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AIU Exam – Environmental Management and Pollution

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Contents

Introduction

The theme of the environment is currently one of the most important concerns of the world at the highest political, social and scientific levels. International conferences and scientific symposia are held to discuss the subject of the environment and related issues of concern to the world at the level of States, individuals, community organizations and non-governmental organizations in order to preserve and develop cultural heritage of environment and its basic elements of water, air and land. In order to preserve the permanence of our planet, the earth, for the benefit, progress and well-being of mankind, is not only for the present, but for the future generations to ensure the permanence of the people and the mission that God has created for them.

Pollution in its various forms, whether biological, chemical or sound, and wherever found in the air, water, and land, is one of the most dangerous threats to the environment and thus threatens the existence, progress and well-being of humankind, in addition to affecting animals and plants.

Environmental management is one of the important topics in order to maintain a clean Air, clean water and healthy food supply for all people of Earth, and to cut or minimize the effects of pollution risks on Humans and Nature in order to reach sustainable development and preserve natural resources so that they are optimally exploited.

The material of the following exam covers most of Environmental Management and Pollution topics; Air pollution and its sources; potable water pollution, sources and cleaning methods; wastewater management and treatment plants; solid wastes, recycling reuse and reduce procedures. It also concentrates on International cooperation concerning global management on water and pollution issues.

Lesson 1: WHAT IS POLLUTION?

1. How is pollution defined

Answer:

Pollution is any addition of chemicals, energy such as noise and heat to the environment that have adverse effect.

2. What are the 6 sources of pollution?

Answer:

2.1- Hazardous and toxic chemicals

2.2- Plant nutrients, fertilizers

2.3- Radioactive material, from nuclear plants and laboratory wastes.

2.4- Sediments, which may contain organic chemicals and heavy metals

2.5- Heat, such as hot springs, volcanoes, and industrial water

2.6- Biodegradable wastes, from human and animal waste.

Lesson 2: Environmental Management & Pollution

3. What is an Environmental Management System (EMS)?

Answer:

Environmental Management System is a systematic approach for incorporating energy and environmental goals and priorities (such as energy use and regulatory compliance) into routine operations

The US EPA defines an EMS as “a set [or system] of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency.”

This focus on processes and practices is common to all EMSs, which are generally founded on the "Plan, Do Check, Feedback" cycle1 of continuous improvement

4. Describe 6 of the 17 ISO 14001 Elements.

Answer:

1) Environmental Policy

   This item reveals how much a community or municipality is committed to sustainable environmental performance through public awareness policies and cooperation with high levels of environmental issues; for example a clean city requires rules for cabbage disposal and clean air in the city require rules for factories and vehicles on their gas emissions. This also requires cooperation with legislative authorities against rules breakers.

2) Environmental Aspects

   This item deals with community and municipality activities which may have negative impact on the environment if they are not done properly, for example solid waste disposal which may contain harmful medical waste, or unused pharmaceuticals, these may cause water pollution from the seepage into groundwater or damage to soil or air pollution from vapors of these materials.

3) Legal and Other Requirements

   Each community or municipality should comply to rules either by local rules proposed by local government and related legislative committees, or by international rules and agreements. For example potable water quality parameters for differ from one country to another, each country has its own regulations which depend on the source of water.

Also disposal of liquid wastes into rivers and lakes which have international borders is subjected to the agreements between those countries on the standard levels of pollution and purification procedures.

4) Environmental Management Programs

This item deals with methods and procedures that a community and municipality will follow to achieve objective towards good environmental management, for example the plans and methods used for solid waste disposal, sewage systems, radioactive plants, dumping sites, water purification systems, new roads and airports construction sites, new factories sites.

5) Training, Awareness & Competence

Dealing with environmental issues is not easy, it concerns with human life as will with sustainable development in the community and the whole world. For example technicians and workers in water purification systems or in landfills, should be of high skill and well trained on handling the raw material and should be aware of the standards of the final product. The designers of the environmental protection plants should be aware of the environmental laws locally and internationally. Training for all employees for such plants should done periodically so as to reinforce their knowledge and to open new sights on new scientific methods.

6) Communications

This issue deals with local and international environmental data bases for all activities. This will save efforts and money in dealing with environmental issues, for example for the construction of a new landfill site, all geological, groundwater, surface

water, land use, human colonies, roads, airports, should be available on the table of stakeholders and engineers.

Cooperation and communication between scientists, scholars and politicians among local and international leaders, should be done periodically to overcome any problem.

Lesson 3: ATMOSPHERIC POLLUTION

1. Describe the "Four types of processes" that affect air pollution levels.

Answer:

1- Emission: A type of air pollution process which involves emission of chemicals in the atmosphere such as gases, particles and other chemicals from human activities such as burning fossil fuel, biological systems also emit gases and chemicals through biogenic degradation of food. Nonliving systems such as volcanoes also emit dangerous gases and small chemical particles.

2- Chemical:

Many reactions occur in the layers of the atmosphere involving VOC's and common air pollutants such as NO_x and OH. VOC reacts in such a way that it initiates radical levels it would enhance the rate of ozone formation from all VOCs present. The following chemical equations illustrate the consumption of pollutants such as NOx and the formation of Ozone

$RH + OH \rightarrow R + H_2O$

$R + O_2 \rightarrow RO_2$

$RO2 + NO \rightarrow RO + NO_2$

$2(NO_2 + h\nu \rightarrow NO + O)$

$2(O + O_2 \rightarrow O_3)$

$RO + O_2 \rightarrow$ Carbonyl Compound $+ HO_2$

$HO_2 + NO \rightarrow OH + NO_2$

$RH + 4O + 2h\nu \rightarrow H_2O + 2O_3 +$ Carbonyl

The formation of ozone proceeds until all NOx is consumed, so air pollutants are reduced by these reactions.

3- Transport: Strong winds and aerosols from sea carry pollutants from their local source through air to long distances, which make it difficult to tract.

4- Deposition: Many toxic chemical species which occurred in upper atmosphere are deposited back to earth by rain, snow, fog; The old saying " snow is the fertilizer of the poor" Nitrate ions formed in the atmosphere by the reaction of nitrogen oxide with lightening come to ground by snow.

2. What are the four "Primary Air Pollutants"?

Answer:

Oxides are compounds formed from the reaction of molecular oxygen (O_2) with other metals or elements. The reaction is called oxidation reaction. The famous oxides found in air and may react with water vapor molecules in the atmosphere forming acid rain. They are considered as primary air pollutants, because they are emitted directly from the source.

1- Sulfur dioxide, SO_2 ; this oxide reacts with water vapor (H_2O) in air and forms sulfuric acid (H_2SO_4)

2- Nitrogen Oxides, NO and NO_2 or sometimes they are called NOx; these oxides react with water vapor (H_2O) in air forming Nitric acid (HNO_3).

3- Carbon monoxide (CO); this toxic gas is emitted from vehicle exhaust and from indirect burning of biomass. It causes suffocation in humans upon its binding with hemoglobin in place of oxygen causing death.

4- Volatile organic compounds (VOC's); an example of these compound are low carbo carboxylic acid like acetic, formic and propionic acids, hydrocarbons like benzene hexane, cyclohexane, toluene, ethylbenzene and some organic gases like methane; these compounds volatile at low temperatures and their molecules are carried by air over a large area very quickly, they may go into reactions in the atmosphere forming new pollutants. Although some of them may be the seed for Ozone formation.

3. What is smog?

Answer:

Smog is a visible air pollution, it is a mixture of smoke and fog, usually happened close to the ground, it is caused by agricultural activities such as burning wood or burning coal for heating purposes. Also it can be caused from intense vehicle and industrial emissions. Smog is composed of smoke and dirt particles, nitrogen and sulfur oxides, carbon dioxide and ozone, it has a bad stinky odor it causes respiratory irritation and in some cases pneumonia and death especially in infants and in old people.

Lesson 4: SECONDARY ATMOSPHERIC POLLUTION

1. How is the Ozone layer around the earth affected by pollution?

Answer:

Ozone is the shield for our planet Earth against the harmful ultraviolet radiation from Sun, which causes cells damage, burns skin cancer at high concentrations.

The concentration level of Ozone is decreasing 0ver the past few decades because of the bad production and use of some chemicals. Chlorofluorocarbons (CFC's), which were used in cooling systems and in fire extinguishers and also in manufacturing plastics. These compounds are the main sources of Ozone depletion.

CFC's react with UV to produce Chlorine radicals ($Cl\cdot$)

$CFCl_3 + UV \rightarrow 2Cl\cdot + \cdot CFCl_2$ ---------- (1)

The chlorine free radicals are very reactive species. They react with Ozone (O_3) in the stratosphere to for $ClO\cdot$ radicals, which are also reactive radicals

$Cl\cdot + O_3 \rightarrow ClO + O_2$ ---------- (2)

$ClO + O_3 \rightarrow Cl\cdot + 2\ O_2$ ---------- (3)

From equations 1m 2 and 3, above we see that one chlorine radical depletes two ozone molecules and regenerated again for more Ozone depletion.

2. What are Greenhouse gases? How do they cause Climate Change?

Answer:

Climate change is defined as the change between absorbed solar heat and the radiated heat from Earth per unit time and unit area (W/m^2).

Greenhouse gases are those gases that absorb and emit radiated thermal energy in the Infrared region. These gases are mainly Water Vapor, Carbon dioxide, Methane, Nitrous Oxide and Ozone of the Troposphere; these gases keep absorbing radiated heat from Earth and reflecting it back to Earth which causes elevation in Earth temperature, without these gases, Earth's average temperature would be -18 °C, but now it is 15°C.

Because much of earth is covered with oceans, the warming of these oceans causes vaporization of water into clouds and hence severe storms like hurricanes typhoons are formed in The Northern Hemisphere, more rain and melt of snow in North Pole and Antarctica, causes elevation of ocean water; the change in temperature causes change in wind patterns which brings monsoon in Asia and changes rain and snow in the whole world. Unpredictable weather all over the world is also another concern of climate change.

Lesson 5: WATER QUALITY

10. Describe completely the "Water Environment" and "The Hydrologic Cycle".

Answer:

The Water Environment is described as the whole water within the Planet Earth, it starts with rain droplets in the clouds falls down as rain on mountains, forests grassland, forming valleys, streams, rivers and lakes and then down to oceans and seas, or seeps into ground and stored as groundwater in confined or unconfined aquifers and then erupts as springs or trapped into deep layers of rocks.

Water movement and path in the water world is called Hydrologic Cycle; It is the folkloric story we used to hear in elementary science classes about the journey of a water drop "A drop of water tells its story".

The hydrologic cycle starts from oceans, which is the reservoir of water, where sun heats ocean surface, water evaporates into clouds and moved by wind on land, clouds in the upper layers cool and water drops condense into rain or snow, it goes down to earth, it may seep into groundwater and stays there until it is pumped as drinking or irrigation water, or it may be absorbed by plants and goes through the food cycle, or it may come back to ocean by volcanic eruption or earthquake breakdown. Another way of rainfall drops, they may go back into ocean through stream, valleys and rivers or they may evaporate again from surface water and cools again in clouds and comes back as rain or snow, and the cycle goes on.

11. Describe 4 examples of how "Human Activates" affect water quality.

Answer:

1- Human activities in rivers

Some big rivers, like Nile, Amazon, Danube and many others, from ancient time, were used as the main trade transportation routes between highlands and sea, to carry goods across continents. As an output of this activity, contamination of rivers water with all kinds of pollutants, such as leakage of fuel oil from ships and boats, organic and inorganic wastes from drowned goods, sewage from boats, also wastes dumped from cities and constructions on the shores of the rivers, reached high levels which makes rivers water unsafe for domestic uses as well as agriculture. The assimilative capacity of rivers becomes overburdened and the rivers are no longer capable of cleansing itself. Another contamination factor may arise in some rivers like Nile as an example, when the state of Ethiopia decided to build the Big Dam of Al-Nahda, which will decrease the amount of

water flow for Egypt and then the concentration of contaminants will increase in the Egyptian part of the river.

2- Human activities in lakes and ponds

Many people from ancient times and until now, look at lakes and ponds as a place for spending vacations for fishing, swimming skiing, they build country houses and cottages on lakes banks, and in many cases hotels are constructed on lakes banks, and without consideration for environmental rules, people dump wastes in these lakes in the absence of municipal sewer systems ; as lake's water is not changeable quickly like rivers and streams, it becomes contaminated very quickly with no hope of fast and efficient purification. Another source of contamination in lakes is the storm-water runoff, which carries pollutants and contaminants, like pesticides, herbicides, fertilizers, oils, antifreeze, soaps and paints from lands surrounding the lakes. The water quality of lakes water deteriorated and takes a long time and money to recover.

3- Human activities in gulfs and estuaries

Gulfs and estuaries are the connection between salty water of the sea and the fresh water of rivers. From ancient time gulfs and estuaries are used by mankind as trading points between sea and highlands, in when tide is high, mixing of fresh water and salty sea water is obvious and contamination of the gulf water from human activities such as industrial, agricultural and sewage disposal in these areas, also the contaminated sea water from the leakage of oil from ships and the dumped wastes from nearby construction are carried by tide water and aerosol to the rivers and streams causing pollution and water quality deterioration.

4- Human activities in groundwater

Groundwater is that water trapped in the layers of rocks under the land surface, it may be trapped in confined aquifers, unconfined aquifers and perched aquifers. Ground water in many countries, who don't have apparent surface water, is the main source of fresh water. Usually man made power is used to pump water from ground , in many places, natural springs emerge from aquifers directly into streams and rivers.

Groundwater is not easily accessible, any contamination of pollutants from direct or indirect sources will be hard and expensive to overcome.

The main sources of pollutants that may cause contamination of groundwater are industrial, agricultural and municipal human activities. Since rainfall water is the main source of groundwater, air polluted rainfall, runoff carrying pollutants from agricultural and industrial activities and from the leakage of sewer systems, contaminated aerosol from sea, will go into groundwater and changes the water quality of groundwater. Over pumping of groundwater will increase the concentration of pollutants and in some cases intrusion of sea water will change the water quality of groundwater.

Lesson 6: WATER POLLUTION

12. Describe 3 of the most common sources of water pollution.

Answer:

Water pollution is defined as any addition to water that changes its color, smell, temperature, biological, physical and chemical parameters. Some of the sources of water pollution are:

1- Storm water runoff

Some of rainfall goes directly into ground and then to recharge groundwater, other parts of rainfall forms what is called runoff, runoff strength and volume depend on the topology and slope of the land. Depending on the land use, runoff carries pollutants, it carries oils, fuels, vehicles particles from roads and parking lots, pesticides and fertilizers and animal wastes from farm lands, industrial and construction residues from factories and housing sites, leachate from landfills.

The pollutants from these sites causes serious water quality deterioration in rivers, lakes , sea shores and groundwater, through contamination with heavy metals, oils, toxic organic compound and biological species.

2- Septic systems

This procedure for wastewater treatment consists of a large tank buried in soil and a perforated pipes comes out of it through soil, the sediments remains in the tank and the liquid effluents runs and treated into soil. This system can be a strong source of water pollutants if it was near potable water such as springs or if the groundwater table is high or if the soil structure is not good for the wastewater effluent to be treated, some soils, like clay don't allow water to go through it because of the finely packaging of its particles and then the pollutants remains near the source. In other cases when the soil have conduits and meets with karstic systems in rocks, it can be a serious contamination problem for groundwater. Also if the septic tanks are too many in condensed populated areas and the effluent flow was very fast, the soil will be over its capacity for good treatment of wastewater.

3- Sewage treatment plants

In large communities and big cities, municipalities usually have sewage treatment plants for the treatment of wastewater, which is drained from houses through pipes to the treatment plant. In the treatment plant, the solids (sludge) are separated, dried and used in fertilizers; the liquid wastewater is purified and disposed into waterways.

This process is not a one hundred percent efficient, and may cause a serious problem to the water quality; many toxic chemicals such as metals, polychlorinated hydrocarbons are not separated efficiently and remains in the sludge, the effluent water is not completely treated and may dissolved metallic compound and biological species remains in the water which goes directly into water ways such as rivers and streams and may go to groundwater, so the toxic pollutants comes back to water systems and the risk on public health remains.

In old sewage system, the possibility of intrusion of wastewater before treatment through cracks and links into water ways is possible, also during rain storms and hurricanes and floods there is a danger of overflow from storm water from drainage systems back into waste water treatment plants causing damage to the plant and decreasing the time of biodegradation of the organic compounds.

Lesson 7: HAZARDS OF HEAVY METAL CONTAMINATION

13. What are “Heavy Metals”? What are the hazards of “Heavy Metals”?

Answer:

The term heavy metals is referred to the high density (greater than 5g/cm^3) elements, like Mercury (Hg), Cadmium (Cd), Lead (Pb), Arsenic (As) and Chromium (Cr). These elements

are highly toxic at very low concentration and are note degradable in Nature. Heavy metals accumulate in the food chain starting from seafood, fish, drinking water and ends to humans. These elements are considered as hazardous elements because of their effect on environmental species and Human health, they cause nervous system disorder, abdominal pain, loss of sight, vomiting, abdominal pain, nausea, diarrhea, constipation , bones and Skelton pain , they cause lung, skin cancer and kidney failure leading to death. Psychological symptoms are observed upon poisoning from heavy metals.

14- What are the sources of Cadmium pollution? What is the hazard of Cadmium?

Answer:

Contamination with Cadmium comes mainly from waste disposal of Ni-Cd rechargeable batteries, the leachate of landfills containing disposed batteries, goes with runoff into water ways. Household wastes containing Cadmium products and cigarette smoking is another source of cadmium exposure.

Cadmium poisoning causes severe pain in the Spine and Joints (Tai-itai disease), bone softening and fractures, coughing, anemia and kidney failure leading to death. Contaminated rivers with Cadmium causes fish death.

15. What the sources of pollution from Mercury, Lead and Arsenic?

Answer:

-Mercury is a liquid element, it is very volatile at low temperature, it is found as elemental state Hg° or as compound like calomel $HgCl_2$ which is soluble in water. vapors of mercury reacts with organic material in the atmosphere forming Methyl Mercury, which deposits in

water bodies and soil or on vegetation, these forms of mercury are accumulated in the food chain for humans through sea food, like fish, snails, sharks and others. Other sources of Mercury pollution are the dental amalgams waste and medical and scientific laboratories.

-Lead was a very useful element for many industries such as paints, pigments glass coloring, batteries, plumping works and household equipment like glazed food containers. Pipes for carrying water were used widely until replaced by polyethylene and polypropylene pipes. Wrong use and improper disposal methods of these materials is a good source of lead pollution.

Emissions from vehicles engines as the major source for lead pollution; tetraethyl lead was added to engine fuel to prevent electrostatic charge in fuel tanks.

-Arsenic is a naturally occurring element in rocks soils and groundwater, in some countries like Bangladesh and Chile, it is found in groundwater as well as surface water causing a serious pollution problem for the people of these countries and may cross boarders to other countries. Arsenic is also found in many industries

Lesson 8: Environmental and Chemical Carcinogenesis

16. How do chemical pollutants in the environment cause cancer through DNA?

Answer:

Most pollution chemicals modify DNA whether by forming adducts or causing DNA breakage or nitrogenous base modifications. The result is DNA damage that when not fixed will cause mutations and cancer cell proliferation. Each chemical has its own mechanism on its connection to DNA in cells.

17. What are the sources and hazards of Aflatoxins?

Answer:

Aflatoxins are poisonous carcinogenic compound produced by some kind of mold (*Aspergillus flavus*) it grows in soil, old vegetation and grains such as corn, rice and peanuts. Aflatoxins enter the food of the animals causing contamination of their product, such as eggs milk products and meat, which then goes to Humans food causing cancer in many cases. Children and patients infected with of hepatitis B virus, are particularly affected by Aflatoxins exposure, which is associated with delayed development, stunted growth, liver damage and liver cancer. Some types of Aflatoxins like Aflatoxin B1- permeate through the skin.

Lesson 9: Group Facilitation Techniques & Methods

18. Describe how the processing of food contributes to pollution. What methods are used to remove the pollution from the environment?

Answer:

Food processing industry contribute to pollution through wastewater and solid waste, depending on the kind of food, whether vegetables, beverages milk or meat.

Wastewater in vegetable food processing is used in large quantities for washing, it contains residues of pesticides, herbicides, insecticides pathogens and sugars, and it may cause degradation of water quality in water ways and soil.

Wastewater from protein food processing contains fats, proteins, milk, pathogens and nitrogen, which upon disposal without treatment causes eutrification in water ways.

Solid wastes from meat food processing contains fats, bones, hair, if not treated, it will cause contamination to soil, water ways and air.

Solid waste from vegetables food processing contains rinds, seeds, cellulose, it has a bad effect on the environment and water if not treated.

There are many ways to remove or reduce the pollutants from the environment depend on the source and type of pollutants. The key words for waste treatment are Reduce, Reuse and Recycle (the 3 R's).

The best ways for the removal of pathogens in wastewater before disposal into water ways, are Ultraviolet radiation or by Ozone. Disinfection by chlorine is good but not preferable because of the residual chlorine contamination. Reverse Osmosis (RO) can be used afterwards for a better purification.

Solid waste treatment can be done by reuse of vegetable solid wastes as animal and fish feed and compost. Fats and leather from meat food processing can a base material for cosmetic industries, bones can crushed and used for fertilizers and fish feed.

19. Describe 1 "Advanced Wastewater Treatment Practice".

Answer:

Water is vital for life, two thirds of our bodies consists of water. Our daily intake of water comes to our taps from environment after proper treatment by municipalities to maintain the good quality of potable water. Many pathogens and microorganisms can be found in untreated potable water which may cause cholera, polio, hepatitis and typhoid, and eventually lead to death to individuals. Disinfection is one of many advanced methods used to eliminate these pathogens from potable water and keeps the water quality under control.

Good water quality is indicated by Total Coliform colonies (TC) and the quality of wastewater quality is indicated by fecal coliform (FC) and in some cases by *Escherichia coli* (E.C).

Disinfection by Ozone, in which Ozone oxidizes some organic compounds, producing new compounds that have disinfecting properties. Ozone occurs naturally and also can be manufactured, in this case special care is needed to avoid explosions in the system and ventilation is required from reservoir tanks to avoid ozone irritation.

Disinfection by irradiation of wastewater with Ultraviolet (UV) light. UV has a short wavelength (250-270 nm) and a high energy, it affects the genetic material of the microorganisms and retards their ability to reproduce. This process is considered as a clean method and does not leave residues which need further removal but it is slow and expensive because the UV lamps need cleaning from algae and sediments. It needs periodic maintenance. Removal of suspended solid is needed before application of UV light because it blocks the light path. This method has a side effect as some microorganism can reactivate itself and regrow again, special care for reuse of treated wastewater by this method.

Chlorination by chlorine gas (Cl_2) Chlorine gas is very toxic and hazardous compound, special safety precautions should be done when applying this chemical. Chlorine gas from cylinders is dissolved in a small quantity of potable water and then poured into the septic tank containing wastewater. The contact time is important for complete disinfection.

Disinfection of wastewater by Sodium hypochlorite (NaOCl), although it is hazardous and corrosive, but is safer than chlorine gas. It contains between 5%-15% chlorine, it is fed to the stream flow of wastewater by a pump and mixed thoroughly with the effluent in the contact tank.

Disinfection of wastewater by Calcium hypochlorite ($Ca(OCl)_2$) which contains 65%-70% chlorine, it is applied as tablets in the flow stream of wastewater and capable of disinfecting large quantities of wastewater and are safe to use and does need electricity for further cost. Primary treatment to remove suspended solid particle is required before disinfection process.

Potable water disinfection: Disinfection of potable water derived from surface water, ground water, rivers and lakes, should be done in two stages; primary stage in which UV, Ozone or Chlorine is applied first, and a secondary stage is followed by applying chlorine or its compounds before Human use to be sur that no pathogens or microorganism exists.

Lesson 10: Waste Management

20. Describe "Waste Management". How is water being managed globally? How can waste benefit society?

Answer:

Waste management are all activities and actions required to manage wastes from its production and to its disposal. This includes collection methods, transport, storage, methods of treatment and disposal. It includes regulations for reuse and recycling of wastes.

Waste management deals with all kinds of wastes, solid, liquid, gas and with its sources, industrial, biological, domestic or agricultural. Waste management intends to reduce effects on public health and environment, for the benefit of all society sectors and on a global scale.

Global Management of Water:

The main the theme of the World Water Day held on March 2018 was “Nature for Water”. On this day, the United Nation had launched the Water Action Decade 2018-2028. The United Nation and its High Level Panel on Water called for a fundamental shift in global water management. The Water action calls for a fundamental shift in the way the world manages water so the sustainable development goals, particularly goal 6 which ensures the availability and sustainable management of water and sanitation for all.

Since water is a matter of life and death, according to the UN- Secretary General, many actions can be done for a Global Water Management:

1- Provide adequate data on water from all countries and make accessible for all scholars.

2- Water assessment for sustainability, efficiency and water delivery for all. And concentration on women and children sector in the developing countries.

3- Water management is equitable for all and at all levels of government and society organizations.

4- Ensure access to safe water sources and sanitation for all sectors all over the world

5- Developing communities and economies to reduce pollution risks through exchange of experience between all nations and social organizations

6- Increase investment in water infrastructure for sustainability purposes.

7- Protecting environmental water sources by preventing the spread of pollution and degradation.

8- Building partnership and encouraging international cooperation in water issues

9- Developing sustainable cities to conserve water resources, and encouraging new innovations in water science and management.

Answer:

How waste benefits the societies?

Waste is the product of humans, animals and Nature, it is harmful to humans and Nature if not treated properly under scientific control standards. It will be of great importance and lead to social and economic value when waste management applied.

Many sectors in the society make good business out waste dealing

1- Affords jobs for a large sector of workers, collectors, scavengers and scientists.

2- Recycling activities by this sector can generate significant employment, especially for women, through creative microfinance and other small-scale investments.

3- Recovery of useful recyclable material such as glass, metal and paper, will conserve resources and avoid greenhouse gases generation and will decrease overload on Nature.

4- Composting organic wastes such as wastes from food processing plants, provides good quantities of fertilizers for agriculture. Composting and other biological treatments emit very small quantities of greenhouse gases.

5- Recycling animal fats, leather and bones from food processing industry is useful for fish feed and as raw material for cosmetic industry which reduces demand for harmful petroleum products and has less effect on personal and public health.

6- Engineered gas recovery at landfill sites, larger quantities of methane gas are annually being recovered, both to comply with air-quality regulations and to provide energy.

7-Incineration for waste to-energy has been widely implemented in many countries decades

8-Treatment and recycle of wastewater helps to reduce demand on fresh potable water especially for agricultural and industrial purposes. It is also a good source for methane gas which is a good source of energy.

Conclusion

The lesson's material and the exam questions, were not just an exam for me to challenge my knowledge and capabilities; it provided me with a new knowledge and a feedback experience. It was a complete and a comprehensive course.

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