Education, Science and Technology for A Healthy, Safe and Friendly Environment.

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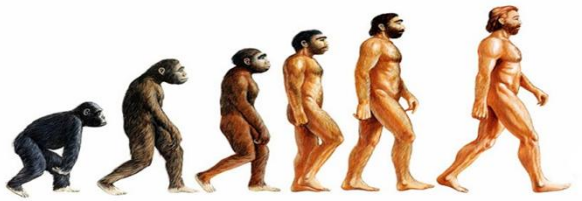
Man in his environment has been endowed with reasons, with the power to create, so that he can add to what he's been given, but in some instances, he hasn't been a creator.....forests keep disappearing, rivers are drying up, wild life's are becoming extinct, climates are changing and the lands are getting polluted daily.

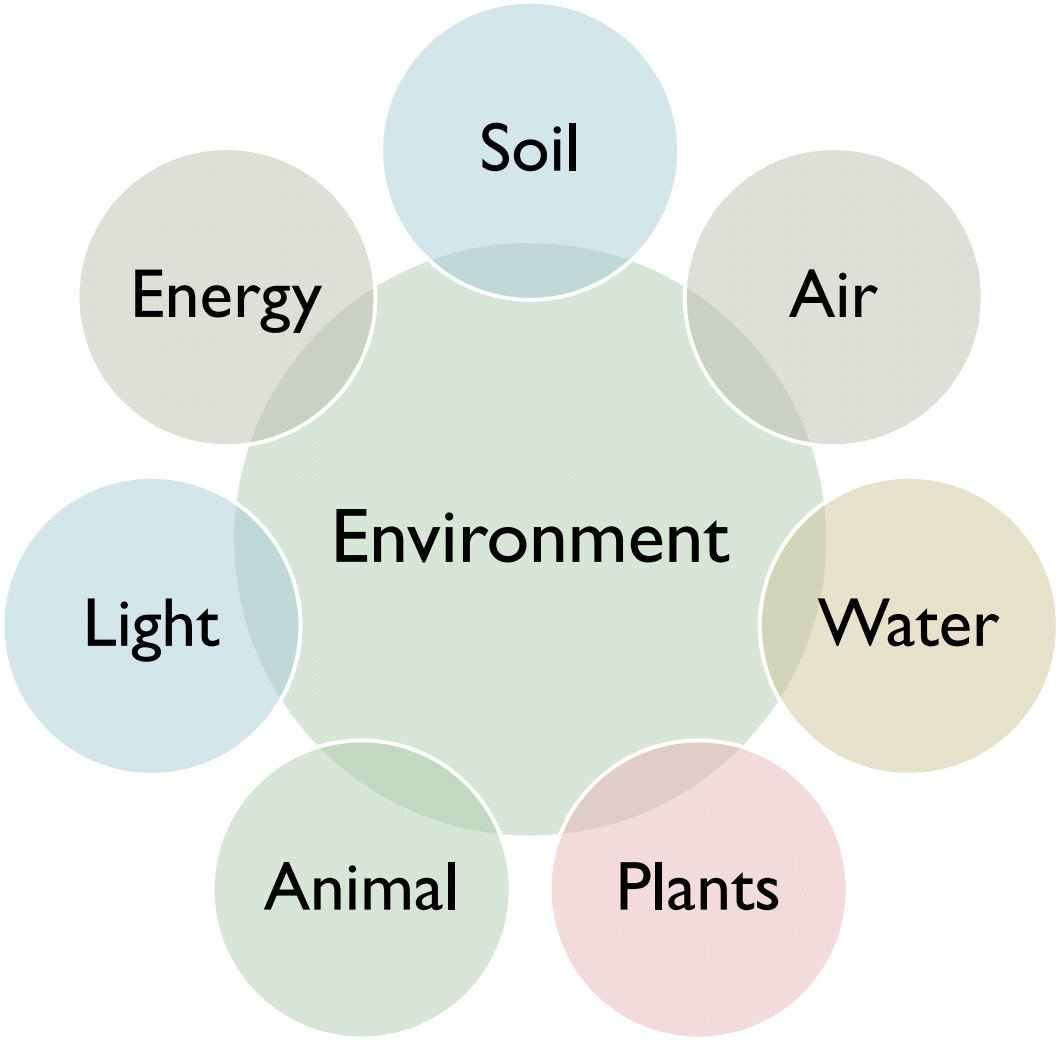
Anton Chekhov (1860 - 1904)



Overview of Environment

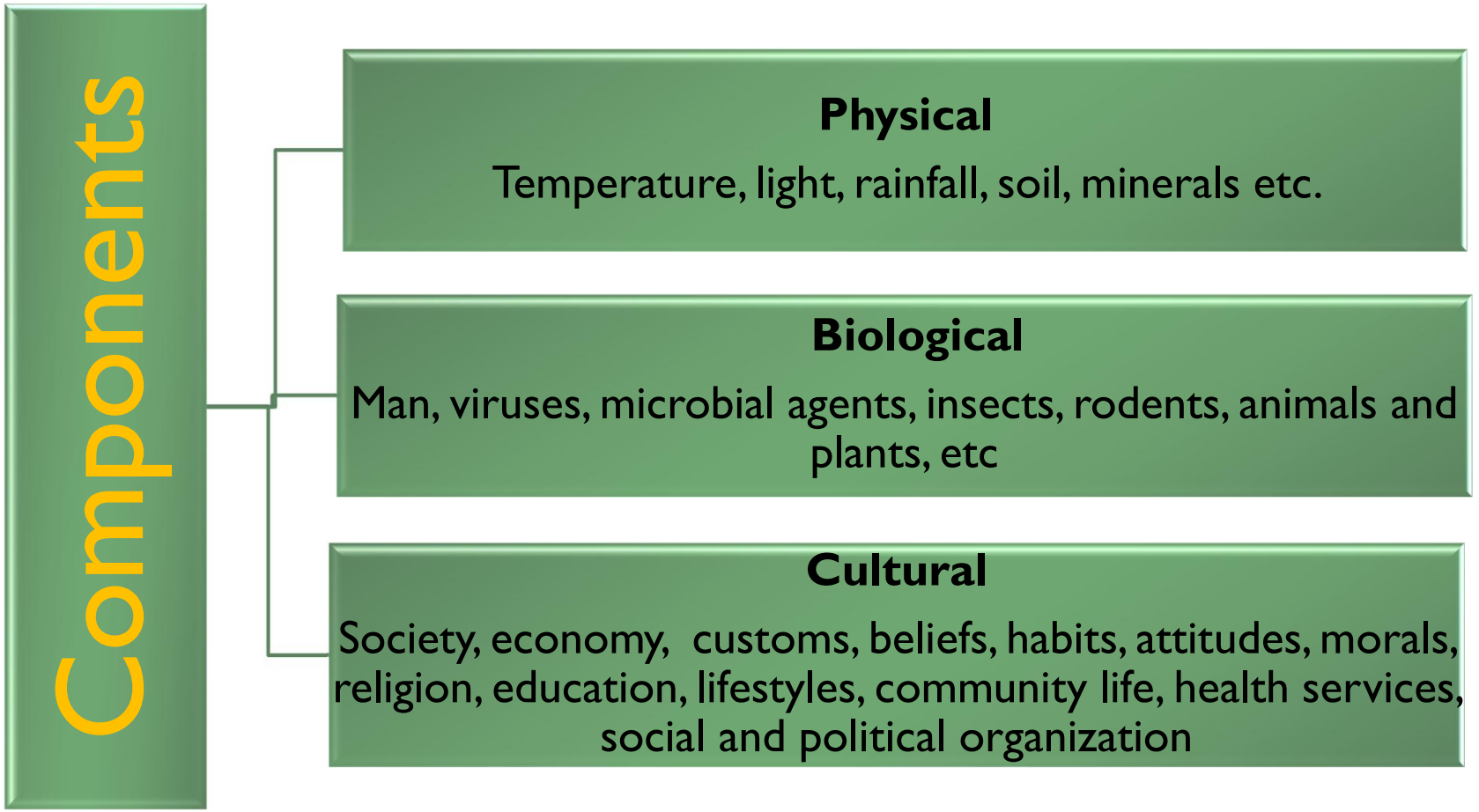
- Environment denotes all the physical, chemical and biological conditions that toge ther act on an individual or an ecological community and infl uence its growth and development.

- It is made up of interacting systems of physical, biological and cultural elements which are interlinked both individually and collectively.



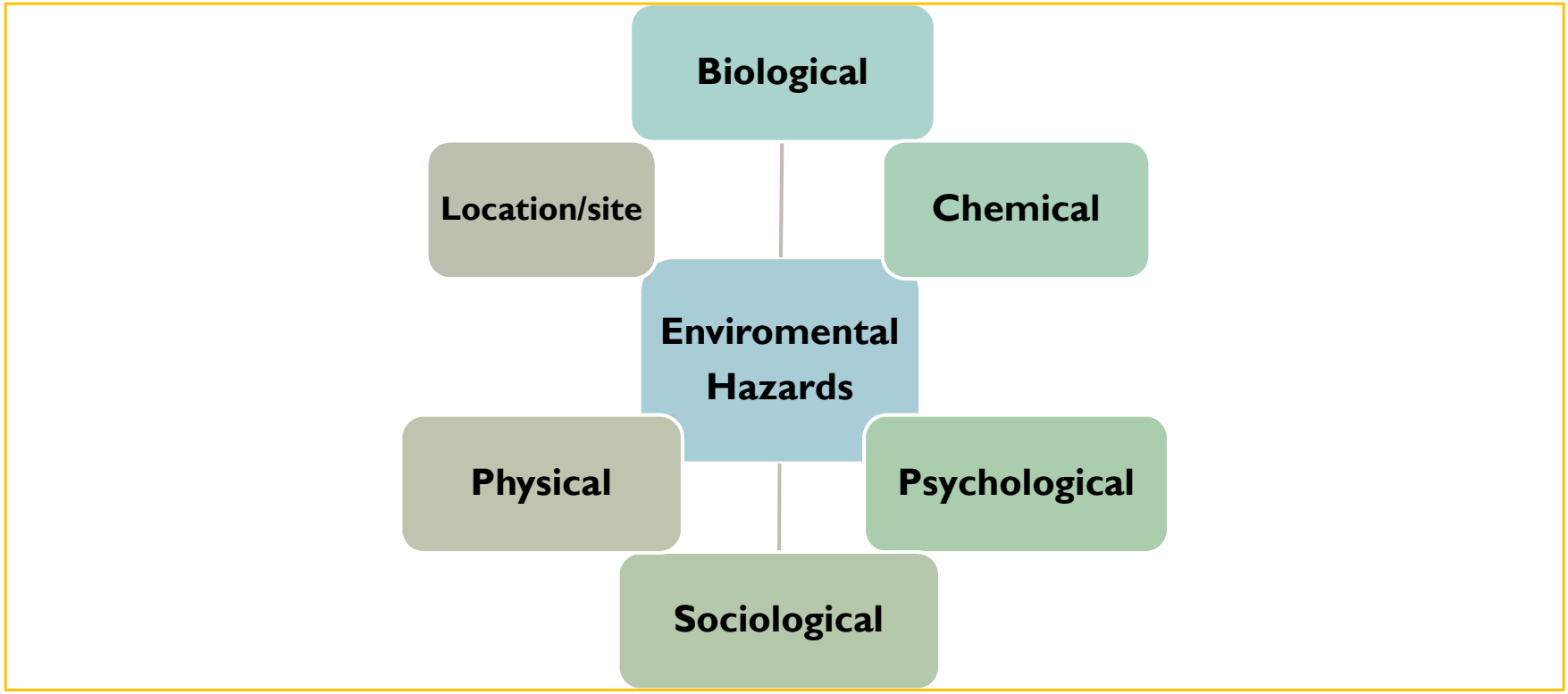
E. J. Ross "Environment are the external forces which influences us"

Components of the Environment



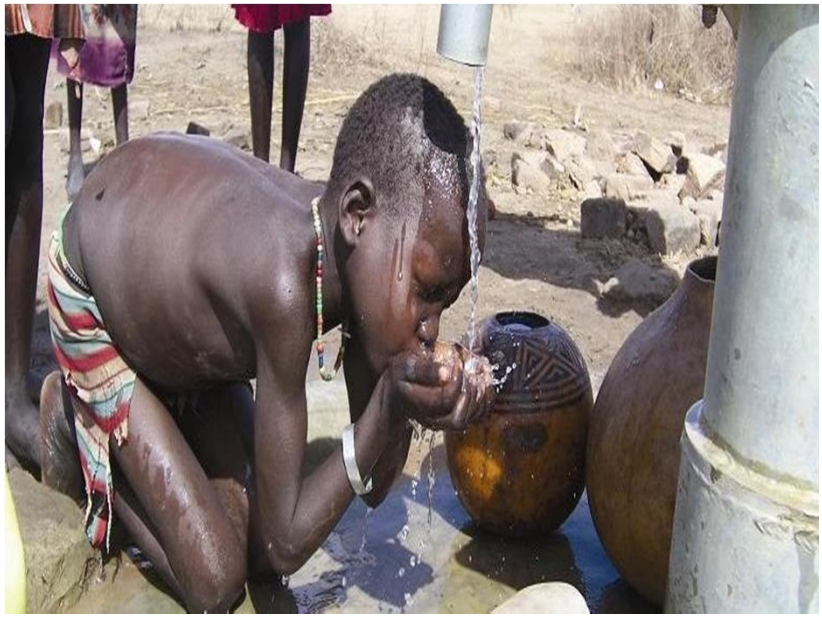
Enviromental Hazards

- Environmental hazards are states of events which has the potential to threaten the surrounding natural environment and adversely affect people's health. They include:



Biological Hazards

- Water and food borne diseases: infections that are predominantly transmitted through contact with or by the consumption of contaminated water and food



- These diseases are transmitted through microbes or parasites e.g. *Salmonella, E.coli* e.t.c

Every year more than 3.4 million people die as a result of water borne diseases, making it the leading cause of disease and death around the world. Most of the victims are young children, the vast majority of whom die of illnesses (WHO, 2014)

Table 1: Studies of food/water borne illness reported in Nigeria

Food /water borne illness	**Prevalence/ Incidence**
Acute diarrhea	E. coli 43%, Klebsiella 9%, Staph. aureus 4%
(Adults)	Salmonella typhi 2%, Pseudomonas 3% , Entamoeba histolytica 35%
Acute diarrhoea	Rotavirus 24%. Escherichia coli 15%, Salmonella 11%, Klebsiella 11% Shigella 5%,
(Children)	Campylobacter 3%
	Yersinia enterocolitica 3%, Giardia lamblia 3%
Acute diarrhea	Escherichia coli 46%, Shigella 21%, Salmonella 17% Klebsiella 9%, Aeromonas 4%,
	Plesiomonas 3%
Paragonimiasis	16.8%
Taeniasis	8.6%
Helminthiasis	Ascaris lumbricoides (54%),
	Trichuris trichiura (43.7%)
	Necator americanus (42.7%)
	Strongyloides stercoralis (33%)
Cryptosporidiosis	2.3%
Gastroenteritis and Diarrhea	21%
Brucellosis	31.82%

 Source: Okike *et al.,* 2011

Chemical Hazards

Pesticides

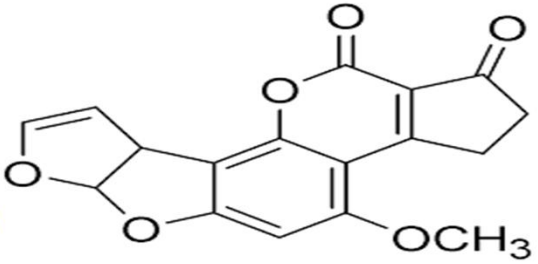
- Includes herbicides, insecticides, fungicides e.t.c.
- Their presence in ground and surface water is of concern and are affiliated with many dangers
- For e.g. organochlorines are very stable and persists in the environment for decades and are dispersed worldwide through air and water.

In East Africa between 1989 and 1990, the use of organochlorine pesticides was found to have lead to 456 and 736 food poisoning cases in Kenya and Tanzania (Mbakhaya et al., 1994)

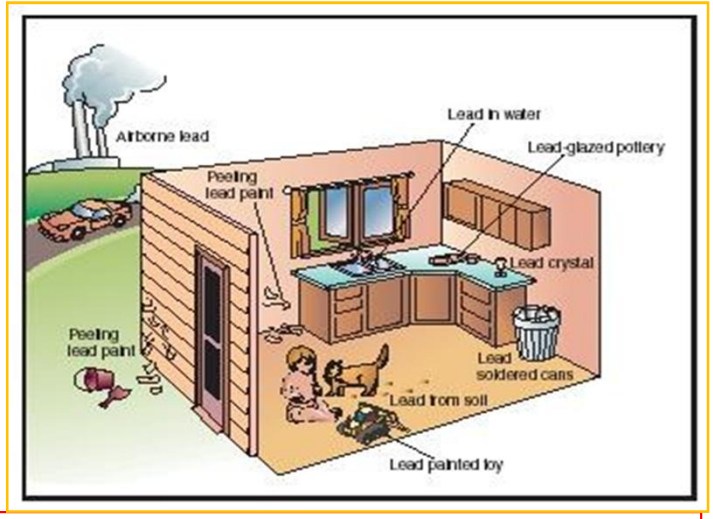
Enviromental tobacco smoke (ETS)

- An environmental hazard produced by millions that smoke due to pollution
- Diseases associated with ETS include lung cancer
- ETS contains 4, 000 substances and has been classified as a Class A carcinogen (EPA, 2013).

Mycotoxins



- Toxic secondary metabolites of fungal origin
- Over 400 mycotoxins are known e.g. Aflatoxins, ochratoxin, fumonisin, deoxynivanelol and zearalenone
- Contaminate various agricultural commodities either before harvest or under post-harvest conditions.
- Tropical conditions such as high temperatures and moisture, unseasonal rains during harvest and flash floods lead to fungal growth and production of mycotoxins.
- Cause both chronic and acute toxic effects in man and animals such as carcinogenic, mutagenic, teratogenic, and estrogenic effects



Lead

- Naturally occurring element used in the manufacturing of many products
- Lead particles in the environment can attach to dust and be carried by air or washed into ground water and water systems due to heavy rains
- Lead exposure leads to anemia, birth defects, bone damage, neurological damage, kidney damage e.t.c

Physical Hazards

Pollution

Pollution: Water, Air, Soil, Noise, Light

Soil: industrial waste, pesticides, heavy metals fertilizers

Air: rises from burning of fossil fuels, hydraulic fracturing and vehicle smokes

Water: oil spills, urban runoff and ocean dumping.

Radiation

- Energy that comes from a source and travels through some material or through space.
- Types: light, heat and sound
- Sources: nuclear fallout from weapons testing, fission materials from nuclear power plants, leaking radioactive disposal sites, flying at high altitudes, mammograms and x-rays.

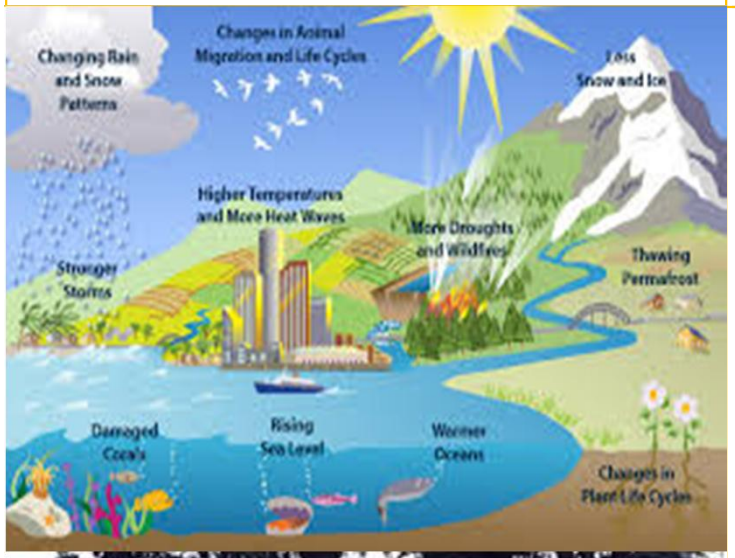
Industrial and Household Wastes

- Tonnes of garbage is produced by each household/industry each year.
- More wastes have been created due population growth, urbanisation, increase in demand for food, shelter and goods
- The use of landfill sites and incineration pose serious environmental concerns.
- This affects human health, wildlife's, degrades soil quality, cause air pollution and results in climate change

Global warming

- Increase in earth's temperature due to effect of greenhouse gases such as carbon dioxide, methane, water vapor and other gases.
- The gases possess heat trapping capacity which makes the planet warm for people to survive.
- During past several decades, the accumulation of greenhouse gases have grown rapidly due to human activity and more heat gets trapped in the atmosphere.
- These gases heat up the earth's surface and this results in global warming and subsequent climate change

Climate change



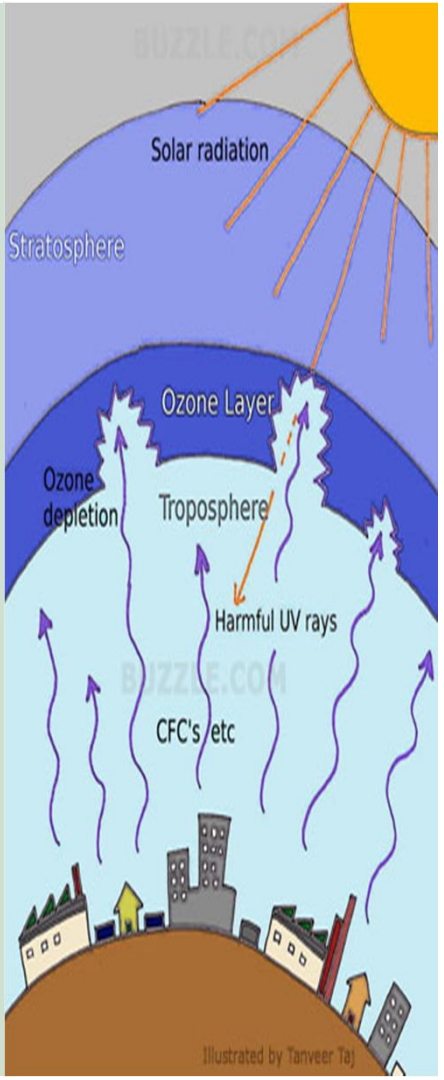
- Change in the statistical distribution of weather patterns when that change lasts for an extended period of time
- Climate change is a major threat to agriculture and our food security is at risk.
- Presently, farmers are struggling to keep up with shifting weather conditions which has affected yield.

Deforestation

- Clearing earths forest on a massive scale
- Agriculture is the biggest driver of deforestation and not all deforestation are intentional. some are caused by natural factors like wildfires and overgrazing
- Impacts include loss of habitat for millions of species, climate change, transformation of forest lands to barren deserts, global warming, floods, soil erosion e.t.c
- *United Nations Food and Agriculture Organization (FAO), stated that approximately18 million acres (7.3 million hectares) of forest are lost each year.*

Ozone layer depletion

- Ozone layer of the atmosphere protects life on earth by absorbing harmful ultraviolet radiation
- Depletion is caused by release of some chlorine and bromine-containing chemicals into the atmosphere
- Thinning of the ozone layer is predicted to cause increases in skin cancer and cataracts, damage to certain crops and marine food web and an increase in atmospheric carbon dioxide



Desertification

- Process by which fertile land becomes desert
- Nearly one fifth of the world's land is threatened with desertification
- Caused by drought, climatic shifts, tillage for agriculture, overgrazing and deforestation

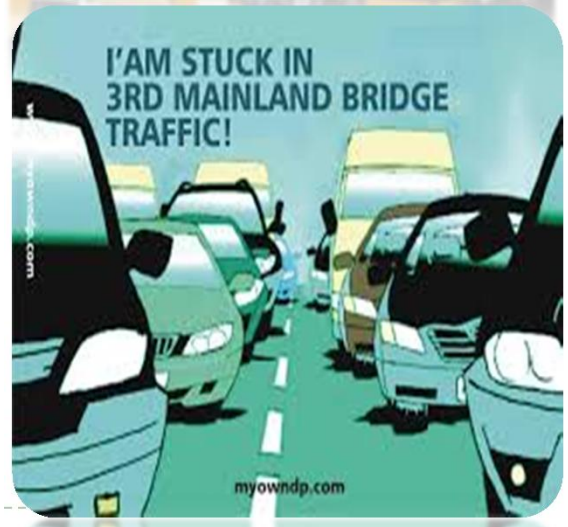
Table 2: Some examples of desertification trends

Kenya	At Lake Baringo, an area of 360,000 ha, the annual rate of land degradation desertification between 1950 and 1981 was 0.4%. At Marsabit, an area of 1.4 million ha, it was 1.3% for the period 1956-1972.
Mali	In the three localities of Nara, Mordiah, and Yonfolia, with a total area of some 195,000 ha, the average annual rate of loss during the past 30-35 years has been of the order of 0.1%.

Source: UNCCD, 2008

Psychological Hazards

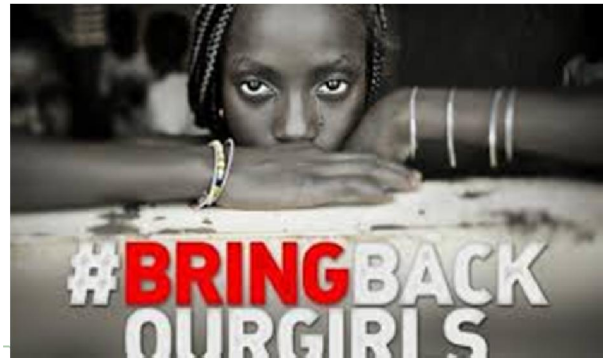
- Environmental factors that produce psychological changes expressed as stress, depression e.t.c
- Examples: high exposure to noise, light, overcrowding, waiting in traffic e.t.c
- These hazards can build up over time and cause psychological changes later in life.
- A recent survey shows that getting stuck in a traffic jam is the biggest cause of everyday stress (dailymail.co.uk, 2015)



Sociological Hazards

- Enviromental hazards that occur as result of living in a society e.g overpopulation, racial discrimination, terrorism, war e.t.c.

- Effects of sociological hazards are reduced life expectancy, increased emergencies, unemployment, environmental degradation e.t.c



Site and Location Hazards



- Natural disasters which are geographical and meteorological events of magnitude and proximity that produce significant damage and injuries to communities
- Examples are cyclones, earthquakes, floods, hurricanes, tornadoes, typhoons, and volcanic eruptions.
- Biological, psychological and sociological hazards may increase following a natural disaster
- Caused by several factors: soil erosion, seismic activity, tectonic movements, human activities, air pressure, ocean currents e.t.c

Table 3: Examples of site and location hazards

Number of deaths	Disasters	Location	Date
280,000	2004 Indian Ocean earthquake and tsunami	Indian Ocean	December 26, 2004
102	2010 Kohistan avalanche	Pakistan	2010
133	2008 Chinese winter storms	China	2008
138,866	1991 Bangladesh cyclone	Bangladesh	April 29, 1991
280,000	2004 Indian Ocean earthquake	Indonesia	December 26, 2004
56,000	2010 Russian heat wave	Russia	2010
903	Rio de Janeiro floods and mudslides	Brazil	2011

Source: https://en.wikipedia.org/wiki/Natural_disaster

Nigeria as a Case Study

- The discussed environmental hazards are faced in Nigeria but an exemption may be made in the area of the occurrence of severe natural disasters such as earthquakes
- A significant environmental hazard in Nigeria is oil spillage especially in the Niger delta region
  - This has lead to water pollution, uncultivatable lands, loss of income, acid rain, air pollution, death of the fish and wildlife population and also deaths due to fire outbreaks

OUR LECTURE SO FAR……

The significance of our lecture so far is to ask deeper questions…we ask which education, which technology or form of science is beneficial for all life on the planet as a whole?

The Role of Science, Education and Technology in Reducing, Managing and Prevention of Environmental Hazards

- Addressing environmental challenges requires the role of the government (at national, state and local levels), non-governmental organizations, and community based organizations, individuals, international organizations, law enforcement agencies, academics, technocrats, youth, companies amongst others and this can be done in the following ways:

Adopting effective environmental hazard/risk communication (EHC) strategies

- EHC is the interactive exchange of information of incidents or trends, either man-made or natural in cause, that have potential to inflict harm to human health and/or ecosystems and could include physical assets or the economy amongst stakeholders.

- Communication of environmental risks can be divided into two based on time-sensitivity of the need for sharing information:
  - events that might occur in the future where prevention is the focus
  - emergency scenarios where an event has occurred, and there is a need for immediate notification and deployment of mitigation actions.

In order to create a safe and healthy environment;

- **A good communication process must be established** in which the policies and procedures under which countries will operate is established **e.g. maintenance of frequent communication both in crisis and non-crisis times with the media and community, conducting educational programs to help prepare individuals to manage and mitigate environmental hazards (e.g. the case of Ebola)**

- **Innovative communication technologies should be adopted** e.g visual representation of hazards using geospatial tools, multimedia approach (word-of-mouth, public speaking, radio, television, telephone e.t.c.)
  - **Adequate information about hazards must be properly disseminated in order to avoid anxiety and related psychological impacts**

Development of Efficient EMS

- An efficient and durable **environmental management system** (EMS) brings together the people, policies, plans, review mechanisms, and procedures used to manage environmental issues in a country/organization
- It targets continual improvement, pollution prevention and environmental compliance

- **The development and adoption of an efficient EMS will:**
  - **make individuals/countries/organizations to be conscious of managing environmental risks**
  - help to reduce injury, sickness and death of nationals
  - help to minimize economic waste and reduce pollution
  - boast agricultural productivity and other economic activities

Application of Enviromental Impact Assessment (EIA)

- EIA is a formal process of evaluating the likely environmental impacts of a proposed activity or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse means and measures to mitigate and monitor these impacts
- **It remain the most practical tool for integrating environmental concerns and sustainability issues in development planning**

- In order to measure an impact the baseline situation which is the existing environmental situation or condition must be known
- **Enviromental impacts may be described in a number** of ways for EIA e.g. intensity, direction, spatial extent, duration, frequency, reversibility, probability e.t.c.

- **Benefits of adopting EIA**
  - more environmentally sensitive decisions are made
  - reduced environmental damage
  - a positive contribution toward achieving sustainability

Adoption of environmental hazards solving/friendly technologies:

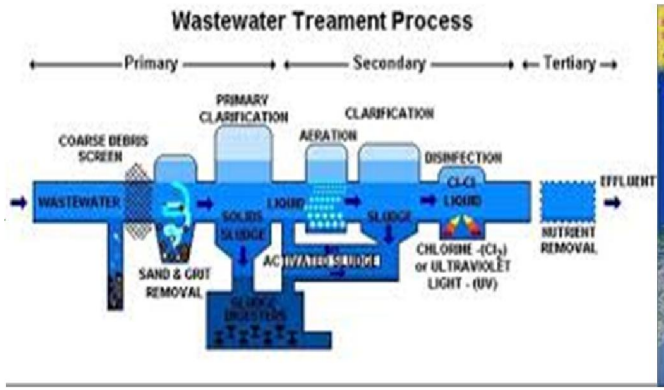
a) **Waste Management**

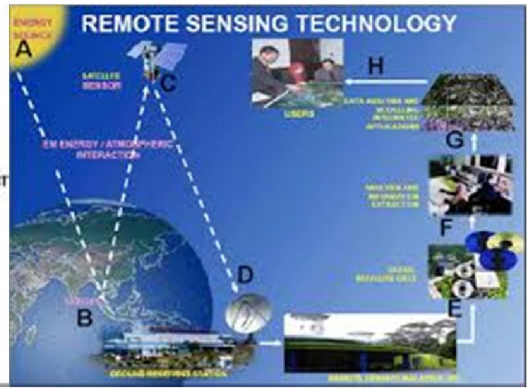
- **Control, monitoring and regulation of the production**, collection, transport, treatment and disposal of waste; and prevention of waste production through in-process modification, reuse and recycling.
- Intended **to reduce and minimise the effect of waste on health and environment**
- **Waste hierarchy** remains the cornerstone of most waste minimization strategies.
- **The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste**

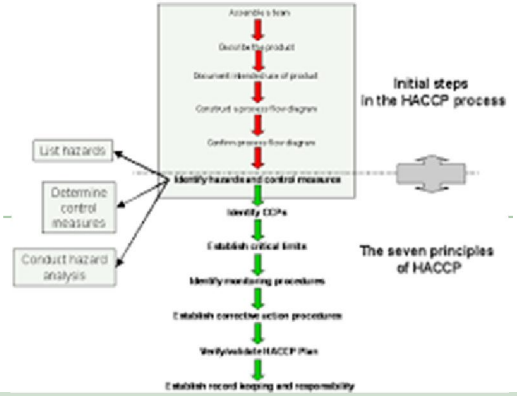
b) **Carbon emissions mitigation**

- Significant **reductions in carbon dioxide emissions can be achieved by switching away from fossil-fuel energy sources.**

- **Solar power, wind power, and hydrogen fuel cells also emit no greenhouse gases and these can serve as alternatives.**
- **Other alternatives include fuels made from plants, such as biodiesel and ethanol (a plant-based gasoline additive**)







c) **Water treatment and monitoring of distributing networks**

d) Adoption of Hazard Analysis and Critical Control Point to food production

e) Provision of proper and sound environmental education

f) **Conservation of wildlife and natural resources**, pollution abatement, control of bush fires, planned industrial development, evaluation and monitoring of radioactivity.

g) **Environmental monitoring** with the use of satellites, geographical information systems and remote sensing techniques, reintroduction of species, disaster forecasting and mitigation and mapping.

h) **Irrigation farming**, agro-forestry, rotational grazing, and prevention of illegal felling of trees.

i) Afforestation and re-afforestation programmes.

j) Urban planning

k) Promotion of alternative livelihood systems in areas prone to desertification;

l) Developing comprehensive anti-desertification programmes and integrating them into national development plans and national environmental planning

m) **Strict adherence to environmental policies** such as air pollution and emission standards and punishment of offenders

o) Establishment of more and stricter policies and regulations on environmental hazards e.g smoking regulations

p) Conducting scientific research that leads to the development of innovative solutions to environmental hazards.

- Nobel prize-winner Paul Crutzen, of the Max Planck Institute in Germany, suggested that it would be possible to inject sulphate particles into the atmosphere to mimic the effects of a volcanic eruption.

Our roles in the development of a safe, healthy and friendly environment

- Proper waste disposal
- Reporting of illegal logging and avoid bush burning
- Effective and appropriate vehicle maintenance
- to avoid heavy carbon emission
- Walk or ride your bike when going on a short distance
- Take environmental sanitation seriously
- Educate others on and practice the 3 Rs (reduce, reuse and recycle) of the waste management hierarchy
- Consider using solar energy in your house as solar energy prevents water and air pollution associated with burning fossil fuels for energy.
- Organize a community cleanup event near a river or lake where you live
- Join a community effort to replant trees

- When using chemicals, follow package instructions for use and disposal.
- Leave small grass clippings on the lawn, these, provides nutrients to the soil, creates healthy lawns and diverts yard debris from the landfill.
- Avoid wasting water or food
- Buy reusable materials instead of disposable ones
- Purchase energy efficient house hold appliances.
- Encourage organic crop production and consume organically grown foods as these reduce the amount of pesticides and herbicides used on crops.
- Switch off unused electrical appliances

Conclusion

- The continued existence and well-being of all living things, plants, animals and other component of the environment depend largely on the reduction/elimination of the discussed hazards and effort need to be made by all stakeholders to achieve this.

Remember……

We won't have a society if we destroy the environment.

Margaret Mead (1901 – 1978)

THANK YOU