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ENVIS NEWSLETTER

Centre for Environmental Studies (CES)

Dept. of Forest & Environment, Govt. of Odisha

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Chairman's Message...

Environmental awareness concerns living system and life. The success of any environmental planning is dependent on awareness of environmental problems and realizing the need of conservation of natural environment which has to be inculcated in the psychology of rural and urban masses. What is needed is a series of discussions on the way we want to develop taking into account our aspiration, needs and availability of local resources while caring the health of our planet earth. The collective thinking should evolve as an impetus for ushering in a new environment revolution and a green guard mass movement for preserving the Mother Earth to provide new direction to explore an alternative pattern of development.

I am aware that ENVIS Newsletter continues to be a torch bearer in this regard.

I wish the readers all the best.

Shri Suresh Chandra Mahapatra, IAS
Chairman, Centre for Environmental Studies and
Additional Chief Secretary, F & E Deptt., Govt. of Odisha

From the Coordinator's Desk...

The Environmental Information System (ENVIS) has been providing data on issues related to State of Environment of Odisha. Publication of this newsletter is one of the ways for transmission of information to the public. The other ways include dissemination through a web-enabled system and query services. The Centre has been trying to respond various queries on environmental issues.

Our Centre is striving to bring out environmental issues of significance through this newsletter. However, many aspects of environment of the State have been covered in previous issues.

This newsletter focuses on **Solid Waste Management**. I hope this issue will be useful to readers.

Prof. Dr. Ashutosh Debata
Director, CES-cum-ENVIS Coordinator

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SOLID WASTE MANAGEMENT

Solid waste is unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional) according to its contents (organic material, glass, metal, plastic paper etc) or as per hazard potential (toxic, non-toxin, flammable, radioactive, infectious etc).

Management of solid waste reduces or eliminates adverse impact on the environment human health and supports economic development thus improving quality of life. A number of processes are involved for effectively managing waste for a municipality. These include monitoring, collecting, transporting, processing, recycling and disposing.

Refuse, Reduce, Reuse, Recycle, Recover, Rot

Methods of waste refuse, reduce, reuse, recycle, recover and rot are prefered options when managing waste. There are many enviornmental benefits that can be derived from the use of these methods. They reduce or prevent greenhouse gas emissions, reduce the release of pollutants, conserve resources, save energy, reduce the demand for waste treatment technology and landfill space. Therefore it is advisable that these methods be adopted and incorporated as part of the waste management plan.

Refuse, Reduction and Reuse

Waste reduction and reuse of products are both methods of waste prevention. They eliminate production of waste at the source of usual generation and reducing the demands for large scale treatment and disposal facilities. Methods of waste reduction include manufacturing products with less packaging, encouraging customers to bring their own reusable bags for the purpose, encouraging public to choose reusable products such as cloth napkins, reusable plastic, glass containers, backyard composting, sharing and donating any unwanted items rather than discarding them. All of the methods of waste prevention mentioned require public participation. In order to get the public on board, training and educational programmes need to be undertaken to educate the public about their role in the process. Also the government may need to regulate types and amount of packaging used by manufacturers and make the reuse of shopping bags mandatory.

Recycle, Recover, Rot

Recycling refers to removal of items from waste stream to be used as raw materials in the manufacture of new products. Thus recycling occurs in three phases: first the waste is sorted, recyclables collected to create raw materials. These raw materials are then used in the manufacturing of new products.

The sorting of recyclables may be done at the source (i.e. within household or office) for selective collection by municipality or to be dropped off by the waste producer at specified recycling centres.

The pre-sorting at source requires public participation which may not be forthcoming if there are no benefits to be derived. Also a system of selective collection by the government can be costly. It would require more frequent circulation of trucks within neighborhood or importation of more vehicles to facilitate the collection. Another option is to mix recyclables with general waste stream for collection sorting and recovery of recyclable materials can be performed by the municipality at a suitable site. The sorting by municipality has advantage of eliminating dependence on the public and ensuring that recycling does occur. The disadvantage however, is that the value of recyclable materials is reduced since being mixed in and compacted with other garbage can have adverse effects on the quality of recyclable material.

Waste Collection

Waste from our homes is generally collected by our local authorities through regular waste collection or by special collections for recycling. Within hot climates the waste should be collected at least twice a week to control fly breeding and the harbouring of other pests in the community.

Other factors to consider when deciding on frequency of collection are the odours caused by decomposition and accumulated quantities.

Treatment and Disposal

Waste treatment techniques seek to transform the waste into a form that is more manageable, reduce the volume or toxicity of waste thus making the waste easier to be disposed of. Treatment methods are selected basing on the composition, quantity and form of waste material. Some waste treatment methods are being used subjecting the waste to extremely high temperatures, dumping on land or land filling and use of biological processes to treat the waste. It should be noted that treatment and disposal options are chosen as a last resort to previously mentioned management strategies reducing, reusing and recycling of waste.

Thermal treatment

This refers to processes that involve the use of heat to treat waste. Some commonly utilized thermal treatment processes are;

Incineration

Incineration is the most common thermal treatment process. This is the combustion of waste in presence of oxygen. After incineration the wastes are converted to carbon dioxide, water vapour and ash. This method may be used as a means of recovering energy to be used in heating or supply of electricity. In addition to supplying energy incineration technologies have the advantage of reducing volume of waste, rendering it harmless, reducing transportation costs and production of greenhouse gas, methane.

Pyrolysis and Gasification

Pyrolysis and gasification are similar processes which decompose organic waste by exposing it to high temperatures and low amounts

of oxygen. Gasification uses a low oxygen environment while pyrolysis allows no oxygen. These techniques use heat and an oxygen starved environment to convert biomass into other forms. A mixture of combustible and non-combustible gases as well as pyroligenous liquid is produced by these processes. All of these products have a high heat value and can be utilised. Gasification is advantageous since it allows for incineration of waste with energy recovery and without air pollution that is characteristic of other incineration methods.

Descriptions of the main collection systems

System	Description	Advantages	Disadvantages
SHARED: Residents can bring out waste at any time			
Dumping at designated location	Residents and other generators are required to dump their waste at a specified location or in a masonry enclosure.	Low capital costs	Loading the waste into trucks is slow and unhygienic. Waste is scattered around the collection point. Adjacent residents and shopkeepers protest about the smell and appearance.
Shared container	Residents and other generators put their waste inside a container which is emptied or removed.	Low operating costs	If containers are not maintained they quickly corrode or are damaged. Adjacent residents complain about the smell and appearance.
INDIVIDUAL: The generators need a suitable container and must store the waste on their property until it is collected.			
Block Collection	Collector sounds horn or rings bell and waits at specified locations for residents to bring waste to the collection vehicle.	Economical less waste on streets. No permanent container or storage to cause complaints.	If all family members are out when collector comes, waste must be left outside for collection. It may be scattered by wind, animals and waste pickers.
Curbside collection	Waste is left outside property in a container and picked up by passing vehicle or swept up and collected by sweeper.	Convenient. No permanent public storage.	Waste that is left out may be scattered by wind, animals, children or waste pickers. If collection service is delayed, waste may not be collected or some time causing considerable nuisance.
Door to door collection	Waste collector knocks on each door or rings doorbell and waits for waste to be brought out by resident.	Convenient for resident. Little waste on street.	Residents must be available to hand waste cover. Not suitable for apartment buildings because of the amount of walking required.
Yard Collection	Collection labourer enters property to remove waste.	Very convenient for residents. No waste in street.	The most expensive system because of the walking involved. Cultural beliefs, security considerations or architectural styles may prevent laburers from entering properties.

Open burning

Open burning is burning of unwanted materials in a manner that causes smoke and other emissions to be released directly into the air without passing through a chimney or stack. This includes burning of outdoor piles in a burn barrel and the use of incinerators which have no pollution control devices and as such release gaseous by products directly into the atmosphere (Department of Environmental Quality -2006). Open burning has been practiced by a number of urban centers because it reduces the volume of refuse received at the dump and therefore extends the life of their dump site. Garbage may be burnt because of ease and convenience and cheapness of the method. In countries where house holders are required to pay for garbage disposal, burning of waste in the backyard allows the householder to avoid paying costs associated with collecting, hauling and dumping the waste.

Open burning has many negative effects on both human health and environment. This uncontrolled burning of garbage releases many pollutants into the atmosphere. These include dioxins, particulate matter, polycyclic aromatic compounds, volatile organic compounds, carbon monoxide, hexachlorobenzene and ash. All of these chemicals pose serious risks to human health. The Dioxins are capable of producing a multitude of health problems; they can have adverse effects on reproduction, development, disrupt the hormonal systems or even cause cancer. The polycyclic aromatic compounds and the hexachlorobenzene are considered to be carcinogenic. The particulate matter can be harmful to persons with respiratory problems such as asthma or bronchitis and carbonmonoxide can cause neurological symptoms.

The harmful effects of open burning are also felt by the environment. This process releases acidic gases such as the halo-hydrides; it releases the oxides of nitrogen and carbon. Nitrogen oxides contribute to acid rain, ozone depletion, smog and global warming. In addition to being a green house gas carbon monoxide reacts with sunlight to produce ozone which can be harmful. The particulate matter creates smoke which contributes to air pollution.

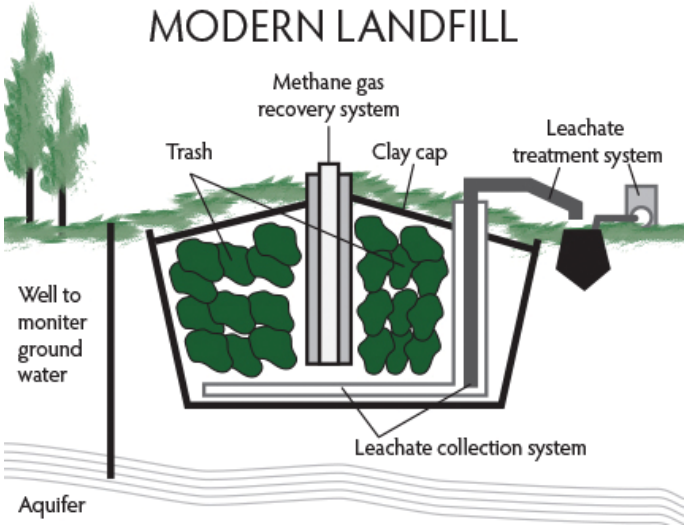
Dumps and Landfills

Sanitary landfills

Sanitary landfills are designed to greatly reduce or eliminate the risks that waste disposal may pose to the public health and environmental quality. They are usually placed in areas where land features act as natural buffers between the landfill and environment. For example, the area may be comprised of clay soil which is fairly impermeable due to its tightly packed particles or the area may be characterized by low water table and absence of surface water bodies thus preventing the threat of water contamination.

In addition to the strategic placement of the landfill other protective measures are incorporated into its design. The bottom and sides of landfills are lined with layers of clay or plastic to keep the liquid waste known as 'leachate' from escaping into the soil.

The 'leachate' is collected and pumped to the surface for treatment. Boreholes or monitoring wells are dug in the vicinity of landfill to monitor



groundwater quality. A landfill is divided into a series of individual cells and only a few cells of the site are filled with trash at any one time. This minimizes exposure to wind and rain. The daily waste is spread and compacted to reduce the volume, a cover is then applied to reduce odours and keep out pests. When the landfill has reached its capacity, it is capped with an impermeable seal which is typically composed of clay soil.

Some sanitary landfills are used to recover energy. The natural anaerobic decomposition of waste in the landfill produces gases which include Carbon dioxide, Methane and traces of other gases. Methane can be used as an energy source to produce heat or electricity. Thus some landfills are fitted with landfill gas collection (LFG) systems to capitalize on Methane being produced. The process of generating gas is very slow for the energy recovery system to be successful but produces large volume of wastes.

These landfills present the least environmental, health risk and the records kept can be a good source of information for future use in waste management. However, the cost of establishing these sanitary landfills are high when compared to other land disposal methods.

Controlled dumps

Controlled dumps are disposal sites which comply with most of the requirements for a sanitary landfill but usually have one deficiency. They may have a planned capacity but no cell planning. There may be partial leachate management, partial or no gas management, regular cover, compaction in some cases, basic record keeping and they are fenced or enclosed. These dumps have areduced risk of environmental contamination where the initial costs are low and operational costs are moderate. While there is controlled access and use they are still accessible by scavengers and so there is some recovery of materials through this practice.

Bioreactor Landfills.

Recent technological advancements have led to introduction of Bioreactor Landfill. The Bioreactor landfills use enhanced microbiological processes to accelerate decomposition of waste. The main controlling factor is constant addition of liquid to maintain optimum moisture for microbial digestion. This liquid is usually added by re- circulating the landfill leachate. In cases where leachate in not enough water or other liquid waste such as sewage sludge can be used. The landfill may use either anaerobic or aerobic microbial digestion or it may be designed to combine the two. These enhanced microbial processes and have the advantage of rapidly reducing the volume of waste creating more space for additional waste, they also maximise the production and capture of Methane for energy recovery systems and reduce the costs associated with leachate management. For Bioreactor landfills to be successful the waste should be comprised predominantly of organic matter be produced in large volumes.

Biological waste treatment

Composting

Composting is the controlled aerobic decomposition of organic matter by the action of micro organisms and small invertebrates. There are a number of composting techniques being used today. These include: in vessel composting, window composting, vermicomposting and static pile composting. The process is controlled by making environmental conditions optimum for waste decomposers to thrive. The rate of compost formation is controlled by composition and constituents of materials i.e. their Carbon/ Nitrogen (C/N) ratio, temperature, moisture content and amount of air.

The C/N ratio is very important for the process to be efficient. The microorganisms

require carbon as an energy source and nitrogen for synthesis of some proteins. If the correct C/N ration is not achieved, then application of compost with either a high or low C/N ratio can have adverse effects on both the soil and the plants. A high C/N ratio can be corrected by dehydrated mud and a low ratio-be corrected by adding cellulose.

Moisture content greatly influences composting process. The microbes need the moisture to perform their metabolic functions. If the waste becomes too dry the composting is not favoured. If however there is too much moisture then it is possible that it may displace air in the compost heap depriving the organisms of oxygen and drowning them.

A high temperature is desirable for elimination of pathogenic organisms. However if temperatures is too high above 75°C then the organisms necessary to complete the composting process are destroyed. Optimum temperature for the process is in the range of 50-60°C with the ideal being 60°C.

Aeration is a very important and the quantity of air is needed to be controlled properly when composting. If there is insufficient oxygen the aerobes will begin to die and will be replaced by anaerobes which are undesirable since the will slow the process, produce odours and also produce highly inflammable Methane gas. Air can be incorporated by churning the compost.

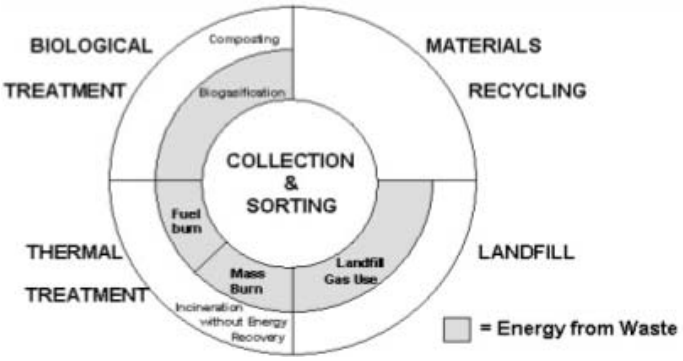
Anaerobic Digestion

Anaerobic digestion like composting uses biological processes to decompose organic waste. However, where composting can use a variety of microbes and must have air anaerobic digestion uses bacteria and an oxygen free environment to decompose the waste. Aerobic respiration, typical of composting results in the formation of Carbondioxide and water while the anaerobic respiration results in the formation of Carbon dioxide and Methane. In addition to generating the humus which is used as a soil enhancer, Anaerobic Digestion is also used as a method of producing biogas which can be used to generate electricity.

Optimal conditions for the process require nutrients such as nitrogen, phosphorous and potassium.lt requires that the pH be maintained around 7 and alkalinity be appropriate to buffer pH changes, temperature should also be controlled.

Integrated Solid Waste Management

Integrated Solid Waste Management (ISWM) takes an overall approach to create sustainable systems that are economically affordable, socially acceptable and environmentally effective. An integrated solid waste management system involves the use of a range of different treatment



Elements of Integrated Solid Waste Management

methods and key to the functioning of such a system is collection and sorting of the waste. It is important to note that no single treatment method can manage all the waste materials in an environmentally effective way. Thus all of the available treatment and disposal options must equally be evaluated and the best combination of available options suited to the particular community to be chosen. Effective management schemes therefore need to operate in ways which best meet current social, economic and environmental conditions of the municipality.

Observation of Van Mahotsav 2017

Odisha ENVIS Centre, Centre for Environmental Studies (CES) observed Van Mahotsav festival during July 2017. To success this programme, CES conducted various events along with awareness programmes in following places to create awareness among the students as well as the public. We had send SMS to mobiles of Eco-club Teachers & Master Trainers for wide coverage so that more students can participate in the plantation programme. During Van Mahotsav, CES planted different trees inside & outside the campus with the help of the students. The students also water the plants.

01.07.2017 - Van Mahostav Programme at Sundargaon High School, Cuttack
02.07.2017 - Van Mahostav Programme at Choudwar Girls High School, Cuttack
05.07.2017 - Van Mahostav Programme at Vibekananda Sikshya Kendra, Saliasahi, Bhubaneswar
07.07.2017 - Van Mahostav Programme at Sovaniya Sikshya Kendra, Cuttack
10.07.2017 - Van Mahostav Programme at Gatiroutpatana, Cuttack
11.07.2017 - Van Mahostav Programme in Puri Zilla School, Puri
13.07.2017 - Van Mahostav Programme at Maa Bhubasinee High School, Samantarapur, Bhubaneswar
15.07.2017 - Van Mahostav Programme at Tangi Girls High School, Tangi, Khurda
19.07.2017 - Van Mahostav Programme at DRIEMS Group of Institution, Tangi, Cuttack
20.07.2017 - Van Mahostav Programme at Kujang College, Kujang, Cuttack
22.07.2017 - Van Mahostav Programme at Tangi Girls High School, Tangi, Khurda
23.07.2017 - Van Mahostav Programme at Gatiroutpatna, Basundhara
26.07.2017 - Van Mahostav Programme at Maa Saraswati Vidya Mandir, Berhampur
31.07.2017 - Van Mahostav Programme at Balunkeswar Bidyapitha, Deuli, Cuttack

These programmes were successfully completed with the cooperation of Sri Pravat Mohan Dash, Programme Officer and Sri Prashanta Kumar Nayak, Information Officer under guidance of Director, CES.

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