pollution

Air pollution is the presence in the atmospheric environment of natural and artificial substances that affect human health or well-being, or the well-being of any other specific organism. Air pollution also applies to situations where contaminants impact structures and artifacts or esthetic sensibilities (such as visibility or smell). It involves release into the atmosphere of gases, finely divided solids, or finely dispersed liquid aerosols at rates that

exceed the capacity of the atmosphere to dissipate or to dispose off through incorporation into the biosphere. The main types are indoor and outdoor air pollution.

Indoor Pollution

More than 2 billion people worldwide continue to depend on solid fuel including biomass fuels for cooking. Sources of indoor air pollution include combustion, building material, bio aerosols. Specific diseases associated with indoor pollutant exposure include respiratory illness, childhood acute respiratory illness, and cataract and low birth weight.

3.2 Sources of air pollutants and type of pollutants

Sources may be characterized in a number of ways. First, a distinction may be made between natural and anthropogenic sources. Another frequent classification is in terms of stationary (power plants, incinerators, industrial operations, and space heating) and moving (motor vehicles, ships, aircraft, and rockets) sources. Sources of air pollution can also grouped into automobiles, industries, domestic, and miscellaneous sources.

Air Pollutants

Air pollutants are classified as either directly released or formed by subsequent chemical reactions. A direct release air pollutant is one that is emitted directly from a given source, such as the carbon monoxide or sulfur dioxide, all of which are by-products of combustion; whereas, a subsequent air pollutant is formed in the atmosphere through chemical reactions involving direct release pollutants.

Table 4.1 Sources of air pollutant

Sources of air pollutants	Air pollutants
Automobile	CO, CO_2, hydrocarbons, lead , SO_2, particulate matter, smog
Industries-	CO_2, SO_2, smoke , NO, smog
Domestic	smoke, dust, SO_2,NO
Miscellaneous	Pesticides, nuclear energy programmes.

3.3 Hazard/Effects of air pollution.

Air pollution may possibly harm populations in ways so subtle or slow that they have not yet been detected. What most people experience is determined by how air pollutants interact with

one another in the body and with physical factors such as nutrition, stress, alcohol, cigarette smoking, and common medicines. Causes of discomfort in environment are as a result of chemical and physical changes. Chemical changes results in increased carbon dioxide, reduced oxygen. Physical changes results in increased temperature, humidity, reduced air movement, perspiration and bacterial pollution. Hazards of pollution are acute effects, chronic, photo oxidants, green house effect, thinning of ozone layer and socio economic effects.

Box 4.1

- Acute effects- acute brochiolitis, Acute Rspiratory Infection, pneumonia, emphysema, mortality
- Chronic- COPD, chronic bronchitis, respiratory embarrassment, lung cancers, neuropsychiatric disorders, stillbirths, pneumoconiosis and skin cancer
- Photo oxidants- oxidation of pollutants and its products result in irritation of the eyes, nose and throat, exacerbation of asthma etc.

Greenhouse Effect

Green house effect- This is caused by the formation in the lower layer of air strata a gaseous layer comprising of green house gases. These gases are CO_2, chlorofluorocarbon and methane. This acts in the same way as a glass of green house. The gases take up heat from the sunlight but do not allow it to go out. The trapped heat inside increased the global temperature by about $0.3\text{-}0.6^0$C. Consequences of green house effect are warm and dry climate, reduced global food production, melting of polar of ice caps, rise in sea level, flooding of low lying areas, smog formation, cataracts and cancers.

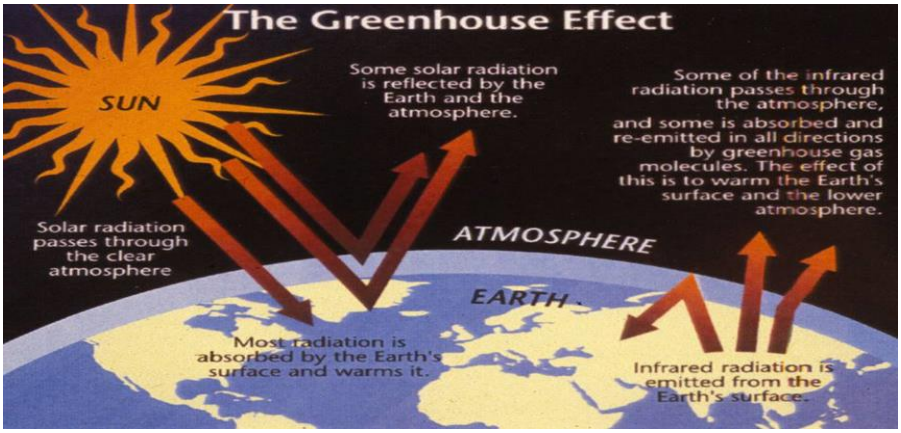
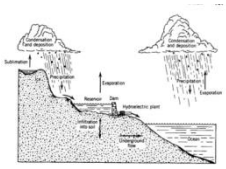


Fig.4.1: The Greenhouse Effect

Thinning of ozone layer.

Thinning of ozone layer - the layer of ozone in the stratosphere prevents harmful UV rays from reaching the atmosphere. Continuous and vigorous air pollution over the years has led to thinning of ozone layer. The adverse effect of the thinning has been reduced photosynthesis leading to reduced crop yield, disruption in food chain and impairment of the protective system of the human skin. Other effects are mostly social and economic impact like increased expenditure, work limitation. Corrosion of metals and building damages leading to increased cost of maintenance, increased accident rate due to poor visibility.

3.4 Climate change and health.



⇧ TEMPERATURE

⇩

PRESSURE

➡ WIND ➡ WEATHER

Figure 4.1 Changes in Climate

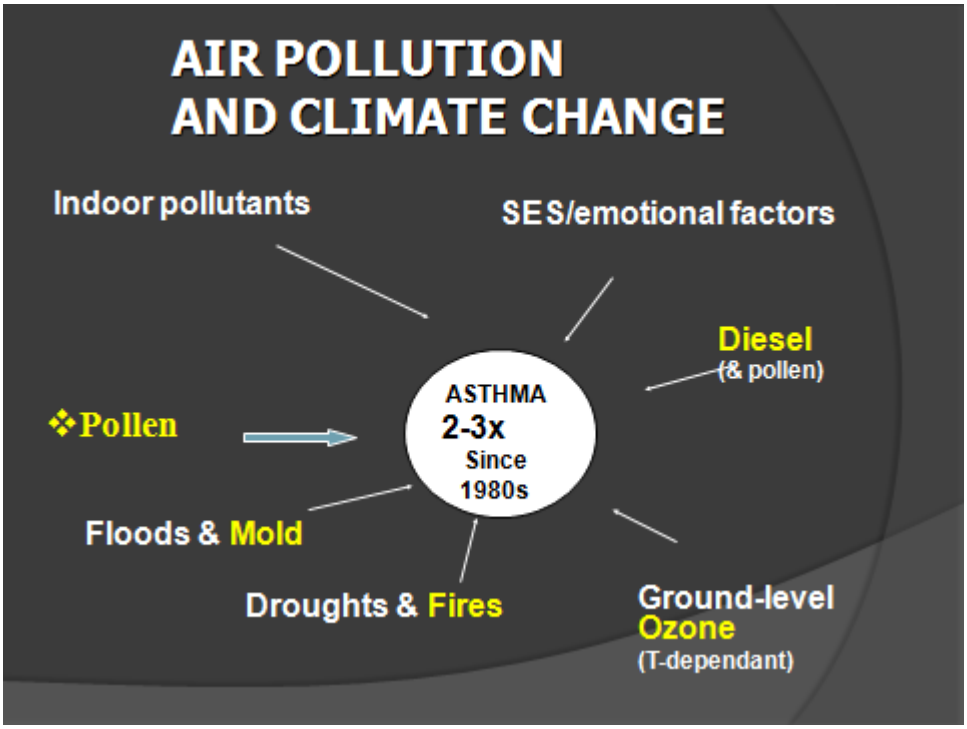


Fig. 4.2: Air pollution and Climate Change.

Health Impacts of Climate Change

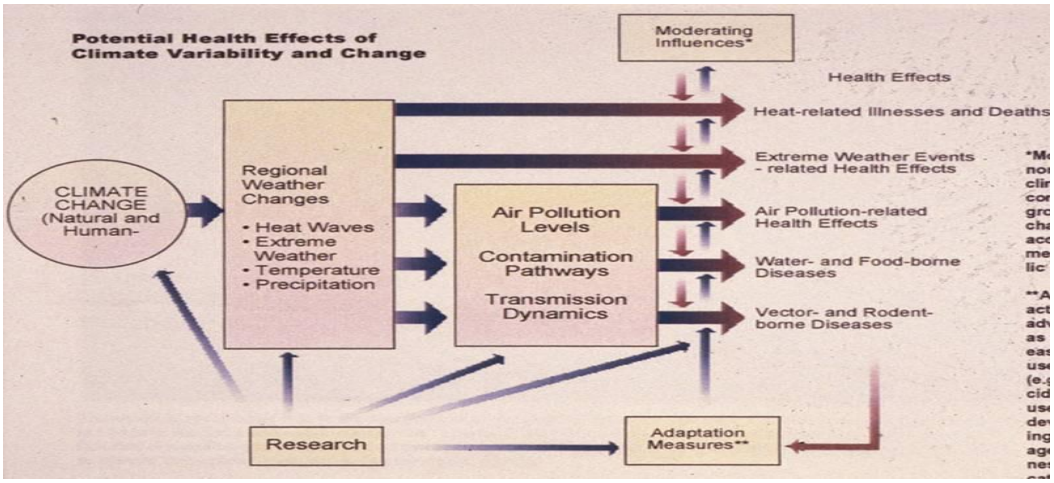


Fig. 4.3: Potential Health Effects of Climate Variability and Change

Levels of solution proffered to effect of climate change on health

i. Surveillance and Response Capacity
ii. Health Early Warning Systems

iii. Environmental, Energy & Economic Policies

3.5 Steps in prevention and control of air pollution

The steps include containment, replacement, dilution, legislation and international action.

i. Measures for containment - prevention of escape of toxic substances into the air by engineering techniques like enclosure, ventilation, electrostatic precipators.

ii. Replacement - replacement of coal by electricity, natural gas, central heating, deleaded petrol, automobile gas.

iii. Dilution - ensuring there is industrial and residential areas.

iv. Legislation and monitoring – suitable legislation exist in the country for containing air pollution e.g. FEPA now ministry of environment.

v. International action- WHO set standards for the gases in the ambient air.

vi. Various treaties – UN habitat, Rio de Janeiro Declaration, Kyoto protocol, Intergovernmental panel on climate change (IPCC).

3.6 Clean Air Quality

The Clean Air Act Amendments of 1970 gave the Environmental Protection Agency (EPA) the authority to establish and enforce air pollution standards and to set emission standards for new factories and extremely hazardous industrial pollutants. The states are required to meet “ambient air quality standards” by regulating the emissions of various pollutants from existing stationary sources, such as power plants and incinerators, in part by the installation of smokestack scrubbers, electrostatic precipitators, and other filters. The 1990 amendments also expanded the scope and strength of the regulations for controlling industrial pollution. The result has been limited progress in reducing the quantities of sulfur dioxide, carbon monoxide, nitrogen oxide, ozone, particulate matter, and lead in the air. The EPA also regulated hazardous air pollutants, which in 1992 included mercury, beryllium, asbestos, vinyl chloride, benzene, radioactive substances, and inorganic arsenic. The most satisfactory long-term solutions to air pollution may well be the elimination of fossil fuels and the ultimate replacement of the internal-combustion engine. In 1992, 150 nations signed a treaty on global warming at the UN-sponsored summit on the environment in Rio de Janeiro. A UN Conference on Climate Change, held in Kyoto, Japan, in 1997, produced an international agreement to combat global warming by sharply reducing emissions of industrial gases.

Although the United States abandoned the treaty in 2001, saying it was counter to U.S. interests.

4.0 Conclusion

Air is essential to health. Presence in air of contaminants and other impurities beyond that which is natural has the potential of causing damage to health of man, plants, animals and aesthetic beauty. Air pollution is usually by-product of human activities and/or from natural sources. The best indicators for air pollution are - smoke, suspended particles and SO2. Actions for control of air pollution include health education; economic empowerment; adequate housing/EH policy; air quality guidelines; monitoring of compliance through routine inspection; effective housing regulation

5.0 Summary

In this unit, you have learnt about the following:

- **i.** Air Pollution
- **ii.** Sources of air pollutants and type of pollutants
- **iii.** Hazard/Effects of air pollution
- **iv.** Climate change and health
- **v.** Steps in prevention and control of air pollution
- **vi.** Clean Air Quality

6.0 Tutor Marked Assignments

6.1 Activity

Find out the contents of the various treaties – UN habitat, Rio de Janeiro Declaration, Kyoto protocol, Intergovernmental panel on climate change (IPCC).

Discuss the contents of the treaties and what you consider as the roles of government, agencies, communities, families, individuals and nurses in the prevention and control of air pollution.

6.2 Please answer the following questions:

i. What is air pollution?
ii. What are the sources of air pollution and the pollutants involved.
iii. What are the effects of air pollution on health?

7.0 References and other resources

Sameer Kumar and Dhruv Katoria (2013) Air Pollution and its Control Measures International Journal of Environmental Engineering and Management 4(5):445-4502 http://www.ripublication.com/ijeem_spl/ijeemv4n5_06.pdf

UNIT FIVE - ADEQUATE AND SAFE WATER SUPPLY

CONTENT

1.0 Introduction

Every 8 seconds a child dies of water-related disease. Over one billion people (nearly one fifth of the world's population) lack access to safe water. Five million people die annually of illnesses linked to: unsafe drinking water, unclean domestic environments, and improper

excreta disposal. Ninety percent of those who die from diarrheal diseases are under five children in developing countries.

Water is a basic human right and essential need. Globally, water is recognised as *a social good, an economic good, and an environmental good.* It has many uses as follows: domestic, agricultural, industrial, public, hydro electric power and transportation. The UN declared 1981 to 1990 as "The International Drinking Water and Sanitation Decade", with the goal of full access to water supply and sanitation to all people. Sources of water include rain water. Ground water (Boreholes, Springs, Deep & Shallow wells) and Surface water (Streams, Rivers, Ponds, Impounding reservoirs, Lakes). The minimum quantity of water required daily has been estimated to range between 20-40 litres per person per day and safe water should be located within a distance of 100 metres from the household residence.

Water treatment is intended to make impure water potable, remove chemical contaminants which may be dangerous to health at values above the threshold and remove microbiological contaminants (pathogenic micro-organisms), thereby preventing water borne diseases. Water Safety Plan (WSP) is an effective means of risk management through a systematic approach in which risks from catchments to consumers are identified and mitigated. It's applicable to all water types and options WSP is divided into three steps: System Assessment, Operational Monitoring and Management and communication

2.0 Objectives

i. identify the various types of water sources and their characteristics
ii. describe the various treatment options for each of the water types
iii. discuss community water supply system emphasizing surface water abstraction and treatment
iv. describe the Water Safety Plan (WSP) and its importance in effective management and sustainability of safe water supply

3.0 Main Content

3.1 Global Commitment on adequate and safe water

The International Drinking Water and Sanitation Decade" was declared by the UN with the goal of full access to water supply and sanitation to all people. Unfortunately, despite that the cost utilised exceeded $700 billion, the target was not achieved. This was followed by The 8 Millennium Development Goals (MDGs) i.e Goal 7 which is to ensure environmental

sustainability; targets reduction by half, the proportion of people without sustainable access to safe drinking water by 2015. However, universal access to safe water through centralized water treatment facilities is a long-term goal. Currently, low-cost interventions at the household & community level are targeted to reduce diarrheal illnesses and ensure survival.

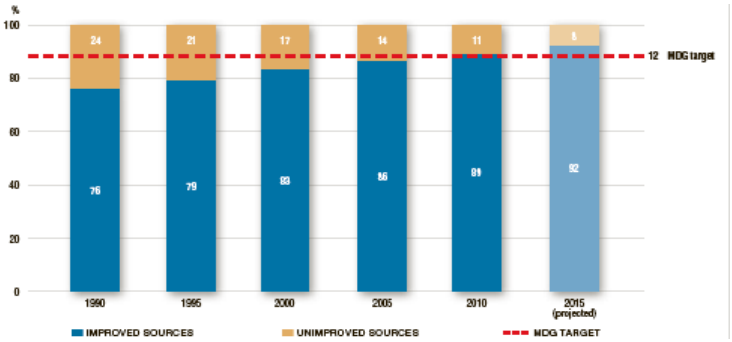


Fig. 5.1: MDG Drinking Water Target

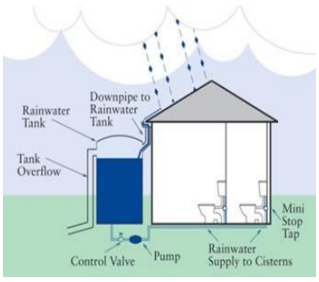
Trends in global drinking water coverage, 1990-2010, projected to 2015.

Source: UNICEF/WHO JMP Report (2012)

3.2 Water Sources and characteristics

Sources of water

i) Rain water Harvesting



More than one million people in Australia rely on rainwater as their primary source of water supply

ii) Ground water (Boreholes, springs, Deep & shallow wells)

iii) Surface water (streams, rivers, ponds, impounding reservoirs, lakes.

Characteristics of potable water

Safe, wholesome and potable water should possess the following attributes:

i. Colourless

ii. Odourless

iii. Pleasant to taste

iv. Free from harmful chemical substances

v. Free from pathogens

3.3 Water Treatment

Water treatment can be done at household, community and industrial levels.

- At household level
  - Boiling, filtration, solar disinfection and chemical treatment could be carried out.

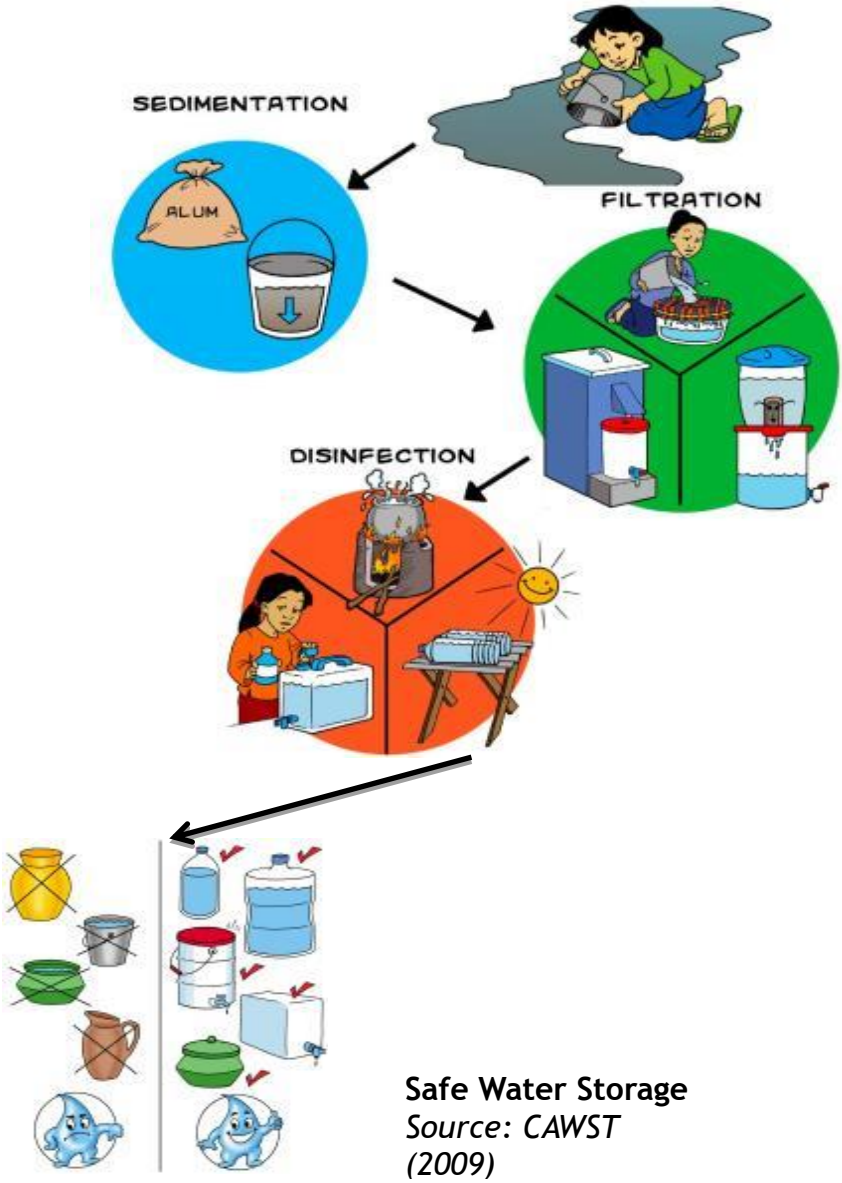
Household or Point-of-Use (PoU) treatment of water is inexpensive but difficult to ensure strict adherence to its principles and proper use by all. The process include

i. *Sedimentation*

ii. *Filtration*

iii. *Disinfection*

iv. *Safe water storage*



Safe Water Storage
Source: CAWST (2009)

Box 5.1 Advantages and disadvantages

Advantages

- Relatively inexpensive
- Independent and done at household level
- Improves microbial water quality and reduces contamination risk between treatment and use
- Wide range of simple, low-cost technologies are available

Disadvantages

- Difficult to monitor correct operation and maintenance (O&M) of technologies
- High self-responsibility required from households
- Each households should be knowledgeable on O&M of the system
- Treated water may have lower quality than that of the community water treatment corporations

Coagulation and Flocculation

The process involves addition chemical coagulants (Alum) and plant coagulants (Cactus) into water in households. The additives encourage settlement of suspended solids by forming larger particles which precipitate (fall to the bottom) and easily removed by settling or filtration.

Alum block

Cactus *Source: http://: www.cdc.org*

Box 5.2 Advantages and Disadvantages of Coagulation and Flocculation.

Advantages

- Low costs
- Simple and easy
- 80.0 to 99.5% reduction in turbidity
- 90 to 99.99% bacterial reduction.

Disadvantages

- Time intensive

Physical Straining

Source: IFRC, 2008

Box 5.3 Advantages and Disadvantages

Advantages

- Low cost
- Required minimal time
- Simple and easy to reduce turbidity
- Known to reduce risk of cholera

Disadvantages

- Requires immediate washing of cloth after use
- Cloth fibre loosen significantly the more they are used
- Does not remove all bacteria and viruses

Chemical disinfection – liquid chlorination

Box 5.4 Advantages and Disadvantages

Advantages

- Provides residual chlorine for protection
- Inexpensive
- Available globally
- Simple and easy to use
- Quick action

Disadvantages

- Can not inactivate parasites like *Guardia*, *Cryptosporidium* and *worm eggs*
- Requires clear water to be very effective
- Formation of by-product if source water has high organic content

Boiling

Box 5.5 Advantages and Disadvantages

Advantages

- Effectively kills most pathogens
- Does not change the taste of the water
- Simple and widely accepted

Disadvantages

- Time-consuming
- Uses traditional energy sources (firewood/kerosene/gas)
- Contributes to indoor air pollution
- Water tastes flat (fizzy)

Safe water storage

Safe storage involves storing water in a suitable position within the house using a clean and appropriate container .The storage container should have the following qualities:

i. *Strong with tightly fitting lid or cover*

ii. *Spigot, tap or narrow opening*

iii. *Stable base*

iv. *Durable*

v. *Gives room for air to enter as water is poured*

Source: Dangol and Sphuler, 2010

3.4 Community drinking water treatment systems

Surface water is the source and targets. The processes involved are turbidity and color removal, screening, aeration, ccoagulation and sedimentation, filtration and disinfection. After these processes, water is stored and distributed to the community for consumption.

Central treatment plants may be expensive and difficult to manage. There is possible contamination during distribution.

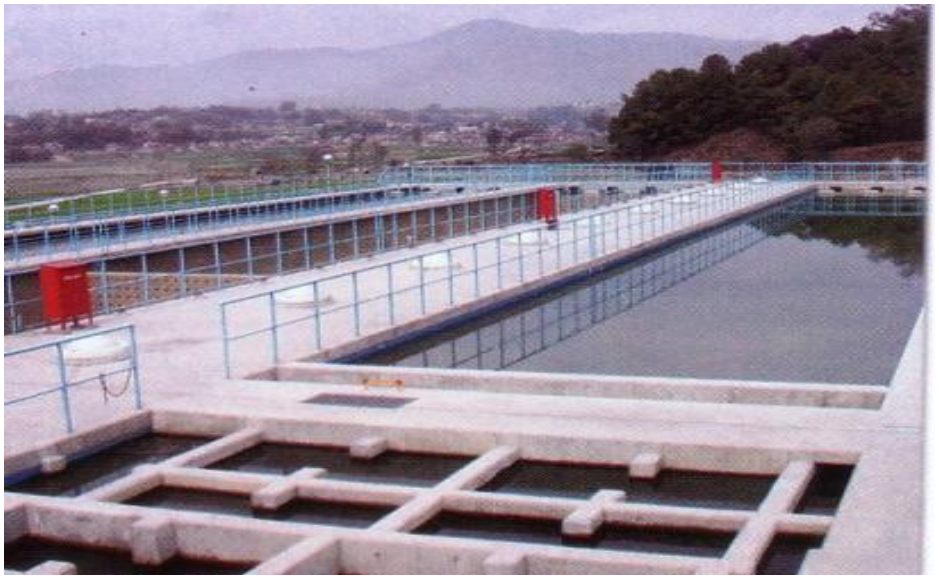
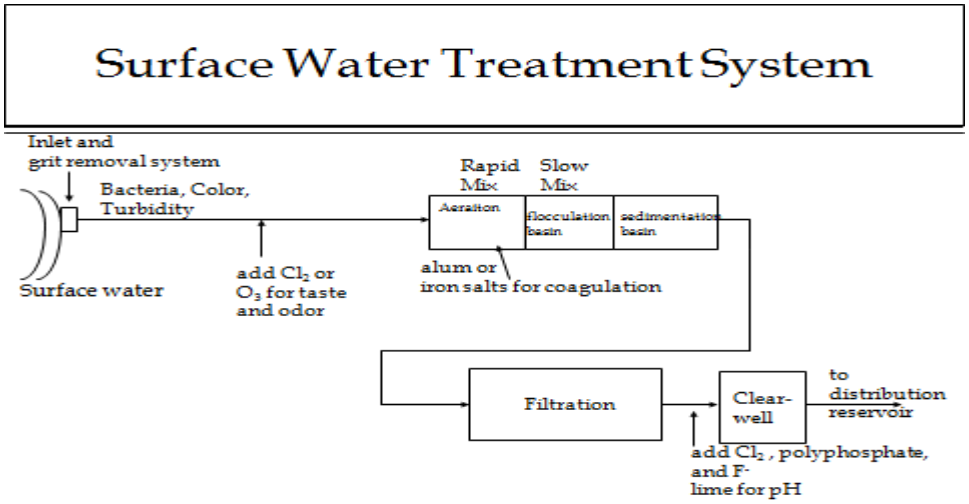


Fig. 5.2: Water Treatment Plant



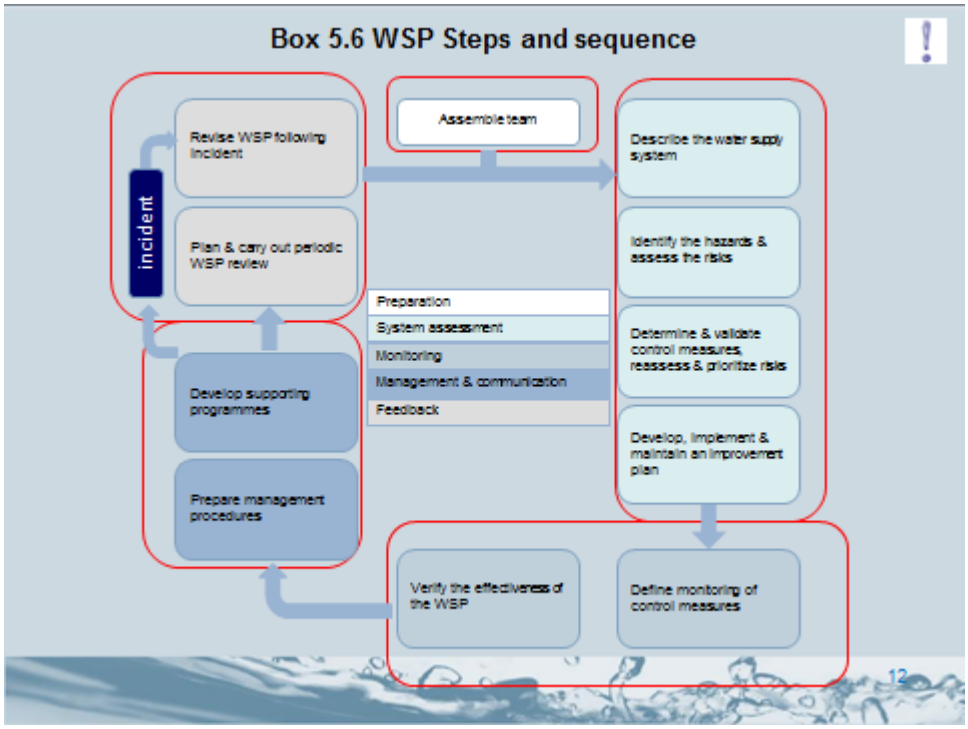
3.5 Water Safety Plan (WSP) within the concept of safe water supply

Water Safety Plan (WSP) has replaced water quality surveillance. It is applicable to all water types and options. WSP is divided into three steps:

1. Preparation
2. System Assessment

- Risk assessment
- Risk mitigation (Action Plan)

3. Monitoring
4. Management and communication
5. Feedback



4.0 Conclusion

The basic types of water sources are rain water harvesting, ground water (springs, BHs and wells) and surface water sources (rivers and streams). The characteristics of potable water are colourless, odourless, pleasant to taste, free from harmful chemical substances and free from pathogens. Water can be treated at household, community and industrial levels. Application of WSP in place of water quality surveillance to ensure sustainable supply of safe water sources is the new approach. Strategy to achieve WSP includes preparation, system assessment, monitoring, management and communication and feedback.

5.0 Summary

In this unit, you have learnt about the following:

i. Global Commitment on adequate and safe water
ii. Water Sources and characteristics
iii. Water Treatment
iv. Community drinking water treatment systems
v. Water Safety Plan (WSP) within the concept of safe water supply

6.0 Tutor Marked Assignments

6.1 Activity

In your community of residence, find out different sources of water available for people's use. Take samples from at least 3 of the sources and describe the quality of the water that you got from each source. Interview at least 5 people about how they manage the water before use and how they store their water. Share your findings in the class discussion forum and keep your report in your portfolio.

6.2 Please answer the following questions:

i. What are the types of water sources and their characteristics?
ii. Describe the various treatment options for each of the water types
iii. Discuss community water supply system emphasizing surface water abstraction and treatment
iv. Describe the Water Safety Plan (WSP) and its importance in effective management and sustainability of safe water supply

7.0 References and other resources

World Health Organization (2015) Water Sanitation http://www.who.int/water_sanitation_health/hygiene/en/ accessed on 12 September 2015

World Health Organization (2015). Investing in Water and Sanitation http://apps.who.int/iris/bitstream/10665/139735/1/9789241508087_eng.pdf accessed on 12 September 2015

World Health Organization (2015). Health through safe drinking water and basic sanitation http://www.who.int/water_sanitation_health/mdg1/en/print.html accessed on 12 September 2015

UNICEF (2015) The right to safe water and to sanitation. Current Issues 3:1-5 http://www.unicef.org/esaro/Current_Issues_Paper-The_Rights_to_Safe_Water_and_Sanitation.pdf accessed on 12 September 2015

MODULE 2

Unit 6: Waste management and disposal
Unit 7: Vector control
Unit 8: Role of environmental health professionals
Unit 9: Disaster management
Unit 10: Public and environmental health laws

Introduction

This module covers management of waste and control of those things in the environment that can cause danger to human beings. It also provide information on constitutional provisions through laws to manage the environment to reduce risks of dangers to people. The roles of professionals are also covered.

Objectives

At the end of this module, you should be able to discuss and apply relevant knowledge and laws in taking actions to control for vectors that can endanger the members of the public.

UNIT SIX - WASTE MANAGEMENT AND DISPOSAL

CONTENT

Solid and Liquid waste management

Fig. 6.1: Municipal Solid Waste

World Health Organization (1990) classified waste substances as comprising of solid waste, liquid waste and, gaseous waste

1.0 Introduction

High population, refuse generation and poor solid waste management are nagging sources of concern. Urban wastes will more than quadruple by the year 2025. Uncollected waste encourages the breeding of flies, mosquitoes, and attracts rodents and stray animals that may spread disease. Dust particles from waste heaps can contain heavy metals - lead, mercury, cadmium, and arsenic; all harmful to humans. Drinking water can be polluted via leachate from waste dumps, causing diarrhea, gastroenteritis, cholera, typhoid, and dysentery.

Municipal solid waste (MSW) is defined to include refuse from households, non-hazardous solid waste from industrial, commercial and institutional establishments (including hospitals), market waste, yard waste, and street sweepings. Municipal solid waste management (MSWM) refers to the collection, transfer, treatment, recycling, resources recovery and disposal of solid waste in urban areas. The goals of municipal solid waste management are to promote the quality of the urban environment, generate employment and income, and protect environmental health and support the efficiency and productivity of the economy.

Human Excreta is a source of pathogenic organisms, infection and an important cause of environmental pollution. Flies have affinity for faeces and spread pathogenic organisms

contained in faeces and also breed them. There is a need to manage this safely. Health hazards of excreta include soil/water pollution, food contamination, and flies propagation, among others. As at 2000, an estimated 2.4 billion people lack access to adequate means of excreta disposal (WHO, 2000) An estimated 2.6 billion people lack access to improved sanitation (defined as facilities that hygienically separate human excreta from human contact (WHO, 2010). Most urban cities in African and Asia lacks sewerage system. On sanitation, Nigeria is 5th highest in hierarchy in Open Defecation practice, after India (626m), Indonesia (63m), Pakistan (40m) and Ethiopia (38m). Available statistics revealed that Nigeria is not on track to achieving the sanitation target of the MDG of achieving 63% access to improved sanitation by the population by 2015

- as nearly 100 million people have no access to improved sanitation, and
- a large portion of the population (34 million people) practice open defecation .

Sewage Disposal methods in household are sanitation ladder (pit latrine and its modification); pour flush water system, water closet, septic tank system and chemical closet. Diseases can be transmitted through faecal contamination of water, food from primary host fingers or flies or contamination of soil. A new host can be infected through these means.

The objective of safe management of faeces (SMoF) is to:

i. dispose of potentially dangerous excreta
ii. Prevent proliferation of vectors that might breed in such waste.

Sewage treatment could be primary, secondary or tertiary.

2.0 Learning Objectives

At the end of this Unit you will be able to:

i. define waste management, sewage , sullage and key words in bold
ii. discuss the basic concepts and components of waste management
iii. describe the strategies of waste management
iv. list the features and discuss the principles of sanitary toilets
v. describe sanitation ladder and types of excreta disposal facilities.
vi. critique the different excreta management options
vii. describe the F-diagram and transmission routes for faecal coliforms

3.0 Main Content

3.1 Solid waste

Solid wastes are organic and inorganic substances that are not freely flowing. It comprises rubbish/trash (paper, plastics, wood, metal, and throw away containers), garbage (food wastes) and construction debris (broken pieces of bricks, pipes, among others), sewage treatment residue (sludge and solids from the coarse screening of domestic sewage), dead animals, manure and other discarded materials.

Sources of Solid waste

i. Street refuse - Street cleansing which contains leaves, straw, paper, animal droppings and litters
ii. Market refuse – refuse collected from markets, containing large quantity of organic matter
iii. Stable litter – animal droppings and left –over animal feeds
iv. Industrial refuse – collected from industries and ranges from chemicals which may be inert and toxic depending on the raw materials
v. Domestic refuse - ash, rubbish and garbage
vi. Medical wastes – collected from hospitals

3.2 Management of Solid waste

i. Storage (in the generating premises)
ii. Collection and transportation
iii. Reduce, Reuse and Recycle/Disposal

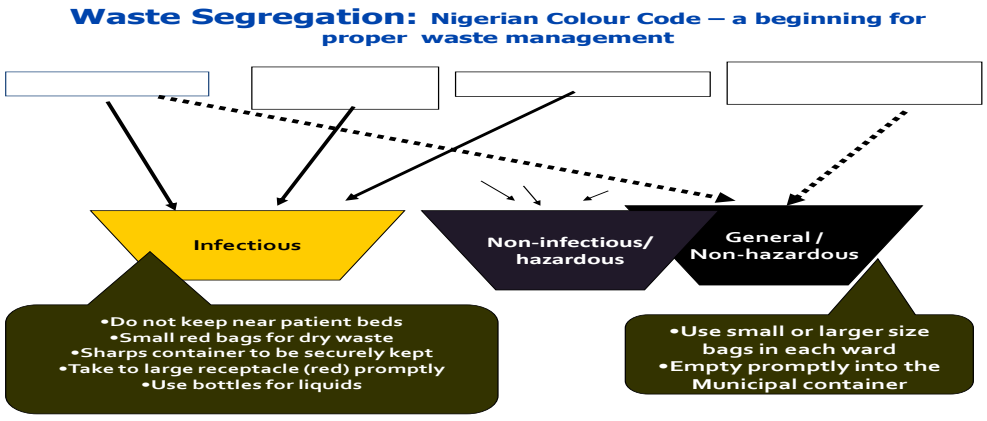


Fig. 6.1: Waste Segregation.

Solid wastes storage

Solid waste storage requires the provision of adequate number of containers to hold the quantity of refuse generated.

- The type of container, placement (where maximum convenience is assured for the user and collector), are important considerations

The primary responsibility of waste generator is safe storage before collection

- Depending on the type and nature of the refuse generated
- Depending on the waste components

Examples of solid wastes retainers are sacks, plastic/ metal bins, nylon made for that purpose and paper sacks.

Waste storage bin volume is determined by the volume generated & frequency of collection and waste bin should be kept 2-3 inches above ground level to prevent flood from access to the bins.

Collection and transportation

Waste collection is the collection of solid waste from point of generation (residential, industrial, commercial, institutional) to the point of treatment or disposal. Refuse collection staff need protective clothing and education to reduce the risk of infection

Solid wastes could be

i. collected and emptied directly into refuse transport vehicles
ii. Aggregated in designated refuse depots from where the refuse transport lorry picks it up
iii. Hydraulic operated Refuse compactors

Box 6.1

MSW is collected in several ways:

1. **House-to-House: C**ollectors visit individual houses to collect garbage. The user pays a fee for this service.
2. **Community Bins:** Users bring their garbage to community bins, at fixed locations in the locality. MSW is picked up by the authority, or its designate, according to a schedule.
3. **Curbside Pick-Up**: Users leave their garbage in front of their homes at a pick-up schedule day (secondary house-to house)
4. **Self delivered**: Generators deliver the waste directly to treatment/disposal sites or transfer stations, or hire third-party operators (or the municipality).
5. **Contracted or delegated service**: Businesses hire firms (or municipality with municipal facilities) who arrange collection schedules and charges with customers. Municipalities often license private operators and may designate

Box 6.2 Hazards of poorly-managed solid waste

- Unsightly appearance
- Breeding of flies
- Biodegradation and decomposition leading to odour
- Attracts rodents and vermin
- The pathogens contained in wastes may be transferred to food
- Possibility of water and soil pollution

Methods of disposal

There are myriads of solid waste disposal methods and none is simple. The choice of disposal method is determined by prevailing local factors such as cost, labour, cultural belief of the community, land availability, type of waste, volume produced. Refuse dumping site should not be nearest to human habitation and sources of water supply. Disposals methods are burning (incineration), open dumping (landfill), controlled tipping, composting, manure pits.

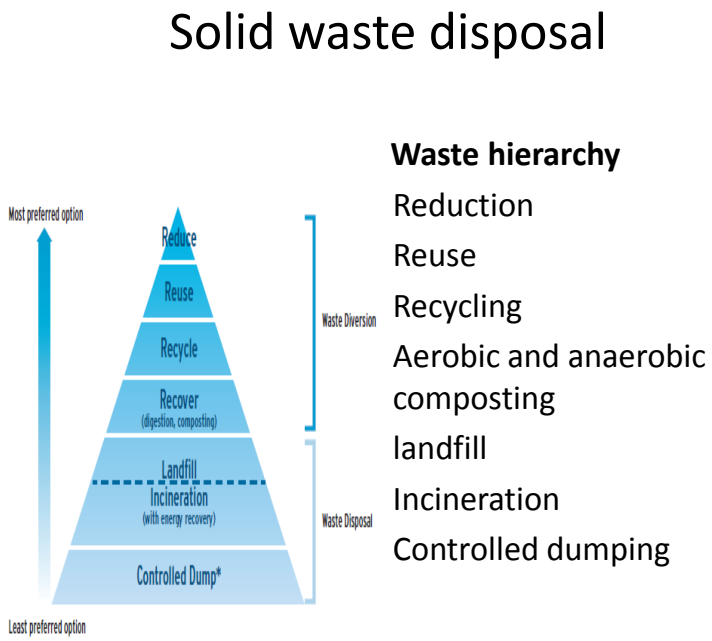


Fig. 6.2: Waste Hierarchy

Open Burning

It is not synonymous with incineration and not a sanitary method of solid waste disposal. It is done where there is no organised waste collection method

Disadvantages

i. Fire risk
ii. Contributes CO2 and promotes global warming
iii. Risk of atmospheric pollution

Open dumping

This method is practised in low lying areas, as a form of land reclamation and also not a sanitary method of waste disposal. It is applicable to domestic wastes, where it decomposes and turned to humus

Disadvantages

i. Refuse exposure to flies and rodents
ii. Source of smell and unsightly in appearance
iii. Dispersal of refuse by wind
iv. Leachates contributes to soil/water resources pollution

Controlled tipping

It is appropriate where ***suitable*** land is available.

Material is placed in a trench, covered/ compacted with soil daily. The method is dependent on the nature of the available land (Trench, Ramp (sloppy) and Area (depression)). Top soil cover of at least 30 cm, evenly spread. The earth cover should be compacted. Chemical, physical and bacteriological changes occur in buried refuse. In compacted waste, temperature rises to above $60^{O}C$ within 7 days; kills all pathogens and hasten the decomposition process. The temperature in the layer cools down at about 2-3 weeks, while it takes 4-6 months to fully decompose into organic matter, depending on the weather conditions.

Incineration

This is an option where land is not available. It is particularly suitable for medical wastes streams generated in the hospitals. It requires high temperature, dry oxidation process that reduces organic and combustible waste to inorganic combustible matter which results in waste-volume and weight reduction. It is also an option for wastes that cannot be recycled, reused or disposed off in a landfill site but expensive to install, operate and maintained. Considerations for effective incineration: Time, Turbulence (mixing), Temperature (75 – $1000^{O}C$) and Oxygen. The heat produced destroys pathogens.

Composting

Composting is a process that fulfils several waste management purposes: stabilization (produce a material that does not putrefy, self-heat, deplete oxygen, produce odour or attract vermin), volume reduction, and sanitization by thermal inactivation of pathogens. The refuse and vegetable matters are converted to stable organic humus. The process ensures that warm and moist environment is maintained through the action of micro-organisms present in refuse. It can be aerobic or an-aerobic.

6.2 Liquid waste

Sewage Disposal in household

Human excreta constitute a major waste originating from the household. Other forms liquid emanating from household activities are also expected to be processed for healthy environment. Three are various ways of waste disposal.

i) Sanitation Ladder

- Pit latrine and its various modifications e.g.
    - Conventional Pit
    - VIP- Ventilated *Improved* Pit
    - Sanitation Platform (SanPlat) latrine

ii) Pour flush toilet system

- Water closet system

iii) Septic tank system

- septic tank
- piped sewer system

iv) Chemical Closet- oxidation processes using chemicals. It is affordable and used in:

- Air craft
- Vehicles
- Mobile toilets

Table 6.1: Classification of Excreta disposal facilities

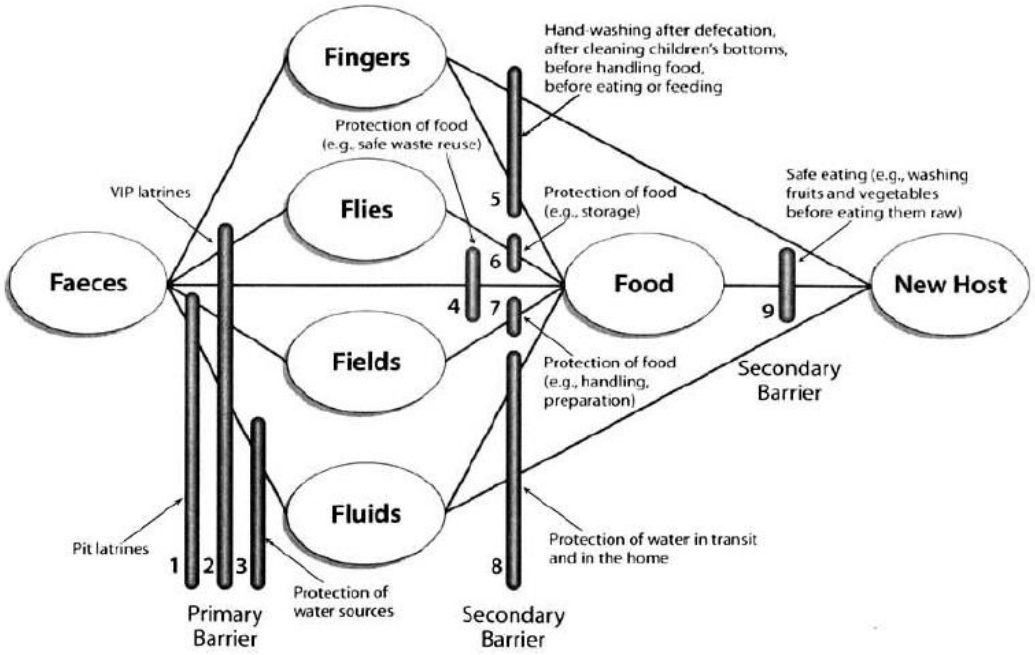
Classification	Sanitation Facilities
• Improved	Use of: • Flush or pour-flush to: • – Piped sewer system • – Septic tank • – Pit latrine • Ventilated improved pit (VIP) latrine • Pit latrine with slab • Composting toilet
• Unimproved	Use of: • Flush or pour-flush to elsewhere (that is, not to piped sewer system, septic tank or pit latrine) • Pit latrine without slab, or open pit • Bucket • Hanging toilet or hanging latrine • Shared or public facilities of any type • No facilities, bush or field • (open defecation)

Box 6.4 Determinant of household sanitation facility

The choice of technology in use for excreta disposal in households is dependent on:

- socio-economic status
- availability of water
- Prevailing culture and practices
- availability of technical know-how
- Popularity of the system
- onsite/off site
- pollution and health risks potentials
- relative and absolute local skills for construction
- Cost

Disease transmission from Faeces (F-Diagram) and possible barriers



Box 6.4 Features of Sanitary well

- Should not contaminate the ground/surface water
- Should not pollute the soil
- Should not be accessible to flies, rodents, animals and other vehicles of transmission
- Should not create a nuisance due to odour or unsightly appearance

Box 6.5 Principles of excreta disposal facilities

- Safety of all. Designed to prevent small children from fallen into it
- Built using hygienic and easy to clean materials
- Accessible to all
- Designed to minimize proliferation and harbourage of disease vectors
- Offer privacy to users
- Located to avoid potential on contamination water sources
- Avoid handling fresh faeces

Methods of sewage treatment

Primary treatment

- Screening
- Removal of grit
- Plain sedimentation

Secondary treatment

- Trickling filters
- Activated sludge

Others

- Oxidation pond
- Oxidation ditch
- Constructed wetlands

4.0 Conclusion

Solid waste or refuse is defined as useless, unwanted or discarded materials that arise from mans' activities. Sewage is free flowing wastes. It can be categorised into 2 main types – garbage (fermentable organic waste) that decompose easily and rubbish (non fermentable wastes) that decomposes slowly. The 3R strategies are the keys to proper management of solid waste - Reduction, Recycling and prompt removal. These strategies should be observed in all aspects of the refuse generation, storage, and collection and disposal chain. Final disposal methods could be sanitary or unsanitary i.e incineration, sanitary landfill, open burning and dumping. Health care waste includes waste generated by health care establishments, research facilities and laboratories. A sewerage system is a series of underground pipes collecting and transporting sewage and household sullage from the various houses in the community to a central point the effluents are treated.. The options of sanitation facilities can be broadly categorised into on -site and off-site systems. The onsite facilities can be subdivided into flush-and –discharge and drop-and-store systems. Sludge from septic tank should not be indiscriminately discharged into the river. The sludge need to be treated. It undergoes primary, secondary treatment and other forms of treatment before the effluent can be discharged into river.

5.0 Summary

In this unit, you have learnt about the following:

i. Solid waste
ii. Management of Solid waste
iii. Liquid waste

6.0 Tutor Marked Assignments

6.1 Activity

Management of Hospital Waste is a major concern for every health care professional as to ensure safety of the staff, the patients and their family members. Visit a public hospital (primary, secondary or tertiary) close to your residence or place of work. Investigate how wastes are managed and submit your write up to your course tutors within 2 weeks of doing this unit.

6.2 Please answer the following questions:

i. What is waste management?
ii. What are the components of waste management
iii. describe the strategies of waste management
iv. list the features and discuss the principles of sanitary toilets
v. describe sanitation ladder and types of excreta disposal facilities.
vi. critique the different excreta management options
vii. describe the F-diagram and transmission routes for faecal coliforms

7.0 References and other resources

Hester, R.E and Harrison R.M., (2002). Environmental and Health Impact of Solid Waste Management Activities

UNIT SEVEN - VECTOR CONTROL

CONTENT

1.0 Introduction

Vectors are invertebrates or vertebrate animals capable of transmitting infection from an infected person or animal to another. Vectors harbor the diseases causing organisms; it could either be involved in the life cycle or just be a medium of transmission of the disease causing agent which could be mechanical, biological or physical. Most vectors are mosquitoes; others are lice, ticks, flies- house fly, chrisoms, sand fly, black fly etc, mites and rodents. Examples of vector borne diseases are malaria, trypanosomiaisis, filariasis, viral hemorrhagic fevers, typhus fever, pediculosis, scabies, plague and recently Lassa fever. They can be controlled by use of physical, biological, chemical methods and genetics. Recently, integrated methods have been found extremely successful in the control of vectors.

Many vectors which were thought to have been controlled have been emerging presently. Reasons are insecticide resistance, lack of research in this field, lack of constant surveillance. There is a need for systematic studies on the vectors i.e knowledge on the habitat and habitats of vectors are important.

2.0 Objectives

At the end of this unit, you should be able to:

i. define vector and List the vectors of public health importance and vector borne diseases
ii. discuss the medium of transmission of disease through vector.
iii. describe the characteristics of vectors.
iv. discuss the various methods available for vector control.

3.0 Main Content

3.1 Vectors and diseases transmitted

Vectors are invertebrates or vertebrate animals capable of transmitting infection from an infected person or animal to another. Common vectors include arthropods especially insects. Arthropods are broadly classified into 3 classes- Insecta, Arachnida, Crustacea.

All have 3 common basic morphology and distinctive body parts, body divisions, antennae, legs and wings.

Insecta- has head, thorax and abdomen, 3 pairs of legs, I antennae, one/two wings and habitat is land. Examples are mosquito, flies, fleas, lice and Reduvid bugs

Arachnida- has cephalothorax, abdomen, 4 pairs of legs, no antennae, no wings and habitat is land. Examples are ticks (hard and soft) and mites (itch mite)

Crustacea- has cephalothorax, abdomen, 5 pairs of legs, 2 pairs of antennae, no wings and habitat is water. Examples -Cyclops

Table 91.1: Classification of arthropods based on distinctive characteristics

	Insecta	*Arachnida*	*Crustacea*
1. Body divisions	Head, thorax abdomen	Cephalothorax abdomen	Cephalothorax abdome
2. Legs	3 pairs	4 pairs	5 pairs
3. Antennae	1	None	2 pairs
4. Wings	One/two, wingless	None	None
5. Habitat	Land	Land	Water

Table 7.1: Vectors and the diseases transmitted.

VECTORS	DISEASES TRANSMITTED
Anopheles mosquito	Malaria
Culex mosquito	Lymphatic filariasis
Aedes mosquito	Yellow fever
Glossina	Trypanosomiasis
Phlebotomus	Leishmaniasis
Chrysops	loasis
Cyclops	Drancontiasis
House fly	Enteric infections, trachoma
Flea	Plague
Mite	Scabies
Louse/ Tick	Typhus/ Relapsing fever

3.2. Methods of transmission

Vectors transmit or cause diseases by three methods:

Direct contact: The vector is the direct cause of the disease and is often transmitted through contact, from one person to the other. Examples include scabies and pediculosis. Infected vector inoculate the infective agents from its salivary secretions into new host. Host become infected through contamination of his mucous membrane or skin by infected feaces of the vector. Through contamination by infective tissues fluids which are released when the vector is crushed

Mechanical transmission: This takes place when the vector only serves as a carriage in the transmission of the disease; carrying disease agent from one source to the next host. Vectors carry infective agents on its body or limbs. Infective agents may be ingested by the vector and passes unmodified and excreted in feaces. Vectors like housefly serve as mechanical vectors for the transmission of diseases like diarrhoea and trachoma.

Biological transmission occurs

When vector provides a site for the multiplication of the disease agent, as is the case with plague in rat flea or when vector provides a site for the disease agent to undergo certain developmental changes with multiplication in number (cyclopropagative) as is the case with the malaria parasite in anopheles mosquito.

Sometimes, the vector only serves for the development into infective stage of the disease agent, without any increase in the number of the agent (cyclodevelopmental), as is the case with the filarial parasite in Culex mosquito, and the guinea worm embryo in Cyclops. In some instances, the vector may acquire infection congenitally by transovarian passage.

3.3 Characteristic of vectors

i) Anopheles mosquitoes-Life cycle- it passes through four stages- egg, larva, pupa and adult. Eggs are dark bodies visible and laid in clean water, leaves or steam of aquatic plants. Egg stage last two days in favorable conditions. Larva is released when egg shell is broken. It is an exclusively surface feeder and float just below the surface of water. It is active and shows swift movements. It has preference for breeding places like collection of rain water, irrigation dams. Larval stage gets completed in 5 days. Pupa is also active swimmer; comma shaped and sees with its eyes but can't feed with the mouth. It last 24-48 hours depending on temperature and seasonal factors. Adult – period of oviposition to emergence of first offspring takes 7-10 days.It starts mating day one after emergence. Food preference-anthrophilic or zoophilic. Anopheles is both, keeping animals may be protective. Blood meal of female anopheles is essential for maturation of ovum. After feeding, female mosquito rest in sheltered place for purpose of digesting blood and development of ovum. Anophele mosquitoes cover long distance –0.75-1.5 km. Length of life of adult female is 2 weeks. It is an important vector in epidemiology of malaria .The longer it lives the greater is the chance of being infected or infective.

ii) Culex mosquito- principal intermediate host of wuchereria Bancroft. It is essentially domestic and peri domestic species Life cycle-Egg- laid in polluted water, contaminated with sewage. It is laid in clusters acquired the shape of raft and has micropollar process at one end. Egg stage last 2 days, hatches and larva emerges. Larva has a long and narrow siphon tube, respiratory openings at the end of siphon tube. It has much slower and snake like movement and hangs from surface but not a surface feeder. It subsists on bacterial and other organic materials .Larva stage lasts 5-6 days. The ppupa is comma shaped stage last 2 days. The period of egg to adult stage takes 8-10 day. Egg, larva and pupa are aquatic stages. Adult – head, thorax and abdomen, thorax makes an angle with abdomen. The Flight range is 1.5-2km. It is very active in dusk and night Female sucks blood and is anthrophilic. Culex quinquefaciatus is prevalent universally, important vector of W. Bancroft. It is anthrophilic and endophagic.

iii) Aedes aegypti is a vector of dengue and yellow fever. It is commonly known as container mosquito (it breeds in containers). It was initially regarded as urban vector, has now spread to vast rural areas .The breeding sites are storage tanks, receptacles with rain water collected. Life cycles- female lay eggs in containers, eggs are elongate and blackish. Egg when flooded hatch rapidly leading to emergence of larvae. Pupa stage last for 24-30 hours leading emergence of adult mosquito. The adult mmosquito is of black or blackish brown color with silvery spots and marking. Because of these characters, it is called as tiger mosquito. Adult seek dark and quiet places to rest in bathrooms, bedrooms, kitchen walls, furniture .Female mosquitoes bite throughout the day, quite vigorous and bite many persons. Flight range is 50-100 meters. Diseases transmitted dengue and yellow hemorrhagic fever

iv) Sand fly- head, thorax and abdomen smaller than mosquitoes. The winks are upright, usually hop and rarely fly. Nocturnal pests live in crevices, holes, store rooms and dark places. Only female bite and hop about breeding sites Life cycle- eggs -7 days, larva 2 weeks, pupa- 1 week and adult 2 weeks. It is the causative organism for Leishmaniasis.

v) Tsetse fly-head, thorax, abdomen. Has wings and proboscis it Live in vegetations near woodland LC- female give births to larva every 10 days, pupa- 20-40 days, lifespan 100days . Disease- African/ American sleeping sickness.

vi) Mites characteristics- less demarcated, head, thorax and abdomen.,4 pairs of legs and suckers on the legs. LC- egg- 2-3 eggs/day adult dies after egg lying; larva matures to nymph in 3 days, nymph 6-8 days, adult- egg to adult- 10-15 days. Lifespan1-2 months. Mode of transmission- close contact, contaminated clothes. Diagnosis- persistent itch, follicles over the hands, wrist, extensor aspect of elbow, axilla, buttocks, feet, ankles, pals, breast and genitals.

vii) Cyclops characteristics- pear shaped, 2 pairs of antennae, legs segmented, eye. It is an intermediate host of guinea worm. Man acquires infection by drinking water with Cyclops. Disease- guinea worm, fish tapeworm.

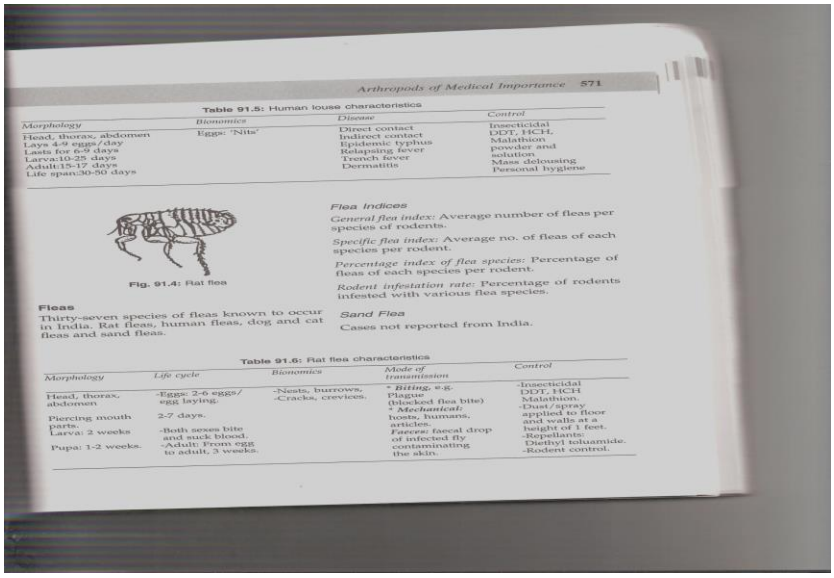


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Table 91.5: Human louse characteristics

Morphology	Bionomics	Disease	Control
Head, thorax, abdomen Lays 4-9 eggs/day Lasts for 6-9 days Larva:10-25 days Adult:15-17 days Life span:30-50 days	Eggs: 'Nits'	Direct contact Indirect contact Epidemic typhus Relapsing fever Trench fever Dermatitis	Insecticidal DDT, HCH, Malathion powder and solution Mass delousing Personal hygiene

Fig. 91.4: Rat flea

Fleas
Thirty-seven species of fleas known to occur in India. Rat fleas, human fleas, dog and cat fleas and sand fleas.

Flea Indices
General flea index: Average number of fleas per species of rodents.
Specific flea index: Average no. of fleas of each species per rodent.
Percentage index of flea species: Percentage of fleas of each species per rodent.
Rodent infestation rate: Percentage of rodents infested with various flea species.

Sand Flea
Cases not reported from India.

Table 91.6: Rat flea characteristics

Morphology	Life cycle	Bionomics	Mode of transmission	Control
Head, thorax, abdomen Piercing mouth parts. Larva: 2 weeks Pupa: 1-2 weeks.	-Eggs: 2-6 eggs/ egg laying. 2-7 days. -Both sexes bite and suck blood. -Adult: From egg to adult, 3 weeks.	-Nests, burrows, -Cracks, crevices.	* *Biting*, e.g. Plague (blocked flea bite) * *Mechanical:* hosts, humans, articles. *Faeces:* faecal drop of infected fly contaminating the skin.	-Insecticidal DDT, HCH Malathion. -Dust/spray applied to floor and walls at a height of 1 feet. -Repellants: Diethyl toluamide. -Rodent control.

Fig. 7.1: Morphology and characteristics of head louse and rat flea

3.4 Control of vectors

The idea of control of disease vectors came to been at the end of 19th century when effective vaccines or drugs were no available for the prevention or treatment of the diseases. Early control programmes include screening of houses. use of mosquito nets , drainage swamps and other water bodies used by vectors as breeding sites and application of oil to breeding places.

The discovery of DDT (dicholoro –diphenyl-trichloroethane) in 1940s brought hope for the likely eradication of vector borne diseases but the success was ruptured by the development of resistance by the vectors. Currently vectors control is carried out as an integrated process that is chemical control is backed up with environmental management and biological control.

Chemical control

Insecticides are the most manufactured for use in agriculture, affect insects of public health importance. But cause poisoning in man. Modes of action are through knock down or residual. Knock down insecticides contain pyrethrum sometimes in additional to DDT. It is fine spray used to get rid of adult and effect last short time. It can use for rapid control as in epidemics of an insect borne disease. Residual has long continued effect (6 months duration). Examples are DDT, BHC & Dieldrin. Organic phosphorus insecticides. The methods of application are through aerosols, fogs, vapors and smokes. Aerial spraying, larvicides, water dispersible powder and solutions & emissions. Insect of public health importance have developed resistance to insecticides. The only measure to overcome this is changing the

insecticides. However aall residual insecticides are toxic. The pprecautions are to avoid contact with concentrated especially when in solutions or emulsions. There is possibility of damage to wildlife and e-benefits for increasing food production

Biological Control

These control measures are designed to restrict development of insect pests. . Exposing the insect pest to predators and parasites- biological agents have been investigated for control of arthropod pests. Through fauna- driving away the big game of the area e.g. there is reduction in food supply of Glossina mortisans and use of bacillus thuringiensis as biological larvicides against samarium fly, also tthrough flora- clearance of low level foliage to control Glossina spp.

Ecology / Environmental control

Environmental control measures refer to measures taken to reduce or eliminate breeding sites of a vector. There are two types – environmental modification and manipulation. This involves alterations in the shelter and food supply through physical changes such as drying of pond or alteration in the speed and course of river.

4.0 Conclusion

Vectors are invertebrates or vertebrate animals capable of transmitting infection from an infected person or animal to another. animals. Common vectors include arthropods and invertebrates such as fresh water snails. Vector can transmit diseases through three methods i.e director contact, mechanical transmission. Most vectors are mosquitoes; others are lice, ticks, flies- house fly, chrysops, sand fly, black fly etc, mites and rodents. The vector borne diseases of public health importance include malaria, trypanosomiaisis, filariasis, viral hemorrhagic fevers, typhus fever, pediculosis, scabies, plague and recently Lassa fever and biological transmission. The principles of control of vector are prevention of vector-host contact through biological barriers and mechanical barriers, destruction of vectors through trapping , collection and destruction and use of Insecticides against the aquatic larva form , others directly against adult vectors. The obstacles to effective control of vector are vectors of malaria, dengue and yellow fever have developed resistance to multiple classical insecticides, Changing land –use patterns, shifting weather patterns , urbanization are new foci of infection and National and international travels and commerce represent continuous opportunities for re-infection.

5.0 Summary

In this unit, you have learnt about the following:

i. Vectors and diseases transmitted
ii. Methods of transmission
iii. Characteristic of vectors
iv. Control of vectors

6.0 Tutor Marked Assignments

6.1 Activity

Identify common vectors that of public importance in your community of residence. What are the people doing, using indigenous knowledge and modern method to control such vectors? Share your submissions with your classmate on the discussion forum and keep your submission in your Portfolio.

6.2 Please answer the following questions

i. What is a vector?
ii. What are the characteristics of vectors?
iii. List the vectors of public health importance and diseases associated with such vectors.
iv. What are the methods of disease transmission by vectors diseases through vectors
v. What are the various methods available for vector control.

7.0 References and other resources

Environmental Control Measures http://jica-ri.jica.go.jp/IFIC_and_JBICI-Studies/english/publications/reports/study/topical/health/pdf/health_08.pdf

UNIT EIGHT - ROLE OF ENVIRONMENTAL HEALTH PROFESSIONALS

CONTENT

1.0 Introduction

Environmental Health Professionals (EHPs) are concerned with the administration, inspection, monitoring, education & regulation as prescribed in environmental health legislation. They act as a public arbiter of environmental health standards, maintaining close contact with the community. The outcome of environmental health duty is the prevention, detection and control of environmental hazards which affects human health through the following functions as specified by WHO. The field of environmental health provides numerous career roles and possible occupations. Private industry, government units, universities, and private research organizations employ environmental health workers in diverse functions. The notable challenges the environmental health professionals faced are mainly logistics and political support in the course of their duties.

2.0 Objectives

i. define the group of people in the workforce that are considered environmental health professionals.
ii. describe the role of the environmental health professionals.
iii. discuss the challenges EHP faced while carrying out their duties.

3.0 Main Content

3.1 Environmental Health Profession as a career.

There are many occupations that have one thing or the other to do with environmental health. The relationship may be direct or indirect. Example of such professions or occupations include

i. Microbiologists,
ii. Physicians,
iii. Biochemists
iv. Chemists/public analysts,
v. Civil building and sanitary engineers,
vi. Veterinarians,
vii. Health and safety enforcement professionals
viii. Environmental management professionals,
ix. Architects,
x. Housing officials,
xi. Water and sanitation engineers,
xii. Town planners,
xiii. Building control officers,
xiv. Prosecutors, lawyers, and all other service providers
xv. Nursing

3.2 Role of Environmental Health Professionals

Box 8.1 Defined role of EHPs - WHO

- waste management;
- food control and hygiene;
- pest and vector control;
- control of housing and sanitation;
- epidemiological investigation and control;
- air quality management;
- occupational health and safety;
- water resources management and sanitation;
- noise control;
- protection of recreational environment
- radiation control and health;
- control of frontiers, air and sea ports and border crossing;
- pollution control and abatement;
- educational activities (health promotion and education);
- promotion and enforcement of environmental health quality standards;
- collaborative efforts to study the effects of environmental hazards (research);
- environmental health impact assessment.(EHIA).

3.3 Specific Roles of Environmental Health Professionals

i) Health Education

- Food handlers - In addition to formal food handlers, special attention needs to be concentrated on informal street food vendors and hawkers.
- Schools - Health education programmes in schools to be undertaken (lectures and distribution of pamphlets i.e. anti-litter campaign and worm infestation) (YES Clubs)
- Informal/Underdeveloped areas - Initiate awareness programs by providing information with regard to disease prevention, AIDS, Typhoid, informal slaughtering etc.
- General Public - Assist in education (anti-smoking, fly and rodent control measures).

ii) Food Safety

- Promoting hygienic handling of food within all food establishments as well as informal sale of food (hawkers).
- Inspections, investigations (food poisoning), Condemnations, Education and Enforcement of legislation.
- Ensure compliance with the Foodstuffs, Cosmetics and Disinfectants Act (Sampling - Food composition, quality & labeling).
- Licensing of food premises.
- Surveys (Contamination from toxins) & issuing of public warnings.
- Creating awareness with regard to the overuse of cooking oils.
- Meat inspection and monitoring for safe meat supplies.
- Ensure a safe milk and milk product supply,

iii) Water

- Promote access to safe drinking (potable) water
- Investigate complaints relating to water quality.
- Monitor water quality through regular sampling (microbiological and chemical).
- Monitor the effectiveness of WSPs
- Monitor recreational water bodies (dams and rivers) for possible pollution and contamination.

iv) Infectious Disease Control

- Investigate environmental factors relating to the spread of notifiable infectious diseases (e.g. avian influenza, anthrax, dysentery, TB, tetanus et c), and putting preventative measures in place to limit the spread thereof.
- Compile case histories with regard to Hepatitis, Typhoid and Cholera etc.

v) Shelter and Housing

- Promote the provision of dwellings, informal structures conducive to health (ensure adequate ventilation etc).
- Inspect informal settlements with a view to maintaining minimum hygiene standards and promoting better living conditions.

vi) Sanitation

- Ensure safe & timely disposal of domestic, industrial & medical waste.
- Evaluate and provide input where necessary as regards the efficiency of sewerage/waste/drainage systems.
- Monitors refuse generation by residents and business community.
- Ensure that problems related to sewerage removal in areas where inadequate infrastructure exists (bucket sanitation), are eliminated.
- Investigate flooding problems so as to provide input regarding future prevention.
- Monitor and eliminate illegal waste water discharge into the drainage system (industrial effluent).
- Prevent & limit the spread of health significant pests in the community.
- Monitor and control all offensive trades.

vii) Pollution Control

- Assist with monitoring in terms of the Atmospheric Pollution Prevention Act and regulations related to smoke control.
- Investigate, prevent, measure and monitor noise pollution.

viii) Planning and Building Development

- Assess and consider applications in terms of Land Use or Departures from the Zoning Scheme Regulations, insofar as the impact on environmental health is concerned.
- Examine building plans and conduct site inspections to ensure compliance with relevant health and building legislation.
- Enforce regulations with regard to facilities for the disabled.

ix) Law Enforcement and Legislation

- Initiate legal proceedings where health education/guidance has failed, in terms of the Criminal Procedures Act.
- Providing evidence in court.
- Where possible, provide input with regard to improving health legislation.
- Implementation of legislation.

x) Other Roles

- Provide input with regard to Environmental impact assessments.
- Serve on task groups and committees to deliver input on environmental health.
- Disposal of dead
- Implementation of Animal Keeping legislation
- Involved in Civil Protection exercises/disasters.
- Training of student health professionals

3.4 Challenges Environmental Health Professionals faced in performing their roles

- Revision of the existing Acts necessary – Some of the laws and acts are not adequate to support environmental professionals achieving optimal environmental health protection
- Logistic supports are usually not adequate to engage in all activities for environmental health promotion
- Mobility support is also usually inadequate
- Slowness in prosecution of people who contravene environmental health laws do not encourage prompt prosecution of people breaking environmental health laws.
- Interference by political and top career officers as to compromise justice to bring people who break environmental health laws to pay.
- Fear of direct and indirect attacks of environmental health officials by law breakers.

4.0 Conclusion

Private industry, government units, universities, and private research organizations employ environmental health workers in diverse functions. The defined roles of EHP as directed by World Health Organisation were based on the issues discussed in most of the previous study sessions. The specific roles of the EHP include: Control of hazards in workplace that may affect workers and the community; Investigate the effect of chemicals found in the workplace upon the health of workers; Monitoring and enforcing government regulations for

environmental quality; Monitor the treatment and disposal of sewage, refuse and garbage; Inspect restaurants, dairies, food processing plants, and other food preparation venues in order to control biological hazards from sources such as *E.coli, salmonella*, and *other food-borne agents*; Enforcement of various public health laws, sanitary codes, and other regulations related to the spread of disease by vector; Investigate hazards in the work environment and develop procedures for their abatement; Conduct health education programmes for the prevention of work-related diseases; Conduct basic research on the risks associated with exposures to certain specific hazards and conduct statistical analysis of the impact of such exposures on human populations. And Provide input to government agencies, assist in the formulation of environmental policies, and may be involved in litigation concerning environmental problems

5.0 Summary

In this unit, you have learnt about the following:

i. Environmental Health Profession as a career
ii. Role of Environmental Health Professionals
iii. Specific Roles of Environmental Health Professionals
iv. Challenges Environmental Health Professionals faced in performing their roles

6.0 Tutor Marked Assignments

6.1 Activity

Interact with at least 2 of the professionals identified as contributing to environmental health and find out the ways in which they directly interact with the members of the community in playing their roles. Which of the roles list in your text do they personally identify with? Share your findings on th discussion forum

6.2 Please answer the following questions:

i. define the group of people in the workforce that are considered environmental health professionals.
ii. describe the role of the environmental health professionals.
iii. discuss the challenges EHP faced while carrying out their duties.

7.0 References and other resources

UNIT NINE - DISASTER MANAGEMENT

CONTENT

1.0 Introduction

Disasters can be defined as any occurrence that causes damage, ecological disruption, loss of human life or deterioration of health and health services, on a scale sufficient to warrant an extra ordinary response from outside the affected community .A disaster is a destructive

event that causes a discrepancy between the number of causalities and their treatment capacity. Disasters can be caused by natural hazards such as mudslides, floods, coastal storms, earthquakes etc while others are entirely man made including those related to social environment. In some cases the impact of natural hazard becomes exacerbated due to human activities.

Emergency simply means sudden occurrence demanding immediate action. It can be defined as a situation or state characterised by clear and marked reduction in the abilities of people to sustain their normal living conditions with resulting damage.

Disasters can be classified according to their speed of onset, cause and their scope. It can be oriented if emergencies are handled with efficiency and speed facilitated by prior planning.

Emergency preparedness has been defined as a programme of long term development activities whose goals are to strengthen the overall capacity and capability of community to manage efficiently all types of emergency, bringing an orderly transition into a future of sustained development.

Disaster management activities are carried out in a cycle- vulnerability assessment, disaster prevention and mitigation measures, emergency preparedness policy and plan and post disaster rehabilitation and recovery plan. Appropriate actions at all points in the cycle lead to greater emergency preparedness, better warnings of the community to possible emergencies, or prevention of disaster, during the next iteration of the cycle. Disaster management is ideally carried at community level by community health development but it can also be conducted by government parastatal. Established Act 12 of 1999 was National Emergency Management Agency (NEMA) in Nigeria to serve as an umbrella organisation to coordinate emergency effort in Nigeria.

2.0 Objectives

i. define the terms hazards, emergency and disaster.
ii. describe the various categories/ classifications of disasters.
iii. describe the impact of disaster on public health
iv. discuss the disaster management cycle.
v. Discuss the roles of the agency responsible for disaster management in Nigeria

3.0 Main Content

3.1 Definitions

Hazards can be defined as any phenomenon that has the potential to cause disruption, or damage to humans and the environment.
Emergency can be defined as a situation or state characterised by clear and marked reduction in the abilities of people to sustain their normal living conditions with resulting damage.

A disaster is a result of a vast ecological breakdown in the relation between humans and their environment, a serious or sudden event on such a scale that the stricken community needs extraordinary efforts to cope with it, often with outside help or international aid.

Emergency preparedness has been defined as a programme of long term development activities whose goals are to strengthen the overall capacity and capability of community to manage efficiently all types of emergency, bringing an orderly transition into a future of sustained development.

3.2 Categories of Disasters

Disasters could be categorised as Natural and Human generated. 2002 DEEP Center Classification for disasters is listed below:

i. Natural disasters
ii. -Non-intentional human-generated disasters
iii. -Terrorist-perpetrated disasters
iv. -Complex disasters
v. -Natural-technological disasters (NA-TECHS

Natural Disasters

Natural disasters arise from forces of nature. There are 2 subcategories:

- Sudden impact or acute onset
- Slow or chronic onset

Box 9.1 **Sudden Impact or Acute Onset Disasters**

Geological or climatic hazards
Hurricanes/typhoons Tornadoes
Earthquakes Volcanoes
Floods Tsunamis
Temperature extremes Wildfires
Landslides Avalanches
Epidemics
Food, water, vector-borne diseases
Person-to-person transmission diseases

Box 9.2 **Slow or Chronic Onset Disasters**

Drought
Famine
Environmental degradation
Chronic exposure to toxic substances
Desertification
Deforestation
Pest infestation

Human-generated/ Manmade Disasters

Box 9.**3 Human-Generated Disasters**

Industrial/technological

Transportation (vehicular)

Deforestation

Material shortages

Complex emergencies

-Wars and civil strife

-Armed aggression

-Insurgency

-Other actions resulting in displaced persons and refugees

Terrorist-perpetrated Disasters

-Biological

-Nuclear

-Incendiary

-Chemical

-Explosive

3.3 Disaster: Public Health Impact

Disasters cause deaths, injuries, and illnesses. Disasters may overwhelm medical resources and health services. Disasters may destroy hospitals. Disasters may disrupt routine health services and preventive activities. Disasters may increase potential for communicable diseases, exacerbate environmental hazards. The consequences are increases in morbidity and premature death, decreased quality of life Disasters may cause generalized panic or paralyzing trauma. Disasters may provoke increases in anxiety, depression and neuroses. Disasters may lead to post-traumatic stress disorder (PTSD) at epidemic levels. Disasters may cause large spontaneous or organized population movements. Population movement may

increase morbidity and mortality. Population movement may precipitate epidemics of communicable diseases in both displaced and host communities.Crowding of populations and overlay of refugee and host populations may lead to injuries and violence.

3.4 Disaster Cycle

Sudden impact natural disasters can be considered as a continuous time sequence of five phases:

i) Interdisaster

ii) Predisaster

iii)Impact

iv) Emergency

v) Reconstruction

i) Interdisaster Phase:

- Planning disaster prevention/preparedness/mitigation
- Identifying risks
- Identifying vulnerabilities
- Creating a resource inventory
- Conducting professional training
- Conducting community education

ii) Predisaster Phase

- Issuing timely warnings
- Implementing protective actions
- Undertaking emergency management activities
- Evacuating population as necessary

iii) Impact Phase

- Destruction
- Injuries
- Deaths

iv) Emergency/ Relief Phase

- Implementing life-saving actions
  -search and rescue
  -First aid
  -emergency medical assistance
- Restoring emergency communications
- Restoring emergency transportation
- Implementing public health surveillance
- Evacuating vulnerable areas

v) Reconstruction/ Rehabilitation Phase

- Restoring predisaster conditions
- Reestablishing health services
- Reconstructing & repairing damaged facilities
- Reflecting and debriefing on lessons learned

3.5 National Emergency Management Agency

It is an emergency management organisation, unlike its predecessor, National Emergency Relief Agency (NERA) that was basically a disaster relief organisation. The act that established NEMA made provisions for the establishment of a State Emergency Management Committee (SEMC) to carry out disaster management activities at the state level. Liaising with NEMA when emergency situation gets beyond its capabilities and working with all relevant agencies to limit and control the effect of the disaster.

4.0 Conclusion

A disaster is a result of a vast ecological breakdown in the relation between humans and their environment, a serious or sudden event on such a scale that the stricken community needs extraordinary efforts to cope with it, often with outside help or international aid. Disasters are classified as natural or manmade. The phases of a Disaster are summarized into PREIMPACT (disaster prevention and education) IMPACT (information collection and disaster mitigation) POSTIMPACT (rehabillitation). Disaster management activities are carried out in a cycle. It involves the following steps: Vulnerability assessment aimed at

identifying and characterising all the hazards in the community. Disaster prevention and mitigation measures are put in place to ensure the identified hazards do not cause emergencies and disasters. Development of emergency preparedness policy and plan to ensure efficient, timely and well coordinated response during emergencies. Development of post –disaster rehabilitation and recovery plan to ensure quick recovery of the community after the disaster. Disaster management is ideally carried at community level by community health development but it can also be conducted by government parastatal like NEMA.

5.0 Summary

In this unit, you have learnt about the following:

i. Various definitions of definitions
ii. Categories of Disasters
iii. Disaster: Public Health Impact
iv. Disaster Cycle
v. National Emergency Management Agency

6.0 Tutor Marked Assignments

6.1 Activity

Check the website of NEMA what are the contents covered there? Search the Internet for various types of disasters that affected different parts of the world in the last 5 years by continents.

6.2 Please answer the following questions:

i. Differentiate between emergency and a disaster
ii. Describe the various categories/ classifications of disasters.
iii. Describe the impact of disaster on public health
iv. Discuss the disaster management cycle.

7.0 References and other resources

UNIT TEN - PUBLIC AND ENVIRONMENTAL HEALTH LAWS

CONTENT

1.0 Introduction

Public health law is the study of legal power and duties of the state to assure the conditions for people to be healthy. The definition suggests five essential characteristics of public health law. The public health infrastructure include public health laws (statues principally at the state level that establish the mission , functions , powers and structures of public health agencies) and laws about public's health (laws and regulation that offer a variety of tools to prevent injury and disease and promote public health. Public health laws constitute the foundations for public health practice while providing tools for public health authorities. At least 6 models exist for legal intervention designed to prevent injury and disease and to promote public health.

In the colonial and immediate postcolonial periods in Nigeria, the practice of environmental health was essentially the finding and abatement of nuisance. Nuisance is defined as the wrong done to a man by unlawfully disturbing him in the enjoyment of his property, or, in some cases in the exercise of a common right. The public health law listed various nuisances. A nuisance may be public, private or mixed. To look out for nuisance, the medical officer of health and environmental health officers are empowered by the Public health law to enter premises at reasonable time. This is called the right of entry. The steps

taken are serving abatement notice, nuisance order, prohibition order or closing order or combination of all.

National Agency for Food and Drug Control (NAFDAC) was established to take necessary measures to ensure food safety in Nigeria.

The role of legislation in inducing responsible attitudes and behaviors towards the environment cannot be overlooked. Legislation serves as an effective instrument for environmental protection, planning, pollution, prevention and control.

The following provides a summary of Nigerian legislation on the environment. - The Constitution of the Federal Republic of Nigeria (1999)

- National Environmental Standards and Regulations Enforcement Agency (NESREA) Act
- Environmental Impact Assessment Act
- The Land Use Act
- Harmful Waste (Special Criminal Provisions) Act
- Hydrocarbon Oil Refineries Act
- Associated Gas re-injection Act
- The Endangered Species Act
- Sea Fisheries Act
- Exclusive Economic Zone Act
- Oil Pipelines Act

2.0 Objectives

i. define public health and environmental health laws
ii. describe the characteristics and models of Public health laws.
iii. discuss the Nigerian legislation on the environment

3.0 Main Content

3.1 Public health laws

Public health law is the study of legal power and duties of the state to assure the conditions for people to be healthy. The definition suggest five essential characteristics of public health law

Box 10. 1 Characteristics of Public Health Law

Government: Public health activities are the primary (but not exclusive) responsibility of government. Government creates policy and enacts laws and regulations designed to safeguard community health.

Populations: Public health focuses on the health of populations. Certainly, public health authorities are concerned with access and quality in medical care, but their principal concern is to create the conditions in which communities can be healthy.

Relationships: Public health contemplates the relationship between the state and the population (or between the state and individuals who place themselves or the community at risk).

Services: Public health deals with the provision of population-based services grounded on the scientific methodologies of public health (e.g., biostatistics and epidemiology).

Coercion: Public health authorities possess the power to coerce individuals and businesses for the protection of the community rather than relying on a near universal ethic of voluntarism.

The six models that exist for legal intervention designed to prevent injury and disease and to promote public health.

Box 10. 2 Six models for legal intervention designed to prevent injury and diseases

Model 1 is the power to tax and spend. This power, given in federal and state constitutions, provides government with an important regulatory technique. The power to spend enables government to set conditions for the receipt of public funds. For example, the federal government grants highway funds to states on condition that they set the legal drinking age at 21 years.[13] The power to tax provides strong inducements to engage in beneficial behavior or refrain from risk behavior. For example, taxes on cigarettes significantly reduce smoking, particularly among young people.

Model 2 is the power to alter the informational environment. Government can add its voice to the marketplace of ideas through health promotion activities such as health communication campaigns; by providing relevant consumer information through labeling requirements; and by limiting harmful or misleading information through regulation of commercial advertising of unsafe products (e.g., cigarettes and alcoholic beverages).

Model 3 is direct regulation of individuals (e.g., seatbelt and motorcycle helmet laws), professionals (e.g., licenses), or businesses (e.g., inspections and occupational safety standards). Public health authorities regulate pervasively to reduce risks to the population.

Model 4 is indirect regulation through the tort system. Tort litigation can provide strong incentives for businesses to engage in less risky activities. Litigation has been used as a tool of public health to influence manufacturers of automobiles, cigarettes, and firearms. Litigation resulted in safer automobiles; reduced advertising and promotion of cigarettes to young people; and encouraged at least one manufacturer (Smith & Wesson) to develop safer firearms.

Model 5 is deregulation. The impact of laws may sometimes be detrimental to public health and may be an impediment to effective action. For example, criminal laws proscribe the possession and distribution of sterile syringes and needles. These laws, therefore, make engagement in human immunodeficiency virus (HIV) prevention activities more difficult for public health authorities.

3.2 Environmental health Laws.

Legislation serves as an effective instrument for environmental protection, planning, pollution, prevention and control.

CONSTITUTION OF THE FEDERAL REPUBLIC OF NIGERIA (1999)

The constitution, as the national legal order, recognizes the importance of improving and protecting the environment and makes provision for it. Relevant sections are:

- Section 20 makes it an objective of the Nigerian State to improve and protect the air, land, water, forest and wildlife of Nigeria.
- Section 12 establishes, though impliedly, that international treaties (including environmental treaties) ratified by the National Assembly should be implemented as law in Nigeria.

- Section 33 and 34 which guarantee fundamental human rights to life and human dignity respectively, have also being argued to be linked to the need for a healthy and safe environment to give these rights effect.

NATIONAL ENVIRONMENTAL STANDARDS AND REGULATION ENFORCEMENT AGENCY (NESREA) ACT 2007

- Administered by the Ministry of Environment, the National Environment Standards and Regulation Enforcement Agency (NESREA) Act of 2007 replaced the Federal Environmental Protection Agency (FEPA) Act. It is the embodiment of laws and regulations focused on the protection and sustainable development of the environment and its natural resources. The following sections are worth noting: - Section 7 provides authority to ensure compliance with environmental laws, local and international, on environmental sanitation and pollution prevention and control through monitory and regulatory measures.

- Section 8 (1)(K) empowers the Agency to make and review regulations on air and water quality, effluent limitations, control of harmful substances and other forms of environmental pollution and sanitation.

- Section 27 prohibits, without lawful authority, the discharge of hazardous substances into the environment. This offence is punishable under this section, with a fine not exceeding, N1, 000,000 (One Million Naira) and an imprisonment term of 5 years. In the case of a company, there is an additional fine of N50, 000, for every day the offence persists.

REGULATIONS (UNDER NESREA) National Effluent Limitation Regulations.

- Section 1 (1) requires industry facilities to have anti-pollution equipment for the treatment of effluent.

- Section 3 (2) requires a submission to the agency of a composition of the industry's treated effluents.

- National Environment Protection (Pollution Abatement in Industries and Facilities producing Waste) Regulations (1991).

- Section 1 Prohibits the release of hazardous substances into the air, land or water of Nigeria beyond approved limits set by the Agency.
- Section 4 and 5 requires industries to report a discharge if it occurs and to submit a comprehensive list of chemicals used for production to the Agency.

Federal Solid and Hazardous Waste Management Regulations (1991).

- Section 1 makes it an obligation for industries to identify solid hazardous wastes which are dangerous to public health and the environment and to research into the possibility of their recycling.
- Section 20 makes notification of any discharge to the Agency mandatory.
- Section 108 stipulates penalties for contravening any regulation.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ACT. CAP E12, LFN 2004.

An Environmental Impact Assessment (EIA) is an assessment of the potential impacts whether positive or negative, of a proposed project on the natural environment: The E.I.A Act, as it is informally called, deals with the considerations of environmental impact in respect of public and private projects. Sections relevant to environmental emergency prevention under the EIA include:-

- Section 2 (1) requires an assessment of public or private projects likely to have a significant (negative) impact on the environment.
- Section 2 (4) requires an application in writing to the Agency before embarking on projects for their environmental assessment to determine approval.
- Section 13 establishes cases where an EIA is required and
- Section 60 creates a legal liability for contravention of any provision.

THE NIGERIAN URBAN AND REGIONAL PLANNING ACT CAP N138, LFN 2004

The Urban and Regional Planning Act is aimed at overseeing a realistic, purposeful planning of the country to avoid overcrowding and poor environmental conditions. In this regard, the following sections become instructive:-

- Section 30 (3) requires a building plan to be drawn by a registered architect or town planner.
- Section 39 (7) establishes that an application for land development would be rejected if such development would harm the environment or constitute a nuisance to the community.
- Section 59 makes it an offence to disobey a stop-work order. The punishment under this section, is a fine not exceeding N10, 000 (Ten thousand naira) and in the case of a company, a fine not exceeding N50, 000.
- Section 72 provides for the preservation and planting of trees for environmental conservation.

HARMFUL WASTE (SPECIAL CRIMINAL PROVISIONS) ACT CAP H1, LFN 2004

The Harmful Waste Act prohibits, without lawful authority, the carrying, dumping or depositing of harmful waste in the air, land or waters of Nigeria. The following sections are notable:

- Section 6 provides for a punishment of life imprisonment for offenders as well as the forfeiture of land or anything used to commit the offence.
- Section 7 makes provision for the punishment accordingly, of any conniving, consenting or negligent officer where the offence is committed by a company.
- Section 12 defines the civil liability of any offender. He would be liable to persons who have suffered injury as a result of his offending act.

OIL IN NAVIGABLE WATERS ACT, CAP 06, LFN 2004.
The Oil in Navigable Waters Act is concerned with the discharge of oil from ships. The following sections are significant:-

- Section 1 (1) prohibits the discharge of oil from a Nigerian ship into territorial waters or shorelines.

- Section 3 makes it an offence for a ship master, occupier of land, or operator of apparatus for transferring oil to discharge oil into Nigerian Waters. It also requires the installation of anti-pollution equipment in ships.
- Section 6 makes punishable such discharge with a fine of N2, 000 (Two thousand naira).
- Section 7 requires the records of occasions of oil discharge.

ASSOCIATED GAS RE-INJECTION ACT, CAP 20, and LFN 2004. The Associated Gas Re-Injection Act deals with the gas flaring activities of oil and gas companies in Nigeria. The following sections are relevant to pollution prevention:-

- Section 3 (1) prohibits, without lawful permission, any oil and gas company from flaring gas in Nigeria.
- Section 4 stipulates the penalty for breach of permit conditions

THE ENDANGERED SPECIES ACT, CAP E9, LFN 2004. This Act focuses on the protection and management of Nigeria's wildlife and some of their species in danger of extinction as a result of overexploitation. These sections are noteworthy:

- Section 1 prohibits, except under a valid license, the hunting, capture or trade in animal species, either presently or likely being in danger of extinction.
- Section 5 defines the liability of any offender under this Act.
- Section 7 provides for regulations to be made necessary for environmental prevention and control as regards the purposes of this Act.

SEA FISHERIES ACT, CAP S4, LFN 2004. The Sea Fisheries Act makes it illegal to take or harm fishes within Nigerian waters by use of explosives, poisonous or noxious substances. Relevant sections include the following:-

- Section 1 prohibits any unlicensed operation of motor fishing boats within Nigerian waters.
- Section 10 makes destruction of fishes punishable with a fine of N50, 000 or an imprisonment term of 2 years.

- Section 14 (2) provides authority to make for the protection and conservation of sea fishes.

OIL PIPELINES ACT, CAP 07, LFN 2004.
The Oil Pipelines Act and its Regulations guide oil activities. The following sections are pertinent;

- Section 11 (5) creates a civil liability on the person who owns or is in charge of an oil pipeline. He would be liable to pay compensation to anyone who suffers physical or economic injury as a result of a break or leak in his pipelines.

- Section 17 (4) establishes that grant of licenses are subject to regulations concerning public safety and prevention of land and water pollution.

NUCLEAR SAFETY AND RADIATION PROTECTION ACT, CAP N142, LFN 2004.
The Act is concerned with the regulation of the use of radioactive substances and equipment emitting and generating ionizing radiation. In particular:

- Section 4 provides authority to make regulations for the protection of the environment from the harmful effects of ionizing radiation.

- Section 15 and 16 makes registration of premises and the restriction of ionizing radiation sources to those premises mandatory.

- Section 37 (1) (b) allows an inspector verify records of activities that pertain to the environment.

- Section 40 clarifies that the same regulations guiding the transportation of dangerous goods by air, land or water should also apply to the transportation of radioactive substances.

NIGERIAN MINING CORPORATION ACT. CAP N120, LFN 2004.
This Act establishes the Nigerian Mining Corporation. It has authority to engage in mining refining activities and to construct and maintain roads, dams, reservoirs, etc. In particular:

Section 16 creates a civil liability on the corporation for the physical or economic damage

suffered by any person as a result of its activities.

QUARANTINE ACT, CAP Q2, LFN 2004.

The Quarantine Act provides authority to make regulations for preventing the introduction, spread and transmission of infectious diseases such as cholera, yellow fever, typhus, etc. under this Act, violation of any regulation is punishable with a fine of N200 or an imprisonment term of 2 years or both.

RIVER BASINS DEVELOPMENT AUTHORITY ACT, CAP R9, LFN 2004.

The River Basins Development Authority is concerned with the development of water resources for domestic, industrial and other uses, and the control of floods and erosion

ANIMAL DISEASES (CONTROL) ACT, CAP A17, LFN 2004.

The Animal Disease (Control) Act makes it an offence to import any animal, hatching egg or poultry into Nigerian except under a permit. The following sections are relevant:
Section 5 provides an inspector with the authority to take emergency measures where necessary.
Section 10 stipulates penalties for contravening any regulation.
Section 13 requires owners of trade animals to possess a movement permit and ensure the fitness of their animals.
Section 20 provides authority to make regulations that prevent and control the spread of animal diseases.

FACTORIES ACT, CAP F1, LFN 2004.

The Factories Act promotes the safety of workers and professionals exposed to occupational hazards. Under this Act, it is an offence to use unregistered premises for factory purposes. In particular:
Section 13 allows an inspector take emergency measures or request that emergency measures be taken by a person qualified to do so in cases of pollution or any nuisance.

WATER RESOURCES ACT, CAP W2, LFN 2004.

The Water Resources Act is targeted at developing and improving the quantity and quality of water resources. The following sections are pertinent:
Section 5 and 6 provides authority to make pollution prevention plans and regulations for the protection of fisheries, flora and fauna.
Section 18 makes offenders liable, under this Act, to be punished with a fine not exceeding N2000 or an imprisonment term of six months. He would also pay an additional fine of N100 for everyday the offence continues.

THE FEDERAL NATIONAL PARKS ACT, CAP N65, LFN 2004.

The National Parks Act is concerned with the establishment of protected areas used for resource conservation, water catchments protection, wildlife conservation and maintenance of the national eco-system balance.

NIGER-DELTA DEVELOPMENT COMMISSION (NDDC) ACT, CAP N68, and LFN 2004.

The Niger-Delta Development Commission Act is concerned with using allocated funds to tackle ecological problems arising from the exploration of oil minerals in the Delta. Section 7 (1) (b) empowers the Commission to plan and to implement projects for the sustainable development of the Delta in the field of transportation, health, agriculture, fisheries, urban and housing development, etc.

The Commission, under this Act, has a duty to liaise with oil and gas companies and advice stakeholders on the control of oil spillages, gas flaring and other related forms of environmental pollution

OTHERLEGISLATION:

Environmental Sanitation Law:

This is a law of Lagos State focused on environmental sanitation and protection. It punishes in varying degrees acts like street obstruction, failure to clean sidewalks, cover refuse bins or dispose wastes properly.

Environmental Pollution Control Law

Section 12 of this law under the Laws of Lagos State makes it an offence to cause or permit a discharge of raw untreated human waste into any public drain, water course or onto any land or water. This offence is punishable with a fine not exceeding N100, 000 (One hundred thousand naira) and in the case of a company, a fine not exceeding N500, 000.

CRIMINAL CODE:

The Criminal Code contains provisions for the prevention of public health hazards and for environmental protection. Hence:

Sections 245-248 deal with offences ranging from water fouling, to the use of noxious substances.

4.0 Conclusion

Public health law is the study of legal power and duties of the state to assure the conditions for people to be healthy. Public health laws constitute the foundations for public health practice while providing tools for public health authorities. In the colonial and immediate postcolonial periods in Nigeria, the practice of environmental health was essentially the finding and abatement of nuisance. The role of legislation in inducing responsible attitudes and behaviors towards the environment cannot be overlooked. Legislation serves as an effective instrument for environmental protection, planning, pollution, prevention and control.

5.0 Summary

In this unit, you have learnt about the following:

i. Public health laws
ii. Environmental health Laws

6.0 Tutor Marked Assignments

6.1 Activity - None

6.2 Please answer the following questions:

i. What are public health and environmental health laws?
ii. Describe the characteristics and models of Public health laws.
iii. Discuss the Nigerian legislation on the environment

7.0 References and other resources