ASSIGNMENT MODULE 5

Daniele Cervellera

Student of WASH post-graduate diploma (Course Code: PGD002) in

The Strategia Netherlands

1. **Paul, a resident in the outskirts of your town, consults you about building a latrine in the compound of his house. He is an open-minded man who is keen to improve life for his family. He has a wife and three young children, and his elderly mother also lives with them. He doesn't have a tap in his house and gets water from a nearby well. The area has heavy soil and the rock below is impermeable.**
   (a)Which types of latrine are possible choices for him?
   (b)Which types of latrine would you recommend, and why?
   (c)What other advice would you give him about the location, design and construction of the latrine?

Paul has some option but not all have the same level of quality. The elements that he has to consider are:

1. Location
2. Construction materials
3. Cost
4. Safety and accessibility
5. User preferences

I would exclude the option of water-flushed system since the family gets water from the nearby well and it is not a source within the compound. So what might be considered are the dry systems.

Among them, I would explain him the safest options, excluding the one that have risks for the health, like the unimproved latrines where there is a chance of insect infestation or pollution to the environment and the bad smell is guaranteed. The unimproved ones are bucket latrines (manual removal of excreta), public or shared latrines, open pit latrines (Kurian & McCarney, 2010).

A good option would be the improved latrine, that if properly constructed has these characteristics: it is safe, with sound and cleanable slab floor, handwashing facility, no contamination of groundwater or surface water, lid to close the hole, free from odours and at the end there will not need to handle the excreta.

Other important elements to consider are the space available in the compound, the availability of local material to construct the latrines, or alternatively a financial possibility to purchase the needed material. The space is important because the latrine should have a distance of at least 10 m from home, and located downwind from the house.

To keep a service running for a lifetime, there is a need to consider more than just initial constructing costs. Life-cycle cost analysis makes clear what these costs are, allowing for better planning for example for maintenance costs (Burr & Fonseca, 2011).

The base of the pit has to be at least 2 metres above the water table, in case there is groundwater used as water source in the surrounding area. The distance between the water source and the latrine should be at least 15 metres, but can be more according to the regulation of the government.

Another important aspect that during the design and construction has to be considered is that no water should enter in the pit, so the latrine should be built on a heap so that the running surface water does not reach the hole. So the creation of diversion ditches is strongly recommended.

If the soil inside the compound is hard, the risk of collapsing of the pit will be low. Since the rock below is impermeable, there is a very low chance of contamination of the wells of the area and its aquifers.

2. **Nancy is a laboratory technician. She is analysing a sample of wastewater collected from a pipe that discharges effluent into a river. Name two tests Worknesh could perform to assess the physical characteristics of the effluent.**
   (b)As part of the analysis she also does a BOD test on the sample and gets an unusually high result. What does the high BOD tell her about the wastewater? What effect could it have on the river?

In the situation where a laboratory technician is going to test the discharge of an effluent, it is necessary to consider the physical characteristics of the liquid waste. This analysis consider the solid material carried along in the flows and it is classified as settleable solids or suspended solids. The first one is falling to the bottom part of the container where the wastewater is stored. The suspended solids are instead moving with the water, as they are suspended. So one test that the laboratory technician should carry on is the measurement of the solid content of the sample, by filtering out and weighing the solids in a given volume of water. The mass of solids is expressed in terms of milligrams per litre of water, in units of mg l^{-1}.

Reaching the site where the technician collects the sample, the measurement of the temperature should be done. The last test to assess the physical characteristics is the odour of the wastewater. The odour can be influenced by the biodegradation processes, that is the decomposition of the organic substances by micro-organisms and bacteria. In the assessment of the odour there is no space for subjectivity, because it is measured in terms of odour units.

The Biochemical Oxigen Demand (BOD) is used to measure the oxygen demand of the microorganism for oxidation of organic matter and ammonium. The test is lasting in a period of five days and it is conducted with a standardized temperature of 20°C (Henze et al., 2001). The test is conducted in the laboratory. If the sample shows that the milligrams of oxygen used per litre is high is due to the high level of organic matter of the sample. The organic matter released into a river or like can create a serious harm to the living organisms like fishes because the level of available oxygen will became too low. The unit to measure the oxygen used in degrading the organic matter in the wastewater is expressed in milligrams per litre (mg l^{-1}).

Wastewater constituents		
Microorganisms	Pathogenic bacteria, virus and worms eggs	Risk when bathing and eating shellfish
Biodegradable organic materials	Oxygen depletion in rivers, lakes and fjords	Fish death, odours
Other organic materials	Detergents, pesticides, fat, oil and grease, colouring, solvents, phenols, cyanide	Toxic effect, aesthetic inconveniences, bio accumulation in the food chain
Nutrients	Nitrogen, phosphorus, ammonium	Eutrophication, oxygen depletion, toxic effect
Metals	Hg, Pb, Cd, Cr, Cu, Ni	Toxic effect, bioaccumulation
Other inorganic materials	Acids, for example hydrogen sulphide, bases	Corrosion, toxic effect
Thermal effects	Hot water	Changing living conditions for flora and fauna
Odour (and taste)	Hydrogen sulphide	Aesthetic inconveniences, toxic effect
Radioactivity		Toxic effect, accumulation

Tab.1: Constituents present in domestic wastewater (Henze et al., 2001, quoted by Henze et al., 2008)

3. **What is the purpose of the report of a rapid assessment and who should receive copies of the report? Explain the contents of Rapid Assessment Report**

The purpose of the Rapid Assessment Report in the WASH context is to understand the situation about sanitation and waste management in an urban area and consequently to decide which enhancements are the most relevant and needed. The process of assessment includes the collection of information from households and institutions, where meeting should be held and discussions with stakeholders should be done with the submission of prepared questions.

The assessment is necessary to have evidences and data with whom requests to the administration can be submitted, either are at local or national level. The team that conducts the evaluation should consider the categories of people that are more at risk.

The "rapid" aspect of this type of assessment gives it a ductility to the instrument that can be used also in emergencies, but also at the beginning and at the end of a project. There are rapid assessment that can be also very specific focusing for instance on availability of latrines or waste management within an area.

To give some examples, a rapid assessment was conducted to develop a strategy for the water resources management for the Zambesi river basin. The scope was "to provide an overview on water resources availability, water utilization and environmental and water quality issues as they apply to the shared Zambezi River Basin" (SADC-WD/Zambezi River Authority, 2007).

Another example is the rapid assessment that was conducted in order to assist the decision makers in determining the availability, accessibility, affordability and sustainability of water resources, and to select the most appropriate technologies for water access and application according to the biophysical and socio-economic environments, and the availability of water sources (Keller et al. 2014),

The methods used in the process are: interviews, observations, community discussions, focus groups, questionnaires. After the work, there will be the gathering of data and notes, and then its analysis that will lead to recommendations for improvement. The production of the report is the last step, and it will be given first to the commissioning. After the document should be shared with all the key stakeholders of the sector, including the local government administration, the extended

workers in the field, the community leaders and representatives, the NGOs working in the sector or any programme that might benefit from the results of the assessment.

4. **Explain five ways in which urbanisation creates challenges for effective sanitation and solid waste management**

The process of urbanisation is spread in many countries, and even more in the developing realities where a number of factors are pushing the population to the urban centres and other factors that are pulling them out from the rural areas. This internal migration is happening also because people are looking at the good chance that the towns are giving, like good health and education services, availability of water and electricity, good salaries and transport system, and good cultural activities.

There are five ways in which urbanisation creates challenges for effective sanitation and solid waste management:

1. Environmental challenge: the movement of people from rural areas to town looking for products, employment or healthcare creates a demand for sanitation facilities, a production of manure by the animal that will be sold, and congestion on the road.
2. Challenge from industrial discharges: many times the industries have not proper disposal of wastewater (no proper treatment), hazardous materials, waste gases. These wastes can cause serious harm to humans and environment.
3. Challenge from transport: traffic congestion, exhaust gases from vehicles can give breathing problems.
4. Challenges to society: migration to towns requires employment for livelihood. This high number of people migrating increases the demand for dwellings and it leads very often to illegal unplanned settlements, adding other sanitation and waste problems. In addition, the demand of food and goods is very high, increasing the pressure on waste collection and treatment system once that the goods become waste.
5. Challenge to administration: the increase of population brings more work to the administrators of the town, because there will be more need of everything related to sanitation and waste management, and it might be difficult to work with the same effectiveness if the funds and personnel are not adequate. In these cases, the good coordination among the stakeholders can help to overcome the difficult situation of high pressure and demand for services.

The local government staff, as it is reported in the study conducted in Uganda by Van Villet, Spaargaren and Oosterveer in 2010 confirms these described challenges: solid waste management and sanitation are respectively the first and second major environmental problems according to them. Another finding is that the urban authorities give instead a low priority in their planning and resources allocation.

There are also other risks created by urbanisation, more generally related to health and environment:

1. High chance of infectious disease amid the people living in crowded area with poor living conditions. As Akhtar (2002) explains, "the majority of diseases among the Low-Income Countries appear to be closely related to the degraded environmental conditions, lack of amenities, poverty and malnutrition. Most common are water-borne diseases such as typhoid, amoebiasis, dysentery and cholera, water-washed diseases such as scabies, and other skin aliments and vector borne diseases".
2. The air pollution can lead to illnesses of the respiratory system. Polluted indoor environments have been responsible for the rapid spread of respiratory diseases (Akhtar, 2002).
3. In the urban lifestyle is much more common to be sedentary, the consumption of alcohol is higher and there are unhealthy diets: all these factor can facilitate the onset of chronic diseases.
4. There are more vehicle accidents due to the traffic, there is more violence and crime.
5. Health problems can be related to climate change, like heat stress and changed patterns of infectious diseases.

5. **How do good sanitation and waste management practices bring a positive effect to urban inhabitants? Give examples for effects on:**
   a) Health
   b) Education
   c) Economic conditions
   d) The environment

Even if the pressure on urban population is high and in different realities, there are good reasons to invest in sanitation and waste management, also because there is a high ripple effect in other sectors.

The immediate results that are visible in a context where there are good sanitation and waste management are in the general health of the population: illnesses will be reduced due to the low contamination of drinking water, reduced presence of agents responsible of infections like bacteria, viruses, protozoa and parasitic worms, reduced presence of vector of diseases like flies. In cities, child survival rates are better than in rural areas because of better access to health care (Mulholland et al., 2008)

If the health is improved, then also the performance of children at school will improve: the attendance at school will improve and so the performance might do it so. As well the presence of good sanitation facilities at school will improve the presence of girls at school, and the health of all the students.

Other benefits will come in the economic situation where the productivity will increase due to the better health conditions, and there will be low absence due to sicknesses and so workers will not lose the job. The expenses of households in healthcare will reduce and contamination within families too.

With a better waste management, the factories will benefit economically and the cost of production will decrease thanks to the reduced need of material, often imported, and the following of the 3 Rs (reduce, reuse, recycle).

As indicated by Adarkwa (2012), “the cities and towns are hubs of trade, jobs, higher education as well as offer high order goods and services to peripheries within their catchment areas thereby facilitating development”.

Also the World Bank (2015), indicates that urbanization generated between 1984 and 2013 a 5.7% annual growth of GDP.

The consequences of a good sanitation and waste management are also in the general environment, where there is not contaminated wastewater flowing in open area, or garbage abandoned, so any living organism will not be affected: any animal will not be harmed or any fish and plants living in the water will not suffer from the absence of oxygen. At the end the pollution of the land, the bad odours and the visual impact of litter will be reduced.

The benefits are even broader where the national and global environment will benefit from good practices and systems (i.e. waste disposed in dedicated sites).

All the good aspects of urbanisation that can lead to development need to have a good governance and management at all level (municipal, regional and national), otherwise the challenges risks to impact more on the population than the positive aspects described above (Benna, Umar G., Garba & Bala S., 2016).

BIBLIOGRAPHY

Adarkwa, K. (2012). The changing face of Ghanaian towns. *African Review of Economics and Finance*, 4(1).

Akhtar R. (2002). *Urban Health in the Third World.* New Delhi: A.P.H. Publishing.

Benna, Umar G., Garba & Bala S. (2016). *Population Growth and Rapid Urbanization in the Developing World*. IGI Global.

Burr P. & Fonseca C. (2011). *Applying the life-cycle costs approach to sanitation: Costs and service levels in rural and small town areas in Andhra Pradesh (India), Burkina Faso, Ghana and Mozambique.* The Hague, IRC International Water and Sanitation Centre.

Henze M., Harremoes P., Jansen J. & Arvin E. (2001). *Wastewater Treatment: Biological and Chemical Processes*. Berlin: Third Edition.

Henze M., Van Loosdrecht M., Ekama G.A., Brdjanovic D. (2008). *Biological Wastewater Treatment.* London: IWA Publishing.

Keller M., Weight E. & Taylor S. (2013). *Rapid Assessment of Water Availability and Appropriate Technologies*. Colombo: IWMI.

Kurian M. & McCarney P. (2010). *Peri-urban Water and Sanitation Services: Policy, Planning and Method.* London: Springer.

Mulholland E., Smith L., Carneiro I., Becher H. and Lehmann D. (2008). Equity and child-survival strategies. *Bull World Health Organ. 2008 May; 86(5):* 399–407.

SADC-WD/Zambezi River Authority (2007). *Integrated Water Resources Management - Strategy for the Zambezi River Basin.* Available on: http://www.the-eis.com/data/literature/RA%20Water%20Resources%20Zambezi%2002Jan2008.pdf

Van Villet B., Spaargaren G. & Oosterveer P. (2010). *Social Perspectives on the Sanitation Challenge.* London: Springer.

World Bank (2015). *Raising Through Cities in Ghana*. Washington: World Bank.