NATIONAL SOLID WASTE ASSOCIATION OF INDIA

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ENVIRONMENTAL INFORMATION SYSTEM CENTRE

Sponsored by: The Ministry of Environment & Forests, Government of India, New Delhi.

NSWAI ENVIS

URBAN MUNICIPAL SOLID WASTE MANAGEMENT

Newsletter

Environmental Information System INDIA

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FROM THE PRESIDENT'S DESK

The 7th issue of NSWAI-ENVIS newsletter portrays two topics :

1. Carbon Credits in India 2. Bio-bin composting

This is in continuance with the topics discussed in our earlier newsletters.

Day by day the cycle of climate on earth is changing. Global warming has led to season shifting, changing landscapes, rising sea levels, increased risk of drought and floods, stronger storms, increase in heat related illness and diseases all over the world. This has resulted due to emissions of Green House Gases (GHG's) from various anthropogenic activities. Since the inception of Kyoto Protocol in the year 1997, countries all over the world have become more concerned about 'Global Warming'. Industrialized countries are the major contributors to these emissions compared to the developing countries. India being one of the developing countries has ratified the Kyoto Protocol and is emerging as one of the leading Carbon traders under the Clean Development Mechanism (CDM) of Kyoto Protocol. Since India generates enormous amount of Municipal Solid Waste, implementation of CDM project for power generation is incredibly viable. The article "Carbon Credits in India"describes how open dumps in India can be efficiently used as CDM activity for recovery of emitted gases & power generation. Such type of projects could be very significant for the economy of the country. Apart from improving the environment, it would not only contribute substantially to the overall power generation capacity but can also give a good return on investment.

Decomposition and stabilization of solid organic waste material has been taking place in nature ever since life appeared on this planet. With the progress of civilization and advancements of scientific knowledge, efforts are being directed towards rationalizing and controlling the process in such a way as to make it more effective and efficient. Bio-bin is one such system of composting which is effective in terms of time and space. This topic is discussed in our second article, "Bio-bin composting"

I hope that the newsletter will serve the purpose of understanding the above subjects in a better and proficient manner.

– Dr. Amiya Kumar Sahu

Carbon Credits in India

Our earth is undoubtedly warming. This warming is largely the result of emissions of carbon dioxide and other Greenhouse Gases (GHG's) from human activities including industrial processes, fossil fuel combustion, and changes in land use, such as deforestation etc. Addressing climate change is not a simple task. To protect ourselves, our economy, and our land from the adverse effects of climate change, we must reduce emissions of carbon dioxide and other greenhouse gases. To achieve this goal the concept of Clean Development Mechanism (CDM) has come into vogue as a part of Kyoto Protocol.

The objective is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system".

Kyoto Protocol is an agreement made under the United Nations Framework Convention on Climate Change (UNFCCC). The treaty was negotiated in Kyoto, Japan in December 1997, opened for signature on March 16, 1998, and closed on March 15, 1999. The agreement came into force on February 16, 2005, under which the industrialised countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that would be expected by 2010 without the Protocol, this target represents a 29% cut). The aim is to lower overall emissions of six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFCs(Hydrofluro Carbon), and PFCs - calculated as an average over the five-year period of 2008-12. National targets range from 8% reductions for the European Union and some others to 7% for the US, 6% for Japan, 0% for Russia, and permitted increase of 8% for Australia and 10% for Iceland.

The Clean Development Mechanism (CDM) is an arrangement under the Kyoto Protocol allowing industrialized countries with a greenhouse gas reduction commitment to invest in emission reducing projects in developing countries as an alternative to what is generally considered more costly emission reductions in their own countries. Under CDM, a developed country can take up a greenhouse gas reduction project activity in a developing country where the cost of GHG reduction project activities is usually much lower. The developed country would be given credits (Carbon Credits) for meeting its emission reduction targets, while the developing country would receive the capital and clean technology to implement the project.

Carbon credits are certificates issued to countries that reduce their emission of GHG (greenhouse gases) which causes global warming. Carbon credits are measured in units of certified emission reductions (CERs). Each CER is equivalent to one tonne of carbon dioxide reduction. Its rate stood at 22 Euros in April, fell to below 7 Euros, before stabilizing at 12-13 Euros. Under IET (International Emissions Trading) mechanism, countries can trade in the international carbon credit market. Countries with surplus credits can sell the same to countries with quantified emission limitation and reduction commitments under the Kyoto Protocol. Developed countries that have exceeded the levels can either cut down emissions, or borrow or buy carbon credits from developing countries.

The UNFCCC divides countries into two main groups: A total of 41 industrialized countries are currently listed in the Convention's Annex-I, including the relatively wealthy industrialized countries that were members of the Organization for Economic Co-operation and Development (OECD) in 1992, plus countries with economies in transition (EITs), including the Russian Federation, the Baltic States, and several Central and Eastern European States. The OECD members of Annex-I (not the EITs) are also listed in the Convention's Annex-II. There are currently 24 such Annex-II Parties. All other countries not listed in the Convention's Annexes, mostly the developing countries, are known as non-Annex-I countries. They currently number 145.

Annex I countries such as United States of America, United Kingdom, Japan, New Zealand, Canada, Australia, Austria, Spain, France, Germany etc. agree to reduce their emissions (particularly carbon dioxide) to target levels below their 1990 emissions levels. If they cannot do so, they must buy emission credits from developing countries or invest in conservation. Countries like United States of America, United Kingdom, Japan, Newzealand, Canada, Australia, Austria, Spain etc are also included in Annex-II.

Developing countries (non-Annex I) such as India, Srilanka, Afghanistan, China, Brazil, Iran, Kenya, Kuwait, Malaysia, Pakistan, Phillippines, Saudi Arabia, Sigapore, South Africa, UAE etc have no immediate restrictions under the UNFCCC. This serves three purposes:

a) Avoids restrictions on growth because pollution is strongly linked to industrial growth, and developing economies can potentially grow very fast.

b) It means that they cannot sell emissions credits to industrialized nations to permit those nations to over-pollute.

c) They get money and technologies from the developed countries in Annex II.

Indian scenario:

India comes under the third category of signatories to UNFCCC. India signed and ratified the Protocol in August, 2002 and has emerged as a world leader in reduction of greenhouse gases by adopting Clean Development Mechanisms (CDMs) in the past few years.

According to Report on National Action Plan for operationalising Clean Development Mechanism(CDM) by Planning Commission, Govt. of India, the total CO_2-equivalent emissions in 1990 were 10, 01, 352 Gg (Gigagrams), which was approximately 3% of global emissions. If India can capture a 10% share of the global CDM market, annual CER revenues to the country could range from US$ 10 million to 300 million (assuming that CDM is used to meet 10-50% of the global demand for GHG emission reduction of roughly 1 billion tonnes CO_2, and prices range from US$ 3.5-5.5 per tonne of CO_2). As the deadline for meeting the Kyoto Protocol targets draws nearer, prices can be expected to rise, as countries/companies save carbon credits to meet strict targets in the future. India is well ahead in establishing a full-fledged system in operationalising CDM, through the Designated National Authority (DNA).

Other than Industries and transportation, the major sources of GHG's emission in India are as follows :

- Paddy fields
- Enteric fermentation from cattle and buffaloes
- Municipal Solid Waste

Of the above three sources the emissions from the paddy fields can be reduced through special irrigation strategy and appropriate choice of cultivars; whereas enteric fermentation emission can also be reduced through proper feed management.

In recent days the third source of emission i.e. Municipal Solid Waste Dumping Grounds are emerging as a potential CDM activity despite being provided least attention till date.

Present status of dumping grounds in India:

In India, due to increased population & commercial development, cities are facing problems of MSW (Municipal Solid Waste) disposal. The urban population in larger towns and cities in India is increasing at a decadal growth rate of above 40%. There are no Sanitary Landfill sites in India at present. Municipal Solid Waste is simply dumped without any treatment into land (depressions, ditches, soaked ponds) or on the outskirts of the city in an unscientific manner with no compliance of regulations.

The existing dumping grounds in India are full and overflowing beyond capacity. It is difficult to get new dumping yards and if at all available, they are far away from the city and this adds to the exorbitant cost of transportation. A study made by CPCB, (2000) shows that the cumulative requirement of land for disposal of MSW in India would reach around 169.6 km^2 by 2047 as against 20.2 km^2 in 1997.

Various processes/technologies available to reduce the amount of Municipal Solid Waste are as follows.

1. Physical (a. Pelletisation)
2. Biochemical (a. Aerobic Composting b. Anaerobic Digestion)
3. Thermal (a. Incineration b. Gasification)

Among the above options/technologies following are considered as favorable to implement in India.

1. Pelletisation,
2. Anaerobic digestion using bio-methanation technology for production of power,
3. Production of organic manure using controlled aerobic composting.

In India the segregation of municipal solid waste at source or at centralized/decentralized centre is not in practice on a large scale. Hence, 90% of Municipal Solid Waste is dumped in a mixed form in the open dumping yards without any pre-treatment. On the other hand, technology required in the above mentioned three options needs waste to be segregated first and then can be subjected to further processing. To carry out segregation of bulk amount of municipal waste at the dumping ground is practically impossible. It is not only massive but tedious. Bulk segregation requires not only substantial large scale labour but also considerable amount of investment. All these factors make the above three technologies unviable for existing dumping grounds.

The waste in the dumping ground undergoes various anaerobic reactions producing offensive odorous gases such as CO_2, CH_4, H_2S and Mercaptans, which foster harmful pathogens and lead to environmental, social and public health issues.

The approximate methane emission all over India as per 2001 census was calculated using an IPCC default (1996) method by NSWAI. The total quantity of methane emitted out of Municipal Solid Waste generated in India as a whole was approximately 4612.69 MT/day.

An economic feasibility study done by IGIDR (Indira Gandhi Institute of Development Research) for Mumbai city indicates that for a total population of 10 million producing 1.82 MT of MSW per year, the net methane that can be produced is equivalent to about 8.5 GJ (Giga Joules).

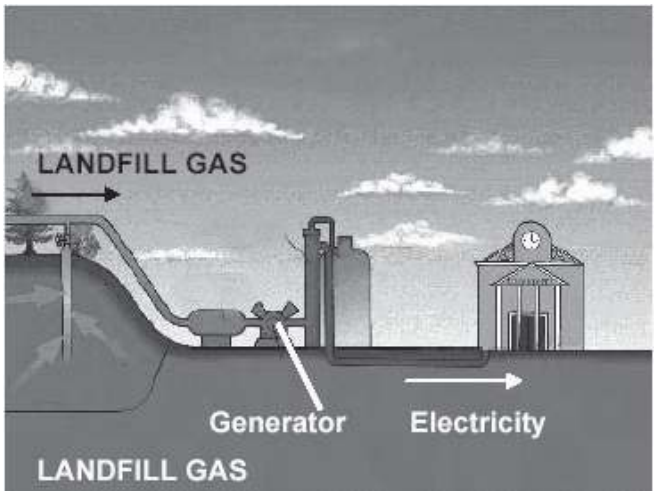
According to TEDDY (2002-2003) the energy recovery potential from different waste is as shown in the following Fig.

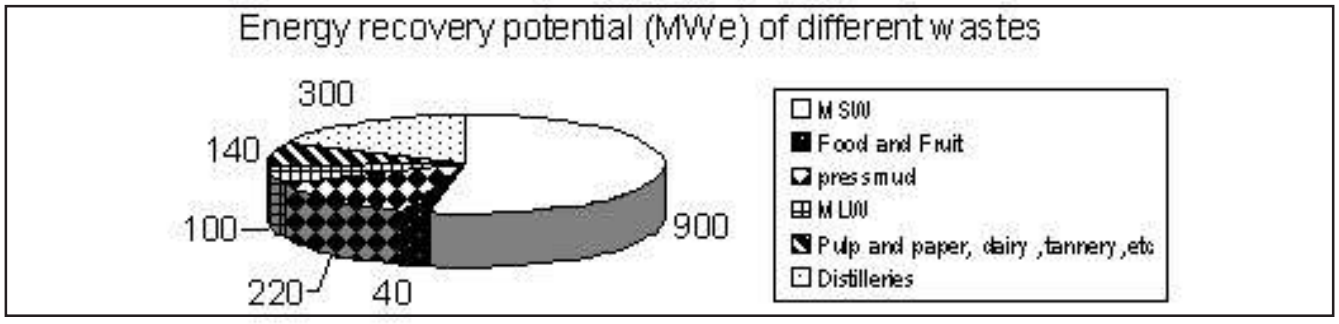
Energy recovery potential of MSW is 900 MWe out of total 1700 MWe amounting to about 53%.

Thus, the utilization of MSW dumping grounds for energy production would mean a favorable and useful solution to the existing Municipal Solid Waste disposal problem.

To efficiently recover the gases, MSW Dumping Ground Projects should primarily have a landfill gas collection technology by means of the following measures:

1. Implementation of vertical and/or horizontal pipes for collection of landfill gases.
2. Construction of vertical gas extraction domes.
3. Construction of venting equipment in order to create under-pressure in the landfill body to prevent uncontrolled emissions of landfill gas.
4. Gas Generator installed at LFG





The project can be executed using a Public-Private Partnership approach in which both the parties can invest and share the benefits. Investment and operating cost is recovered through sale of CERs.

The project will aid in:

1. Gaining annual CER revenues for the country
2. Locally achieving:
    - Reduction in poverty by creating jobs for urban poor.
    - Safe and better working conditions for the informal sector.
    - Better environmental quality(Less odour, leachate, disease vectors)
    - Enhanced public awareness on Solid Waste Management and recycling.
    - Improvement in the quality of life of the city.
    - Efficient resource utilization
    - Contribution to reduction of foreign expenditures (Macro-economic Indicators)
    - The increase in life of the dump sites.
    - Considerable amount of power to the city.
    - Reduction in cost on Solid Waste Management by municipalities.
    - Reduction of ground and surface water pollution and thus reducing health hazards.
3. Globally achieving:
    - Foreign Direct Investment (FDI)
    - Reduction in emissions of GHG's from dumping grounds which are responsible for Global Warming.
    - Project is complying with the Millennium Development Goals (MDG).

Conclusion:

There is a great opportunity awaiting India in carbon trading which is estimated to go up to $100 billion by 2010. In the new regime, the country could emerge as one of the largest beneficiaries accounting for 25 per cent of the total world carbon trade, says a recent World Bank report. The countries like US, Germany, Japan and China are likely to be the biggest buyers of carbon credits which are beneficial for India to a great extent.

The Indian market is extremely receptive to Clean Development Mechanism (CDM). Having cornered more than half of the global total in tradable certified emission reduction (CERs), India's dominance in carbon trading under the clean development mechanism (CDM) of the UN Convention on Climate Change (UNFCCC) is beginning to influence business dynamics in the country. India Inc pocketed Rs 1,500 crores in the year 2005 just by selling carbon credits to developed-country clients. Various projects would create up to 306 million tradable CERs. Analysts claim if more companies absorb clean technologies, total CERs with India could touch 500 million. Of the 391 projects sanctioned, the UNFCCC has registered 114 from India, the highest for any country. India's average annual CERs stand at 12.6% or 11.5 million. Hence, MSW dumping grounds can be a huge prospect for CDM projects in India. These types of projects would not only be beneficial for the Government bodies and stakeholders but also for general public.

A questionnaire to provide a preliminary estimate of the potential for developing a landfill gas project under the rules of the CDM is uploaded on our website www.nswai.com

References Recommended :

Planning Commission Report for operationalising Clean Development Mechanism (CDM), Govt. of India

http://www.pewclimate.org

http://www.ipm.iastate.edu/ipm/icm/2004/1-26-2004/cc.html

http://www.unfccc.int

Bio-Bin Composting

Developing countries like India generate more putrescible waste as compared to developed countries. The putrefying nature of the waste makes it less viable for storage and transportation. It also hinders the recovery of recyclable materials. Limited land resource available for dumping of waste which is ever increasing with increase in population has lead India to think over techniques of reducing waste at the source itself. Composting is one such and the most viable technique to serve the purpose.

Composting is a biological process in which micro-organisms, mainly fungi and bacteria, convert fast degradable organic waste into humus like substance, which is high in carbon and nitrogen. It is an excellent medium for growing plants that recycles the nutrients and returns them to the soil.

Apart from being clean, safe and economic, composting significantly reduces the amount of garbage. The compost produced from composting is a kind of organic fertilizer which can be used instead of chemical fertilizers and it is better, especially when used for growing vegetables. It has the capacity to withhold moisture content in the soil and makes the soil easier to cultivate. It supplies part of the 16 essential elements needed by the plants and helps to reduce the adverse effects of excessive alkalinity, acidity. It helps to keep the soil cool in summer and warm in winter. It aids in preventing soil erosion by keeping the soil covered. It prevents water evaporation due to heat.

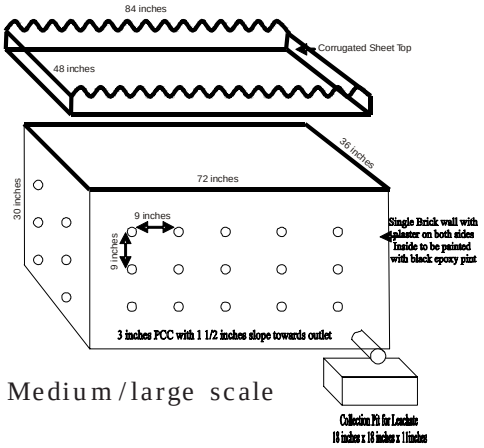
Small scale

The concept of composting gave rise to a system known as 'Bio-bin' which is an in-vessel composting. Bio-Bin is the innovation to find a better way to dispose off the putrescible waste and turn it into compost on site in a relatively short time. It is now being used at various trial sites, expanding from greengrocer waste to becoming an effective vessel for the collection and disposal of Putrescible Food Waste.

The Bio-bin process involves circulation of oxygen into the Bin. Ammonia and the high temperatures combine to kill off disease causing pathogens. Nowadays micro-organism culture known as BTM (Bio Trigger Mechanism) is also added to the content of Bio-bin so as to accelerate the process of composting. The use of this technique not only eliminates foul odour but also minimizes the risk of diseases in the environment due to flies and mosquitoes.

Usage of Bio-bin:

1. The Bio-bin can be used on a small scale in kitchens.
2. On medium scale, Bio-bins can be brought into practice in buildings, housing- societies etc.
3. Gardens, shopping centers, malls, canteens of commercial & industrial places, hotels & restaurants, institutions like colleges, schools etc. are the places where composting can be carried out on large scale using Bio-bins.



Medium/large scale

All the generated waste should be segregated at source and then only it can be transferred to a Bio-bin for composting. It should be noted that putrescible waste, which can be degraded fast, only goes to Bio-bin. The organics which takes considerable time to degrade like paper, wood, cardboard etc. should not make their way to Bio-bin as the process of composting can become prolonged & takes more days to obtain final compost product. Besides it also alters the quality of the final compost product. Hence one should be careful while putting anything into a Bio-bin.

Waste to be put in	Waste to be avoided
All leftover food	Household rubbish
Fruit and vegetable waste	Packaging, Plastic, glass and metal
Coffee grounds, filters and tea bags	Liquids – oil, milk, sauce and soup
Cooked & raw meat	Bread bag ties and twisty ties
Egg shells, nuts and shell fish	Nappies and sanitary products
Bread, baking, pasta and rice	Kitty litter and animal wastes
Cheese	Fire ash and cigarette butts
Paper towels and tissues	Soil and stones
Shrub and grass clippings	Fabrics and textiles
Leaves and small branches	String and garden ties
Cut flowers, bedding plants and weeds (remove soil)	Sharp objects

When in use, the Bio-Bin should be emptied and washed regularly to minimize odors. Placing dry twigs or leaves in the bottom of the Bio-bin reduces things sticking to the bottom. Excessive moisture in the Bio-bin can lead to odor from green waste thus it is necessary to ensure that no liquids are placed into Bio-bin and that the bin is dry after washing.

Benefits of implementing Bio-bin system:

- Quicker composting.
- The optimum aeration to maintain aerobic conditions.
- Minimizing odors and nuisance.
- Control of leachates.
- The whole process is economic and safe, compared to manufacturing of chemical fertilizers.
- Optimum moisture & heat balance within the mixture.
- Easy handling of the waste & Easy operation.
- Safe to use & Saves lot of space (simple to install & use).
- Potential economic returns from the bin (by selling compost).
- Reduces amount of waste for final disposal.

Bio Bin Installation at Thrikkakara Panchayat, Cochin to process Biodegradable Solid Waste through KUDAMBASHREE a Self help Group organized by Govt of Kerala.

Conclusion:

Municipal Solid Waste in India consists 35-40% waste of putrefying nature, which makes 'composting' the most asthetical and viable technique to be practiced extensively. In developing countries like India, Bio-bin Technology offers one of the practical solutions to deal with the tremendous amount of waste generated and related problems. The concept of Bio-bin has a great scope to be promoted not only in metropolitans but also in small towns and villages.

References Recommended:

— http://edugreen.teri.res.in
— http://www.biobin.net
— http://www.ccc.govt.nz

UPCOMING EVENTS

National Conference on Innovative Practice for Sustainable Energy and Waste Management
Sri Ramakrishna Institute of Technology, Coimbatore, India.
27 and 28th April, 2007. Email: ipsewm2007@rediffmail.com

The Ninth International In Situ and On-Site Bioremediation Symposium
Baltimore, Maryland, 7-10 May, 2007
E-mail: biosymp@battelle.org Web: www.battelle.org/biosymp

WasteExpo, 2007
Atlanta, GA, 7-10 May, 2007
E-mail: registration@primediabuisness.com
Web: www.wasteexpo.com

Waste to Energy-International Exhibition & Conference for Energy from Waste and Biomass
Bremen, Germany, 9-10 May 2007
E-mail: rohde@messe-bremen.de Web: www.wte-expo.de

15th Annual North American Waste-to-Energy Conference (NAWTEC)
May 21-23, 2007 - Miami, Florida Web: www.swana.org

5th International Trade fair and Congress on Waste Management, Recycling and Environmental Technologies
Moscow, Russia, 29 May-1 June, 2007
E-mail: waste-tech@sibico.com Web: www.waste-tech.ru

12th Annual Solid Waste Managers Conference: Trends & Challenges Conference
San Diego Marriott Mission Valley, June 25-30, 2007
Web: www.swana.org

International Conference on Sustainable Waste Management
Anna University, Chennai, India, 5-7 September, 2007
Email: landfill@annauniv.edu
Web: www.swlf.ait.ac.th/ICSSWM.htm

Recycling and Waste Management
Birmingham, UK, 11-13 September 2007
E-mail: lucy.vanrenselar@emap.com
Web: www.rwmexhibition.com

ISWA World Congress 2007
Amsterdam, the Netherlands, 24-28 September, 2007
E-mail: iswa2007@congrex.nl Web: www.iswa2007.org

11th International Waste Management and Landfill Symposium
Sardinia, Italy 1-5 October, 2007
E-mail: eurowaste@tin.it Web: www.sardiniasymposium.it

WASTECON 2007
Reno, Nevada, USA 16-18 October 2007
E-mail: info@WASTECON.org Web: www.swana.org

Ecomondo, 2007
Rimini, Italy 24-27 October 2007
E-mail: d.bernabe@riminifiera.it Web: www.ecomondo.com

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