



POSTGRADUATE DIPLOMA IN WATER, SANITATION & HYGIENE (WASH)

FINAL EXAM

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1. Diarrhea among children under 5 is common in many rural villages.

- What environmental factors or practices may cause diarrhea in young children?

Environmental factors like the type of water source, presence of sanitation facilities, solid waste disposal system and food hygiene are found to be crucial contributors for the high prevalence of diarrheal diseases in under five children. This is particularly caused by unsafe/unprotected water sources e.g. ponds, wells, rivers, lakes, lack of improved sanitation, hand washing facilities & practices, poor knowledge on diarrheal cases and information, etc.

- Explain three ways to prevent it

Diarrhoeal disease in under five children is preventable, though it's the second leading cause of death in children under five years old.

Below are the ways to prevent it:

1. Exclusive breastfeeding for the first six months of life
2. Access to safe drinking-water and good food hygiene
3. Use of improved sanitation and always hand washing with soap and good personal hygiene.

2. Think about the possible types of pollution that could be produced from a health center.

- a. List the types of pollution that could be produced, giving one example of each type.

World Health Organization (WHO) reported that from the total waste generated by health care activities, 85% is general waste (non-hazardous waste) and the 15 % balance is considered as hazardous, as it tends to be infectious, toxic or radioactive. (WHO, 2000)

Below are waste types:

- **Infectious waste:** waste contaminated with blood and other bodily fluids, cultures and stocks of infectious agents from laboratory work or waste from patients in isolation wards, etc.
- **Pathological waste:** human tissues, organs or fluids, body parts and contaminated animal carcasses;
- **Sharps:** syringes, needles, disposable scalpels and blades, etc.;
- **chemicals:** solvents used for laboratory preparations, disinfectants, and heavy metals contained in medical devices (e.g. mercury in broken thermometers), etc.
- **Pharmaceuticals:** expired, unused and contaminated drugs and vaccines;
- **Genotoxic waste:** highly hazardous, mutagenic, teratogenic or carcinogenic, such as cytotoxic drugs used in cancer treatment and their metabolites;
- **Radioactive waste:** such as products contaminated by radionuclides including radioactive diagnostic material or radiotherapeutics materials; and
- **Non-hazardous or general waste:** waste that does not pose any particular biological, chemical, radioactive or physical hazard.

The following are the examples of pollution produced from the health center:

- When wastes are disposed of in a pit which is not lined or too close to water sources, the water bodies may become contaminated.

- If health-care waste is burned openly or in an incinerator with no emission control (which is the case with the majority of incinerators in developing countries), dioxins and furans and other toxics air pollutants may be produced. This will cause serious illness in people who inhale this air.
- Through direct contact, health-care waste can adversely impact human health by contaminating water bodies during waste treatment and by polluting the air through emissions of highly toxic gases during incineration.

b. i) Describe the two main approaches to pollution management.

There are two main approaches to pollution management:

1. **Pollution prevention:** focuses on stopping pollution being produced in the first place or reducing any waste generation at the source.
2. **Pollution control:** those measures taken to control pollution and wastes after they have been generated or produced.

ii) Outline the pollution management methods that could be used for the pollutants you have listed.

Though in health center's environment, there are many pollution risks, including general waste, hazardous materials, dust, mold, and germs, etc. Luckily, many of the factors that contribute to these environmental pollutions in health center can be controlled and the pollution possibly avoided.

Below are the methods for prevention & management of the pollution:

- **Handle hazardous waste correctly.** It is critical that entire staff of health center have to know how to handle and dispose of hazardous materials. If the staff is thoroughly trained, it reduces the risk of contamination and pollution. Store hazardous materials away from nonhazardous materials to avoid contamination. Always keep radioactive materials segregated, centrally processed, and properly labelled
- **Consider waste treatment or recovery.** There are treatment systems available that can recover certain substances from wastewater, and others that can detoxify certain substances, meaning that you do not have to treat them as hazardous materials when disposing of them.
- **Control spills to groundwater.** handle properly the contaminated waste (liquid & solid) to dispose underground to avoid proactively the contaminating the groundwater.
- **Minimizing waste incineration.** Incinerating waste can cause the air inside your hospital to become contaminated with toxic chemicals like dioxin. For this reason, minimizing the incineration or seek out alternate methods of waste disposal if the health center still relies on an incinerator. Recycling and reducing waste will help you greatly reduce the costs associated with properly disposing of waste.
- **Properly manage the waste.** Segregate properly the waste and dispose them as safer as possible to avoid polluting the environment.

3. Give three reasons for incorporating plans for M&E during the early stages of a project's development.

Three possible reasons for incorporating plans for M&E during the early stages of a project's development are:

1. To detect any problems or failures and learn from them so that the next project does not make the same mistakes.
2. So that progress can be checked at key stages of the project to ensure that plans are being followed, budgets spent appropriately and targets on track to be met
3. So that the impacts of the project can be assessed to find out if the project has been effective and provided value for money.

4. Explain four factors that are important when choosing a sanitation technology

The following key factors are to be considered important while choosing the sanitation technology:

1. **Ground Condition:** In the choice of sanitation technologies, ground conditions, particularly groundwater level, soil permeability and stability, are important considerations. Some sanitation technologies, except those which can be built above the ground, are feasible when the ground water level is below one meter from the surface. Other options require permeable soil for soakaway of effluent and others require stable ground for construction.
2. **User Hygienic Practices:** In the sanitation technology, the systems can be categorized as dry or wet systems. Dry systems, such as the composting toilets, do not allow the use of water. When water is used for anal cleaning in pit latrines built in low-permeable soil, poor percolation and water logging occurs. In wet systems such as the pour-flush and cistern flush toilets, solid materials such as rocks, mud balls, corn cobs, stones and sticks cannot be used since these materials would cause blockage problems.
3. **Proximity and Access to Services:** The proximity and accessibility of services such as water supply to the majority of the households affect choice of sanitation technology. Sanitation systems which require water for its function can't be installed in area without water accessibility.
4. **Community Density:** In selecting sanitation systems, consideration of community density is critical in settlements with high density. On-site systems such as pit latrines, aqua privies and septic tanks require adequate space for the infiltration of waste discharged into them.

5. a. **Define Sustainability.** Sustainability is a concept used to ensure that activities regardless of the place or the time they happen result in a long-term positive impact on the environment and its inhabitants.

b. **Explain four factors that can be used to foster sustainability in WASH projects.** Factors which critically affect sustainability of WASH services from the planning stage, through construction to post-construction or operation stages, include **participatory planning, social inclusion, technology choice, operation/maintenance**, site selection, quality assurance, governance and social accountability, etc.

Below are my four selected factors that can be used to foster sustainability in WASH projects:

1. **Participatory planning:** Users must participate in planning, so their opinions, interests and needs are addressed.

2. **Socially inclusive planning:** WASH facilities should be planned with all sectors of the community in mind, including the poor, elderly, disabled and children.
3. **Technology choice:** Technologies used in providing WASH facilities should be easy for the community to understand, use and maintain.
4. **Operation and Maintenance:** Establishing a system for timely, efficient and cost-effective maintenance is essential so that breakdowns are prevented.

b. Giving reasons explain 5 conditions that will help in improving the water supply situation in your country. I'm giving the example of my country (DRC)

Although the Democratic Republic of the Congo (DRC) has Africa's largest freshwater resources, it's still suffering from an acute drinking water supply crisis. The country has one of the lowest rates of access to drinking water in Sub-Saharan Africa.

Given the abundance of the DRC's water resources, the potable water problems are fully surmountable if the investments and governance reforms are effectively implemented.

Therefore, five key interventions need to be implemented as a matter of priority. These are:

1. **Developing a national water policy, sectoral water strategies and statutory regulations.** Elaborate a national water policy defining the guiding principles that would create the "enabling conditions" to mobilize investments and ensure strong incentives for improvements in water use. As the preparation of a water resources management strategy and national public water services strategy should be carried out as a matter of priority.
2. **Developing a comprehensive national water information system for the DRC.** This entails investment in both the "hardware" and "software" components of a water information system. The former refers to building a hydrological and climatological station observation network, which was to a large extent, destroyed during the conflict period. It would cover surface and groundwater and monitor both water quantity and water quality. The "software" component is concerned with stakeholder coordination, setting data standards and defining modalities for information sharing and dissemination.
3. **Investing in autonomous, community-based management of microscale water infrastructure.** This should be largely based on the successful Water User Association. A discernible advantage of microscale infrastructure projects is that they can provide greater returns on investment made and reach areas inaccessible to government services. By increasing water supply coverage in periurban and rural areas, this mechanism would significantly contribute to the achievement of national and MDG-based water targets. The aim would be to raise the proportion of the population accessing water from public standposts.
4. **Implement a capacity-building programme for decentralised water institutions.** In view of decentralisation plans, this programme would primarily target building the capacities of provincial water authorities. It would entail significant investment in technical and administrative training in areas such as water law and strategies, development of institutional arrangements and equipment provision. Pilot provinces and catchments from different regions would be selected to ensure that they reflect the country's heterogeneous conditions.

5. **Develop and implement watershed-based source protection plans.** This programme would target strategic but degraded watersheds that play a critical role in supplying drinking water to large population centres. This would entail development of pilot projects based on an Integrated Water Resources Management (IWRM) approach that aim to create a structured process for reconciling the divergent needs of multiple stakeholders within target catchments. It would also provide an opportunity to practically test the IWRM approach promoted in the Water Code and help inform the design of regional and national IWRM programmes.

6. **What are the key factors to be considered when planning a new landfill in small and medium-sized towns? List at least four factors.**

Below social, environmental, technical, and economic factors are to consider when planning a landfill in small and medium-sized towns:

1. **Local opinions and beliefs about the site:** consideration has to be given about the local community belief and opinion about the site.
2. **Distance from Residential Areas:** The waste disposal sites should not be sited or located in populated areas. Therefore, the distance from the site to the town has to be considered.
3. **Location of surface Waterbody:** Generally, waste disposal areas must not be sited near rivers, lakes, ponds or swamps, because they can be polluted.
4. **The depth of groundwater table** is a significant parameter in determining the contamination risk of groundwater below the site by landfill pollutants, in order to limit potential contamination.
5. **Topography and geology of the site:** The areas with high slopes are not ideal for waste disposal, and flat areas are not ideal either. The preferred areas for waste disposal are those with medium slope and the soil type and infiltration rate has to be checked to assessing the potential risk of contamination of groundwater.

b) Explain how incineration differs from open burning

Waste incineration is the combustion of waste in controlled incineration facilities while open burning of waste is the combustion of waste in nature (open-air) or in open dumps, where smoke and other emissions are released directly into the air without passing through a chimney or stack.

Therefore, the Incineration is burning that is enclosed and controlled while open burning is uncontrolled. Incineration produces less smoke; the ash is contained and can be removed for burial; it is safer because the burning waste cannot be blown around and spread fire. A higher temperature can be maintained in an incinerator which ensures more of the waste is consumed, leaving little residue.

7. **List and briefly describe the measures by which the success or otherwise of a public–private partnership providing water supply services can be assessed.**

Below are the criteria that may be used to measure the success of a PPP providing water supply:

- **Accessibility** – the extent of coverage of the population, and the distance to the water point.

- **Affordability** – the cost of the water needed should be less than 5% of the household's income.
- **Cost recovery** – the cost of providing the water should be claimed back from the population.
- **Water quality** – the water should meet national standards for quality.
- **Operational efficiency** – the quantity of water supplied per capita, and the duration of water supply per day.
- **Minimization of non-revenue water** – this should be reduced to 15% or less.

8. What are the possible interventions to manage the solid waste in an emergency situation? Explain at least three actions that could be taken.

Possible three activities to manage solid waste in emergencies include:

1. Install and ensure all waste are collected and taken to a managed disposal site for burial
2. Install and ensure access to sanitation facilities for all households on-site
3. Mobilizing the community for hygienic practices and waste management

9. What are the most important questions you would need to address in a rapid assessment of an emergency?

Some of the important questions to include for rapid assessment of an emergency would be:

- What are the local conditions in terms of groundwater, surface water and soil type?
- What sanitation facilities are already available?
- Does the current position have the potential to cause a threat to people's health?
- Is there space for additional latrine provision?

10. Filtration and disinfection are important water treatment processes. Briefly describe each of these processes and explain their role in making water safe to drink

Clean, safe water is vital for everyday life. Water is essential for health, hygiene and the productivity of our community. The water treatment process may vary slightly at different locations, depending on the technology of the plant and the water it needs to process, but the basic principles are largely the same.

Filtration: Water is filtered through filters to remove particles in the water. The filters are made of layers of sand and gravel, and in some cases, crushed anthracite. Filtration collects the suspended impurities in water and enhances the effectiveness of disinfection. The filters are routinely cleaned by backwashing.

Disinfection: water is disinfected by chlorine, ozone, UV or any other disinfectants, to ensure that any disease-causing bacteria, viruses, and parasites are destroyed. The goal of disinfection of water supplies is the elimination of the pathogens that are responsible for waterborne diseases.

b. List the five factors that make a water source ideal to use.

Below are the five important factors for an ideal water source:

1. Good water quality and quantity
2. Water easily accessible and near the consumers
3. Water affordable and economical to use
4. Sustainable water source with good replenishment rate
5. No risk of environmental pollution around the water source.

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