Module Four

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* 1. **Explain what municipal solid waste (MSW) means.**

There are different kinds of solid waste: a. compostable waste (from plants and slaughter material) b. non-compostable waste. This comes from households and industry: paper, plastic, industrial waste, bottles etc. With the proper infrastructure this can all be re-or up-cycled. The non-compostable waste can be divided in durable goods (furniture), nondurable goods (newspapers) and packaging. (Center for Sustainable Systems 2018).

Municipal Solid Waste (MSW), commonly called “trash” or “garbage,” includes wastes such as durable goods (e.g., tires, furniture), nondurable goods (e.g., newspapers, plastic plates/cups), containers and packaging (e.g., milk cartons, plastic wrap), and other wastes (e.g., yard waste, food). This category of waste generally refers to common household waste, as well as office and retail wastes, but excludes industrial, hazardous, and construction wastes. The handling and disposal of MSW is a growing concern as the volume of waste generated in the U.S. continues to increase.

* 1. **Explain the importance of the following MSW guidelines in solid waste management or treatment.**

This is important because the toxic waste should be separated from the non-toxic and also needs another treatment. According to Alec Liu et al (2015) proper MSW management is crucial for urban public health. Generally, municipalities use landfill or incineration as methods to dispose of the waste. Landfill has it limitations especially because cities are expanding, and space is scarce. Incineration also comes with limitations because not all waste can be incinerated because it is too toxic, like radioactive medical waste. Reuse of ashes of incinerated waste must be regulated because they may expose the environment to toxic heavy metal elements.

The best is to recycle the waste and to collect the waste separate (plastic, glas, paper etc). The starting point for separate collection is that there are valuable materials in the waste that can be reused. As a result, fewer new raw materials, energy and money are needed to make new materials. (Milieu Centraal 2018).

* 1. **Outline the advantages and disadvantages of source separation of MSW**

*Advantages:*

The starting point for separate collection is that there are valuable materials in the waste that can be reused. As a result, fewer new raw materials, energy and money are needed to make new materials. This is not only good for the environment, but also for your wallet: the municipality's waste collection fee can be reduced.

Waste recycling has 4 major advantages over incineration (Milieu Centraal 2018):

a. It saves resources: for example, trees for paper, petroleum for plastic, (rare) metals for appliances and tin.

b. Agricultural land can then be used to grow food.

c. Recycling usually costs (much) less energy than raw materials and making new materials. For example, 20 times more energy is required for new aluminum than for the remelting of old aluminum. The quality of recycled materials is usually just as good.

d. Recycling creates less greenhouse gases.

In the Netherlands most of the waste that cannot be recycled goes to the incinerator (waste-to-energy plant). The combustion provides energy for electricity or district heating. The remains after incineration can be used for the construction of roads. Less than half a percent of household waste (eg non-recyclable construction and demolition waste) is deposited; that happens in a responsible way.

*Disadvantages:*

Source separation is costly. People need separate containers at home and the municipality must collect the garbage in a separate way. Because households not always separate in a proper way, it has to be done again in the plant. Especially plastic is a difficult product since plastic packaging usually consists of different types of plastic. This can not be recycled.

It is also about human behaviour. If people have the idea that by separating their garbage that garbage will be reused/recycled, they are not eager to reduce their garbage production. It is better to introduce a well-functioning deposit system so a. the packages will be used more than once and b. the industry becomes co-responsible for the garbage.

Some studies show that post-separation (at the plant) is more cost-effective. According to Elbert Dijkgraaf and Raymond Gradus (2015) the effectiveness of post separation of plastic increases significantly over time to 8.4 kilograms in 2014. Hans Dekkers (2017) states that subsequent separation also results in an average of 8 kg more per household and that there is more CO2 reduction for one euro.

But the situation in the Netherlands is different from the situation in developing countries. In most countries urban waste recollection is not very well organized and recycling industry is not very well developed. Municipalities normally dump the collected garbage in landfills and/or burn it. Of course, this causes a lot of contamination since the garbage contains household waste but can also contain waste from hospitals and industry. Poor people make a living of garbage and live near or on a garbage dump. They separate paper, plastic, bottles, tin, metal and other materials that can be sold to the industry. They also eat the leftovers from households or restaurants. This is not a healthy business at all but a survival strategy. A famous dump site was Smokey Mountain in Philippines. It was closed in 1995 but people moved to another site because they needed an income. The people that stayed behind received a grant from the Asian Development Bank to set up a cooperative that focuses on recycling in a modern way and that has no negative impact on the health of the people (ADB 2016).

In rural areas the introduction of plastic packaging, electronics, batteries etc. can cause a huge problem since garbage collection is non-existing. So, the garbage is scattered in the landscape or burned.

* 1. **Discuss the challenges faced in disease surveillance.**

According to the WHO *surveillance* can be defined as 'ongoing systematic collection, collation, analysis and interpretation of data and the dissemination of information to those who need to know in order that action may be taken'  (Revati K. et al 2013). Public health surveillance is ‘the on-going, systematic collection, analysis, interpretation and dissemination of health data (disease occurrence and disease potential) to help guide efficient and effective public health decision making and action’ (Buehler et al. 2004). State and local health departments develop systems to detect outbreaks through public health surveillance.

It is the responsibility of local, regional and national healthcare providers to report on prevailing diseases and take the adequate measures. Governments should also make available enough funds and that is not always the case. All countries have a disease surveillance system, but it is not always working properly. The data are collected in the field and transmitted to a central level and not much coordination between the actors (data collectors, analysts, decisionmakers). This makes the process a rather passive one. During the Ebola outbreak in Guinea in 2013/2014 the reaction of government was rather slow (and that of WHO also). Data during this early phase of the outbreak were irregularly collected and it took long before government declared the emergency.

Another challenge concerns the fact that in developing countries surveillance is generally limited to humans and there is lesser attention to zoonotic pathogens. Over 60% of the emerging diseases are caused by those pathogens (Sally Cutler et al 2010).

To improve the disease surveillance in developing countries WHO (2007) developed the Integrated disease surveillance and response approach. This approach is using a single infrastructure for data gathering of multiple diseases. The focus is on local capacity building at each level of the health system and on more community involvement. Resources are used more efficient and the same for the data gathered. Data will also be shared and improved. Laboratories are strengthened, and participation of local clinics stimulated. Exchange of knowledge and expertise between the partners involved. Available resources will not only be used more efficient but efforts to get more funds is also an objective of this approach. (Revati K. et al 2013).

* 1. **Explain 5 diseases that can be prevented by observing proper sanitation.**

There are quite a lot of diseases that can be prevented by proper sanitation. I will discuss 5 of those hereunder.

1. Vector born diseases like malaria, dengue, chaga, Zika etc.

The diseases are transmitted to humans by animals like mosquitoes, sandflies and ticks. The transmission is done via parasites, viruses and bacteria.

To prevent the diseases, it is important to eliminate its main source: standing water (Thomas Matte and Daniel Kass 2017). This can de done by eliminating those places and to prevent the emergence of new ones (Open University 2011). The sources of drinking water need protection and the already discussed importance of proper solid waste management plays an important role to avoid flies, rats etc. Building latrines/toilets, where there are none, is important to avoid open defecation which attracts flies etc.

1. Intestinal worm infection

Eric Strunz et al (2014) state that improving WASH helps to reduce the intestinal worm infections. According to Donald Mc Manus et al (2014) the transmission of the infection is related to poverty, poor hygiene behavior, lack of clean water, inadequate sanitation and waste disposal. Although the infection can be cured by medical treatment it is better to prevent it. Also because people get re-infected easily.

According to Gezondheidsnet (2018) the breeding place of the parasites is sweet (standing) water and people can get infected by swimming, bathing or drinking water. The eggs of the parasitic worm come out in fresh water. The immature larvae come out of the eggs and can only survive in the freshwater snail. The larvae grow further in the snail. Adult larvae return to the water and can pierce the skin of a human being. In humans, the larvae eventually grow into worms. They usually settle in the small blood vessels of the intestines or bladder. The females lay eggs that pass through the wall of the intestine or bladder and into the water through the faeces and urine. That makes the circle around again. Therefore, it is important that people have access to clean water for cooking and drinking. That they implement hand washing practice and that they have access to a latrine. They also need to be informed about the risks of swimming in standing sweet water.

1. Hepatitis A

According to WHO (2017) the Hepatitis a (HAV) virus is transmitted via contaminated food or water or through direct contact with an infected person. The disease causes a liver disease and not much people die from it. But the illness can debilitate people for a long time (like Pfeiffer) and epidemics can develop quickly. The prevalence of HAV is directly connected to lack of safe water and poor sanitation and hygiene. So safe water and improved sanitation and hygiene (handwashing) will reduce the risk of infection. If a person recovers from a HAV infection lifelong immunity is guaranteed. It is also possible to vaccinate to prevent the disease.

1. Typhoid

The Coalition Against Typhoid (2017) states that the disease is spread via the fecal-oral route. If people do not wash their hands properly after defecating they can spread the bacteria easily. Other people can pick them up easily and so the bacteria can pass into their mouths directly or via the food they touched. So, this underlines the importance of safe water, sanitation and hygiene. In 2015 there has been a typhoid outbreak in Uganda and it turned out that it was caused by contaminated fruit juice sold on the market (WHO 2015). Since it is not easy to reach high-risk populations with underdeveloped WASH structure, it is recommended to use preventive vaccines.

1. Trachoma

According to Dr Ranil Appuhamy (2018) trachoma is world’s leading cause of blindness. The infection is caused by bacteria (bacterium chlamydia trachomatis) that spread through contact with eye discharge from an infected person. This spreading can happen easily via towels, sheets and flies. It is related to poor sanitation and personal hygiene. If a person is infected repeatedly the eyelashes will turn inwards and rub against the eyeball. This is very painful and should be treated (surgery). If a person does not receive the eyelid surgery he/she can develop irreversible low vision or blindness.

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