DIPLOMA IN WATER SANITATION AND HYGIENE

ASSIGNMENT FOUR

BY

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QUESTION 1: Explain what municipal solid waste (MSW) means.

ANSWER: According to EPA (2017), MSW (also called garbage) is waste made up of everyday items like broken furniture, bottles, clothes, product packaging, food scraps, newspapers, consumer electronics, and cans. The sources of MSW are homes, schools, hospitals, markets, industries, institutions, restaurants. This definition excludes wastewater treatment, industrial process wastes, automobile bodies, combustion ash, construction and demolition debris. The municipal government or local government is constitutionally empowered to manage wastes with support from states and federal governments in most countries of the world. MSW can be said to reflect the level of economic growth and is some how locational, regional, national and continental specific. Fiksel (2009) asserts that economic growth and increased prosperity have been linked with material consumption and important goal of sustainable development is reduction in material use without a decrease in economic well-being. EPA (2017) further avers that as a society creates and consumes more materials it demands more resources such as water, energy, mineral and land and generates larger quantities of pollutants and wastes.

Hence the waste is generated, it must be collected and managed. Such ways of MSW management include, recycling, composting, combustion or incineration, and landfill disposal. Before 1970s according to EPA (2017) MSW disposal generally consisted of depositing wastes in open or excavated landfills, followed by open burning to reduce the volume. In so doing, hazardous industrial wastes have been co-disposed with MSW in landfills resulting to groundwater pollution, emission of toxic fumes and greenhouse gases, land contamination, and increases in pest and disease vector. Landfills are presently subject to state or federal control to minimize these environmental effects. According to Fiskel (2009), material use reduction (which directly translates to reduce MSW production) can be tracked through” waste material intensity”. This is waste generation per a capital per dollar of gross domestic product (GDP)—total value of goods and services produced in the United States of America. The lower the waste material intensity, the more efficiently and sparingly materials are produced and used. EPA (2017) records show that MSW generation grew from 88 tons in 1960 to a peak of 259 tons in 2014. Of 88 tons generated in 1960, 6 percent came through recycling, and the rest 94 percent was landfilled or disposed through other means. In 2014, 26 percent of MSW was recycled, 9 percent was composted, 13 percent was combusted with energy recovery, and 53 percent was landfilled or disposed of using other methods.

EPA (2017) further says that from 1960 to 2014, total MSW generation in United States of America grew by 193 percent and the population grew by 76 percent and the economy grew by 414 percent.

MSW can impact health and environment negatively if not well managed. The negative environmental impacts include, pollution, surface and ground water contamination from leachates, loss of environmental aesthetics, fouling of air whereas some the negative health impacts are breeding vectors and vermin that spread diseases like diarrhoea, malaria, haemorrhagic fever, trachoma etc.

MSW is not all about diseases and negativities. It can be tuned into wealth through job creation—formal and informal, recycling, composting for gardening and other agricultural activities.

In summary, MSW consists of wastes from homes, industries, hospitals, markets, restaurants and institutions but excludes wastewater treatment sludges, industrial process wastes, automobile bodies, combustion ash or construction and demolition debris. MSW correlates with the level of production and consumption of a society. Common MSW managements are recycling, composting, combustion, landfilling, The largest level of MSW in United States of America was generated in 2014 and landfilling still forms the highest disposal means till date. MSW has both economic and health impacts.

QUESTION 2: Explain the importance of the following MSW properties in solid waste management or treatment,

ANSWER: Municipal solid wastes are heterogenous in nature and their components are time, season, generators (households, industries, markets, etc), regional, consumption-habit, activities and geographical location dependent. However, Okot-Okumu (2012) & Nabegu (2010) averred that MSW in developing countries are 55-80% from households and 10-30% from commercial activities. Other sources with variable quantities are streets, industries, institutions etc. The MSW composition according to Okot-Okomu (2012) is biowaste (65-78.6%), paper (6-9%0, plastic (6.8-12%), glass (0.1-4%), metal (0.3-3%), others (3.4-14%). Low income countries generate less wastes when compared with affluent ones because the later according to Okot-Okumu (2008) & Scheinberg et al (2011) have higher disposable income to buy high volumes of consumable goods of high waste-proportions and indulge in wasteful pattern of consumption.

For MSW to be characterized into above groups, fractionation or sorting at the point of generation or collection centres is required. This is practically difficult in developing nations because of poor enlightenment of clients by the service providers, inability of the service providers to provide sorting disposal bags, poor attitude of the clients, reckless dumping of garbage due delayed collection turn-around, poor sanitation environmental laws and enforcement. If these obstacles are surmounted, reliable data on MSW generation quantification and characterization will be easier to generate. According to Mieza et al (2015) the national biodegradable, non-biodegradable and inert wastes of Ghana are 0.138kg/person/day, 0.096kg/person/day and 0.055kg/person/day respectively.

MSW management is teething problem world wide but worse in developing nations due to non-property characterization of wastes. Chang & Davila (2008) posit that property-characterization of MSW provides an all-inclusive resource for a comprehensive, critical and information evaluation of waste management options in all waste management programmes. Waste property-characterization can be used by investors and the municipalities in arriving at partnership agreement because the former have quantified the volume of investment needed in terms of equipment and treatment options. Mobilization of right equipment and personal protective equipment (PPE) are factored on property-characterization of wastes. Environmental and Sanitation laws that reflect the present realities in relation to comprehensive MSW management depend on proper property-characterization of waste. Property-characterization is helpful in segregation and sorting of waste and setting of waste hierarchy in developed nations. IEA (2003) posits that many developed nations have adopted the principle of hierarchy in order to guide policies on NSW management. This principle lays out the appropriate options for waste management from the source to the final disposal. The hierarchical principle is made up of minimisation→re-use→recycle→recovery→disposal. It further states that recycling of materials is preferable to treatment for energy where it is economically viable and environmentally sound. However, even in developed nations large tons of MSW remain after recycling making energy recovery an environmentally justified and economically viable option before final disposal in landfill. According to Watson et al (2001), property-characterization will prevent emission of methane -a greenhouse gas 23 times more potent than carbon dioxide into the atmosphere thereby slowing global warming and climate change. Methane gas in this context results from decomposition of biodegradable components of MSW in landfills. Through composting this and other environmental problems like contamination of the groundwater (from leachates), air pollution can be reduced and thrash can be turned into cash from sales of compost manure and resulting higher agricultural yields. Property-characterization of MSW will reduce the bulk of disposable waste through removal recyclables and recoverable materials. The recyclables will be turned into new products to enhance socio-economic conditions.

In summary MSW is a heterogenous mixture of recyclables and non-recyclables and needs sorting or segregation to reduce the bulk that will be finally disposed. Property-characterization is employed in the segregation. Property-characterization improves investment plans in MSW management in areas of equipment procurement, users/service provider or municipalities/investors agreement. Hierarchical principle operational in developed countries depends on property characterization.

QUESTION 3: Outline the advantages and disadvantages of source separation of MSW

ANSWER: To do justice to this question greater understanding of the topic is needed. To

understand the topic we need to define ‘source separation’. According to Lardinois &Furedy

(2007), source separation of MSW is the practice of setting aside the post-consumer materials

and household goods so that they will not enter the mixed waste streams for the purposes of

recycling, re-use or better waste management.

Waste separation can either be customary or collectively organised. The former refers to

scavenging for valuables from the piles of MSW by the poor and selling or exchanging them

for what they need whereas the latter is when the government or the non-governmental

organisation intervenes and encourages waste generators to separate waste at the source.

At source separation of wastes have both advantages and disadvantages though in an unequal

measure. According to MHLG/JICA (2006), MSW segregation at the source helps to sieve

out recyclables thereby reducing the bulk that will finally be disposed. The shrunk final

disposable bulk is easier to handle and reduces the propensity of underground water

contamination from leachates in landfills, air and land pollution. The reduction in

underground contamination, air and land pollution is of high public health significance

because water borne, water related and vector borne diseases will be reduced to the minimum

Reduction of the final disposable MSW through source segregation will increase the lifespan

of the landfills and improve the aesthetic state of the environment as well as conserve land for

other developmental purposes. The economic implication of source separation is job creation

through sale of recyclables and their by-products. The recycling plants also employ workers

who earn their living from producing commercially viable products—turning of thrash to

cash. Biodegradable faction of the MSW can through energy recovering yield electricity and

gas for cooking(bioenergy) which helps in the reduction of greenhouse gas responsible for

climate change and global warming. Source separation if encourage and promoted nationally

can help to generate the total national waste data bank which will also help in formulation of

environmental policies, decisions, and partnership for MSW management.

However, despite countless advantages of source segregation of MSW, there are some down

-sides such as delay in waste treatment process which will result in backflow and reckless

dumping of refuse in the environment and public health challenges from water and vector

borne diseases. At source segregation has huge financial implications via provision of

multi-colour sorting bags and can exposure the sorters to health risks. Environmental

implication is the huge—releasing of greenhouse gases which worsens climate change and

global warming. Much money is needed to mechanize waste separation.

In summary, separation of MSW at source has both advantages and disadvantages. Some of

the advantages are, environmental aesthetic, economic implication from job creation, whereas

disadvantages are heavy financial outlay to buy equipment and train staff

QUESTION 4: Discuss the challenges faced in the disease surveillance

ANSWER: Surveillance according to WHO (2018) is an on-going collection, collation,

analysis and interpretation of data and dissemination of the information to those who need it

to make informed decision. Control of communicable disease needs effective surveillance

and response system. In recognition of this WHO/AFRO in 1988 started promoting integrated

disease surveillance and response (IDSR) for all member states to adopt as the main strategy

to strengthen national surveillance system.

Surveillance is divided into sentinel, active and passive. In sentinel surveillance high quality

data are sourced from specialized centres with proficient and highly skilled workforce where

such disease of interest is most likely going to be seen. Data from sentinel surveillance can be

used to signal trend, identify outbreaks and monitor burden of disease in the community.

In active surveillance the surveillance team visits health facilities, talks to the health workers

and examine records to identify the disease under surveillance. In passive surveillance the

data of the diseases of interest (notifiable diseases) are routinely sent to the central collection

centre fromthe peripheral health facilities. The co-operation of the peripheral health facilities

is very important for this to run smoothly.

Disease surveillance is cornerstone of epidemiologic public health but is imbued with

challenges especially in the developing countries. Some of the challenges include: Poorly

trained and motivated manpower, poor access to information communication technology,

inability to diagnose the disease of interest, Poor communication channel, lack of standard

laboratories, fragmentation and duplication of surveillance system, political instability and

interference and belated response from national governments and global specialised agencies.

Poorly trained and motivated workforce is major challenge to surveillance in the sense that all

notifications are done by workforce that detects the disease. If the workforce cannot detect

the disease, it will be there inflicting morbidity and mortality in the disguise of whatever

diagnosis assigned to it. This is responsible for under reporting of a disease of endemic

proportion.

Sometimes notifiable diseases may be rightly diagnosed but there is no reporting channel

because of no information communication technology infrastructures such as internet.

Sending of such message of public health importance will only be through letter writing that

takes weeks to reach its destination.

In modern medicine, laboratory plays key roles. In notifiable diseases’ confirmation requires

reference laboratory which is in short supply in the developing countries resulting to

dependence on services of laboratories in developed world. Because of this, there is always

delay in disease confirmation at exorbitant cost with sometimes high mortality and morbidity

that could have been prevented

Pre-1980s fragmentation and duplication of surveillance activities were rife in Africa

resulting to ‘motion without movement’ and ‘movement to nowhere’ syndrome to which

WHO/AFRO responded. According to WHO (2018), in !998 WHO/AFRO based on

international health regulations 2005 (IHR) following the resolution of 48th assembly started

promoting integrated disease surveillance and response (IDSR) for all member states to adopt

as main strategy national disease surveillance system. The targets of IDSR are: To strengthen

district level surveillance and response for priority diseases. To integrate laboratory with

laboratory support. To reduce duplication in reporting. To share resources among disease

control programmes. To translate surveillance and laboratory data into specific and timely

public health actions.

Political instability is causing weak institutional building in third world. Because of this there

is outstanding public health institution like Centre for Disease Control (CDC) in Africa.

Public Health is a small quiet appendage of Ministry of Health with no or little

epidemiological function to do because of budget constrain.

Even when everything is done well and appropriate information is sent to the appropriate

quarters belated response may be the reward. A case in point here is the Ebola outbreak in W

West Africa in 2013 to which WHO admitted not to have acted fast despite timely

information. The challenges to effective surveillance can be surmounted through: Re-

education of health workforce and making public health an integral part of graduate medical

education. Enactment of legislation establishing national public health institutions and

training of quality workforce to man them will be a step in the right direction, Community

participation in surveillance will a good idea because when people assume ownership of a

programme there is every likelihood of success. Improvement in information communication

technology(ICT) will improve surveillance and dissemination of information greatly.

In summary, challenges to surveillance are more prevalent in the developing world and they

include: Poorly trained and motivated medical workforce, fragmentation and duplication of

functions, lack of co-operation among the competing surveillance bodies, poor ICT

infrastructure, poor reaction time of national governments and international specialized

agencies to surveillance information. Changing above constraints will improve surveillance

and in extension improve disease control.

QUESTION 5: Explain five diseases that can be prevented by observing proper sanitation

ANSWER: Sanitation according to WHO (2010) is safe disposal of human excreta in

hygienically contained way. Same report states that about 2.6 billion people worldwide lack

proper sanitation leading to 10% of global disease burden mostly diarrhoeal.

According to Feachem (1983), one gram of fresh stool from infected person contains 10

million viral pathogens, 10—100 million bacteria pathogens, 10,000 protozoan cysts and

10—10,000 helminth eggs.

Diseases of poor sanitation are mostly faecal-orally transmitted via drinking contaminated

water, eating contaminated food, eating with contaminated hands or ingesting anything

contaminated with soil or flies.

The diseases that can be prevented by observing of proper sanitation are, diarrhoea,

trachoma, helminthiasis, schistosomiasis, and under nutrition.

Poor sanitation results to majority of diarrhoeal diseases causing about 1.6—2.5 million

deaths globally, many of which are under 5 in developing countries according to Kosek et al

(2002). Fewtrell et al (2005) aver that improved sanitation can reduce diarrhoeal diseases by

32—37 %.

Trachoma is caused is caused by bacterium Chlamydia trachomatis transmitted by flies

causing preventable blindness through cornea ulceration and scarification. A recent study in

Ghana found that provision sanitary reduced the number of the vector flies and the disease by

30%. Major human helminthiases are caused by tapeworm (pig and cattle), ascaris,

hookworm, whip worm—geohelminths. All are transmitted via faecal-oral means except

hookworm whose larva burrows into new host skin from infect soil. The eggs of these

worms escape through the stool and remain viable in the soil from where they inadvertently

contaminate water or food and enter the human digestive system and grow to adult worms

causing anaemia and malnutrition especially in under 5. Improved sanitation and stopping of

open defecation have controlled helminthiases in experimental studies,

Schistosomiasis is caused by blood fluke which enters man through skin when in contact with

infected water by the cercariae that emerge from the intermediate water snail called

copepod. In human the cercariae transform into adult schistosomes and live in portal vein

from which they pass their eggs into the bladder causing chronic inflammatory disease to

which bladder cancer has been linked. The eggs exit man through urine in the river and into

the intermediate host—copepod. Improvement in sanitation will trap the egg in the toilet

and prevent them from reaching the intermediate host for further development and eventually

dying off.

Malnutrition is the resultant effect of heavy helminth infestation and diarrhoeal diseases

which is common in slums ghettos and other places populated by the under privileged. It is

not a direct sanitation-based disease but an outcome of diseases caused by poor sanitation

In summary poor sanitation has direct and indirect health consequences. The former are

diarrhoea diseases, helminthiases, trachoma and schistosomiasis whereas the later are

malnutrition and anaemia. These diseases occur mostly in developing nations among the poor

and can be controlled through improved sanitation , water and hygiene.

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