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Review article

Cultural Considerations in the identification, monitoring and control of pollution sources and its environmental impacts on urban spaces

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ABSTRACT

Municipal waste management in our country in order to control solid waste, especially industrial, toxic and dangerous waste seems an inevitable task. Thousands of tons of waste generated in different parts of the country with its pollution, is a problem that should be placed at the forefront of environmental and health programs of the country due to population growth and the development of industry and technology. Emissions of different wastes that are being added every day while causing damage to the original sources (water, soil, air) has led to encountering large amounts of waste material in the forms of solid, semi-solid, liquid and gas and that means that human beings have made their and other beings' life a hell. The collection, disposal, recycling and solid waste management in Iran is significantly different from other countries in the world in the type and quality of waste, so using any technology without exact studies and evaluation in order to understand material and adaptation with local factors would not have favorable results. On the one hand, existence of organic material and moisture in the household waste, and on the other hand, the dramatic differences in climate and environmental conditions in different regions of the country with their own unique style and culture, are themselves reason for rejecting the uncontrolled use of technology dependent on outside. Experience of years of recession in the processing compost and payment of expenses for waste collection and disposal indicate the importance of

this issue in the environmental programs in the country. For this reason, and given the importance of this issue we will in part address the practical hazards non-normative waste disposal and its environmental impacts.

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1. Introduction

Human beings and many other beings produce waste in different ways and the waste generated is increasing dramatically; the increase in production has led to environmental crisis which has faced the survival of organisms on Earth with serious problems. Emissions of different wastes that are being added every day while causing damage to the original sources (water, soil, air) has led to encountering large amounts of waste material in the forms of solid, semi-solid, liquid and gas and that means that human beings have made their and other beings' life a hell. Using forty-eight thousand chemicals in everyday life, five hundred of which has been proved to have carcinogenic properties, is considered as a serious threat to the environment and human health. Principles of hygiene and sanitation in the urban environment require that wastes be taken away from home and the human environment at a minimum time and be disposed as soon as possible. Genesis of this idea (healthy waste disposal in the environment) in the nineteenth century, as a healthy guideline, requires civilians to adhere to it. The importance of waste disposal will be cleared when all the risks are well known. Garbage not only creates disease, stench and ugliness of sights but also can cause a lot of damages by contaminating soil and water and air. As much the composition of the waste is diverse, the risks associated with their ingredients can vary. Municipal waste management in our country in order to control solid waste, especially industrial, toxic and dangerous waste seems an inevitable task. Thousands of tons of waste generated in different parts of the country with its pollution, is a problem that should be placed at the forefront of environmental and health programs of the country due to population growth and the development of industry and technology. For this reason, and given the importance of this issue we will in part address the practical hazards non-normative waste disposal and its environmental impacts. Collection, transportation and the last stage of disposal of this material must somehow be in a way that human health risks are reduced to a minimum.

2. Waste composition

Definition of waste: usually it refers to all solid waste (perishable and imperishable) that are produced at houses, distributing and selling and preparing food centers, industrial, commercial and agricultural institutes, medical centers and hospitals.

Waste products ingredients analysis is used for the collection, storage, transportation, disposal, and recycling. In terms of physical composition, wastes are composed of: 1) food residues 2) paper and cardboard (3) Plastic and rubber 4) fabrics 5) leather, 6) garden waste, 7) wood, 8) glass 9) Metallic cans, 10) unnecessary things of buildings (brick, rock and plaster. ...) 11) dirt and dust, and 12) bone

Wastes' chemical compounds investigate formulaic compositions of waste ingredients like carbon - hydrogen - oxygen - nitrogen - sulfur - PH and moisture

3. Waste leachate

Leachate should remain in landfill or be transferred for treatment. Leachate is a toxic liquid. Leachate motion takes place in the ground, and depending on the material around it, it may move aside. Landfill leachate seeping from the ground can be estimated using Darcy's law by assuming that the obstacles beneath the landfill are saturated up to the aquifer and there is a thin layer of leachate in the context of the landfill.

4. Water pollution

The main condition for the existence of life in the world is water. Population growth rate, improvement of health level and industrial development worldwide has increasingly limited water resources in our country. The problem of water shortage, especially in agriculture and industry has caused many problems. Excessive consumption of water in urban areas and dissipation has intensified the problem. On the one hand, tropical parts of the country and lack of adequate water resources and on the other hand, failure to control water pollution by industrial and municipal wastewater discharge and waste, have a detrimental effect on the economy and the health of our community. The discharge of solid and liquid wastes (garbage and sewage) in the environment by flowing surface waters, including streams, rivers and other waters resulted from raining in different places are causing pollution; however, unfortunately, in some of our cities uncontrolled disposal of waste is mostly done by discharging to streams or their unsanitary landfill is done in steep and other places that is inconsistent with the principles of groundwater protection and is quite dangerous in terms of environmental health. In particular, the location of evacuation or burry is in sandy or light soils near streams and springs.

5. Soil pollution

Unfortunately, wastes that are the mixture of human waste, animal waste, and many other industrial and agricultural wastes are transferred to soil or water in the last stage of disposal. Artificial products that are made from plastic materials are deposited as decomposable waste in the waste and remain in a landfill after use, such as synthetic polymers (nylon), in contrast to wool and cotton natural polymers, which for many years remain as the raw material and unchanged due to the lack of specific enzymes. These materials cause other damage in the exchange of climate and soil physical and chemical reactions. Plant roots are impaired in their drinking water and food when they are adjacent to or surrounded by plastic materials in the soil. Over time, completely unconditioned temperature, humidity and chemical properties appear around the root that leads to plants slow growing and drought. Different types of cans, used tires and carcasses of cars, hospital waste and chemical materials of factories that now in most cities are inseparable parts of urban waste are transferred out of town and are scattered or buried in the lap of nature. The result of this action is the analyses that in the long years create horrific dangers in water and soil and cause various diseases in humans, animals and all the creatures that live in that area. One of the current affairs in the reuse of urban wastes is compost preparation that is now common in many cities in the developed world. Unfortunately, in Iran without conducting studies on the compost preparation system, compost type and use facilities, the establishment of factories have been attempted, the results of which are not favorable and intensify environmental pollution in our rural and urban communities. Nowadays, due to the development of heavy industry, which has resulted in taking too much of the heavy metals and bring damage to the environment, heavy metals like mercury, lead, cadmium and arsenic in the compost and therefore in the soil lead to various diseases, including poisoning in humans.

6. Air pollution

In this context it is said that combust of plastic materials that unfortunately today are frequent in garbage, regardless of dioxins, produce gases like carbon dioxide, chlorate anhydride sulfide and toxic gases that are extremely dangerous and cause severe air pollution. It is said that in areas that are attempting to establish incinerators, long louvers and special filters that are able to prevent air pollution according to environmental regulations are necessary. Aerobic and anaerobic fermentation gases in the landfill are able to penetrate in the lower classes of soil and create disturbances in agricultural soils. According to the studies conducted in areas close to the position of landfill, rate of methane (CH₄) is confirmed to be about 60 percent and carbon dioxide (CO₂) up to 30 percent that are surely effective in prevention of the proper development of plants in those areas.

7. Insects

In this case, the hazards of flies, especially houseflies can be pointed out that is very important in the emission of many pathogenic bacteria. More than 40 thousand kinds of flies play a role in the emission of diseases such as amoebic and bacilli dysentery, trachoma, typhoid and paratyphoid, cholera, tuberculosis, leprosy, plague and anthrax; in this context, building healthy loo in cities and villages and protecting environment from corruptible human and animal excreta are factors that prevent the production and growth of fly larvae. Industrial waste,

including herbal products, fruits, slaughterhouse waste, and etc. whether in cities or in the centers of production and consumption can be a place for flies' larvae (Vermis). If the waste disposal method is piling up in open space, which is the most suitable environment for vermis growth, then the fly vermis will grow and after reaching puberty, they will fly to neighboring homes and places.

8. Rodents

Environmental safety, particularly waste management, whether in their collection or disposal, is a useful way to combat rodents. It is obvious that one of the most dangerous hazards of inattention to waste disposal is the development and dissemination of mice in cities. Adverse consequences of mice increase in urban areas cannot be compensated for any budget. In this respect, these organisms are potential vectors of human disease. Discomforts resulting from the mice are varying from a simple bite to plague and typhus fever. Mice and other rodents need three things, food, water and shelter for their reproduction and population increase that all three are somehow present in urban waste.

9. Incineration of waste

Burning and converting solid waste (garbage) to ash and gas reduces the volume of waste so that if it is done using modern incinerators, it can reduce waste volume up to 80 to 90 percent. This method is considered as a basic method in hospitals' waste disposal and some hazardous waste.

Good results of waste incineration can be obtained when during waste incineration 1- complete combustion occurs; 2- create no infection in the environment, including the atmosphere, soil and water ... 3- special devices of incinerators are used.

Almost all wastes except inert materials (building materials, steel, etc) are flammable. By incinerating waste, its volume is reduced by 90% and the heat of the flames can be exploited. The costs of establishing waste incineration plants are very heavy and its impact on the environment seems doubtful and gasses resulted from incineration have bad effects on the environment. HCL and SO₂ gasses are seen in the intensity of the depreciation of the waste incineration plants themselves.

9.1. Pros of waste incineration

- Excessive reduction of waste volume
- Use of released heat
- Disposal of plastic materials
- Separate the metals for reuse.

9.2. Cons of waste incineration

- Air pollution
- The possibility of soluble salts entering the groundwater after the accumulation of waste residual
- too much costs

10. Health risks of waste

Failure to control urban and rural wastes due to pollutant and corruptive materials and also proper temperature and humidity are perfect haven for a variety of insects and vermin rodents. Always, the piles of wastes are the main cause and generator of many shared diseases between human and animal and other contagious and non-contagious diseases. Distribution of household, commercial and industrial waste and hospital waste emissions on the one hand, and continuation of heat and taking too much to take wastes away from streets and other public places on the other hand, are predisposing factors for the proliferation and rapid growth of many bacteria and parasites and harmful organisms and rodents. Flies cause humans to be sick with the physical transfer of bacteria and parasites such as trachoma - deadly and infectious fungal disease and diarrhea and food poisoning. By controlling and proper sanitary landfill, about 90 percent of the flies, about 65% of the animals can be brought under control.

11. Principles of waste collection and transportation:

Almost 80 percent of the cost of garbage is related to garbage collection and heavy costs burden on municipal and dependent organizations to waste collection and disposal. The amount of waste per capita in urban areas of Iran is 658 g per day and in rural areas between 220 to 340 grams per day for each person and is considered to be an average of 240 kg per year for each person.

Waste materials should be collected, transported, and disposed in the quickest time possible in a suitable location according to health conditions and health observing in the operational procedures after production. The best way is direct collection from home and transporting to disposal sites (landfill or other methods). The role of training and cooperation between garbage generators and urban utilities personnel are very effective in increasing the efficiency of operations in the maintenance and collection stages. Waste producers should have sufficient knowledge about the suitable containers of waste material and their capacity (volume) and delivery time to municipal workers. When storing the waste generated in homes and places, plastic containers or stainless steel with a circular cross-sectional as well as the plastic garbage bags should be used to keep a clean environment. The best way to collect garbage is daily, which is effective in controlling and preventing the growth and breeding of flies and best time of the collection is when the city is quiet and there is no traffic.

12. Sanitary landfill

A method by which the wastes are buried in the soil so that layering and covering them has no harm to the environment, human and other beings. In sanitary landfill, there aren't environmental problems such as odor, smoke and pollution of soil and surface and ground waters. For sanitary landfill in accordance with environmental protection laws and guidelines, following stages take place:

- 1 – Landfill selection
- 2 - Landfill preparation
- 3 - Preventing pollution of ground and surface water in landfill

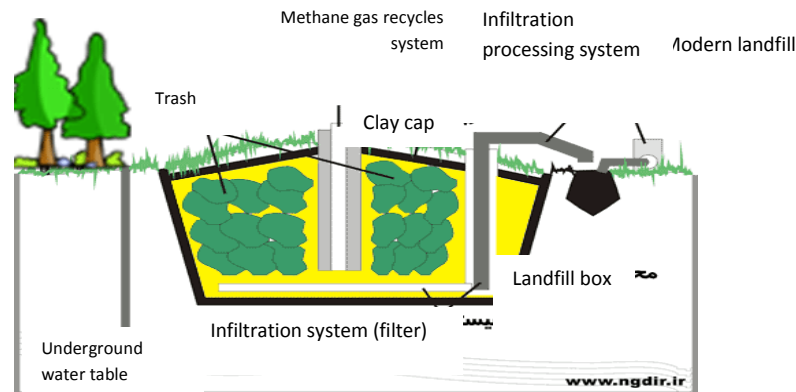


Fig. 1. Modern landfill system.

12.1. Advantages of sanitary landfill

- 1 - Is the most economical method, but if the landfill amount is adequate.
- 2 - The initial investment is lower compared with other waste materials.
- 3 – Do not need subsequent supplements and processes for the final disposal of waste.
- 4 - Does not require separation of materials.
- 5 - The burial ground can be used for the creation of green spaces, parks, and etc. after draining and filling the capacity.

12.2. The disadvantages of sanitary landfill

- 1 – For density communities, the desired land in the proper distance is not available.
- 2 – Sometimes, wastes become piled due to the neglect of authorities.

3 - Construction is not allowed due to the leakage of landfill (not costly)

4 - Explosion danger and groundwater difficulty rising and being polluted due to methane production, leachate leakage and Co₂ production.

13. Different methods of sanitary landfill

13.1. Area method

When the earth is not good for excavation operation, after dumping a narrow band of 40 to 75 cm from the ground surface and are pressed to a thickness of 180 to 300 cm and then cortical soil thickness of 15 to 30 centimeters are poured on them and they are compacted. Each compact layer should not exceed a width of 240 cm.

13.2. Ramp method

It is used when there is a little soil to cover waste or in low-slope areas or mountainous. Desired angle with the ground is 30% gradient and the beam width is designed with respect to the surface gradient in the process by mapping and machinery traffic intensity. In this method, first a groove parallel to the downhill slopes is a created and the first layer of waste is put into the groove, and then continues as a Russian planer.

13.3. Trench method

In areas where the soil with sufficient depth is available and the level of groundwater is low enough, the trenches with a length of 30 to 120 meters and to a depth of 1 to 4 m and width of 5/4 to 15 m is drilled and wastes are poured there and then are covered with fine soil with a thickness of 10 to 30 cm. This method costs too much due to the excavation operation.

13.4. Ravine method

In areas where there are synthetic pits or artificial valleys, this method is used and regional geology - the characteristics of soil and surface water and groundwater status – and waste collection system should be considered.

13.5. The usual method in marshy lands

Marshy lands can be used in emergency situations, but must be done to control pollution. Proper drainage – insulating dams with materials with 30 to 40 cm in the clay ground is important.

13.6. Burial in coastal areas

Burial operations should be done according to the ground level - the amount and type of waste to avoid contaminating water and is like the above technique. The area must be isolated.

14. Management systems for collection and disposal of waste and pollution caused by it

To prevent environmental pollution, solid wastes must immediately be maintained after production in the appropriate place compliance with health issues, and quickly be gathered - transported and disposed.

80% of total expenses of solid waste management are related to the collection. Garbage collection is generally done in two ways:

1. House to house collection (used in a traditional context)
2. Collecting from the temporary container

There are two systems in the temporary container method:

- A. Stationary container system (SCS)
- B. Hauled container system (HCS)

Collecting detailed information from existing social status - determining the time required for the collection and review of variables – is one of the initial needs for essential analysis in the collection system. Identifying parameters such as collection time in stationary and hauled container systems, transportation time, off-line time

are important in computations related to collection lines. After determining equipment and manpower, and the movement direction is determined and path and information are placed exactly on the map.

15. Final disposal

Disposal methods include:

- 1 - Burning in incinerators
- 2 - Burring under soil or landfill
- 3 - Preparation of compost traditionally, semi-traditionally and industrially
- 4 - Processing - Recycling and reuse

Previously, the method of piling in ocean was used, which is a very unhealthy method and is now outdated.

16. The general criteria for site selection - preparing with different methods of burial

Waste landfill means transporting wastes to a special place - unload - layering and condensing with a soil cover.

Site selection: a place that is selected for burial should be selected according to the size of local population growth and should fulfill the requirements for 30 to 40 years. Distance from population centers should be 10 to 20 km and early studies mapping the topography are specified.

Geology Studies - Hydrology - Natural drainage - Ground Cover - Accessibility - Weather - prevailing winds and popularity - health issues are carefully done and prepared.

Landfill preparation: After the selection of site according to criteria, site preparation for laying roads - leveling - installing railroad - guard room - fencing - electricity, water, etc. should be done.

Preventing leachate from leaking into the water: To prevent leakage of leachate measures should be taken. Appropriate slope gradient of 2 to 4 % and 30 % for side slopes and building dam or shields of 3 meters all are very effective to prevent the intrusion of flood and surface water. If the landfill site is adjacent to the sea or the water table below the groundwater or leachate move toward the water table, groundwaters get infected. The diffusion of gases into the water causes the water to be hard. Leachate is highly toxic and besides CO₂ has two to three thousand milligrams per liter of BOD₅ and thirty to forty- five thousand milligrams per liter COD. Elements such as chloride sulphate - Magnesium - Phosphorus - Calcium - Iron - Sodium - Potassium - nitrate enter organic ammonia nitrogen and suspended solids into the water. Leachate is treated by physical - chemical and biological methods.

Waste coating material: to cover wastes of each person, about 1 cubic meter of soil cover is needed per year and the covering soil volume needed is one quarter to one fifth of the total volume of compacted waste. The final cover shall be 60 cm.

Odor Control: Odor is controlled by the rapid coverage of Garbage - Closing cracks and holes, and using odor controlling materials such as ortho - di - chloro - benzene one twenty-fifth the amount of water and consuming 5,000 liters per hectare. The fire also must be controlled in landfill sites.

17. Conclusion

Science and technology development in various fields of chemistry, physics, medicine and etc. has brought the types of hazardous waste even in household waste. Today, traditional garbage collection and disposal systems are not sufficient and cannot prevent the environmental pollution caused by waste from a variety of chemical, biological, radioactive, etc. wastes. Waste Management Act, despite its drawbacks, can be one of the important steps in improving solid waste management in the country. Health hazards resulting from uncontrolled waste and its adverse reactions in human societies have been an important part of the diseases. Existence of food, adequate shelter, moisture and proper environmental conditions in urban wastes are conducive to the possibility of rapid growth and proliferation of harmful insects and creatures, which makes it very difficult to deal with. Also pollution emissions or transfer of many fatal diseases in our society has led our country to be considered among the major consumer of drugs and chemical pollution is added to our environment pollution. Lack of control in rural and urban waste, including human, animal and plant waste in environments, due to the different types of food waste with proper heat and moisture and suitable shelter that are always in the garbage are the main factors and generator of diseases of humans and animals. In principle in order to prevent accidents caused by unsanitary disposal of these

materials, the need for recognizing garbage collection and disposal methods, and above all getting familiar with the dangers and diseases caused by them is very important. Following items are necessary to improve solid waste management in urban areas:

- 1 – Locating, preparing and maintaining waste landfill and complete implementation of landfill disposal definition in these sites
- 2 - Conducting research projects and finding the right system for waste disposal
- 3 - Changing consumption patterns of people and cultures through education and legislation about the required regulations, including the purchase and use of durable goods, produce enough food for consumption, recycling and reuse in production origin
- 4 - Use of specialists and health and environmental perspectives in the management of solid waste
- 5 - Trying to produce bio-compost instead of mixed compost through recycling and separation systems for hazardous waste generated at source
- 6 - Equipping fleet of waste collection and transport and utilization of new and healthy systems

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