

Report

Workshop on Waste Management organised by Science Stream in Collaboration with IQAC Cell, Nongstoin College.

A one Day workshop on Waste Management was organised by Science Stream in Collaboration with IQAC Cell, Nongstoin College on the **23rd September 2017** at Conference Hall, Nongstoin College. The Inauguration programme was chaired by **Prof. B. K Laitflang**, Principal Nongstoin College and the inaugural speech was address by the Chief Quest **Dr. Z. Changsan Scientist 'E'**, Regional Director, Central Pollution Control Board North Eastern Zone, Ministry of Environment, Forest and Climate Change, Government of India. The programme was followed by the technical session which covered the following important topics.

Introduction on Waste Management

Speaker: Dr. Z. Changsan Scientist E. Regional Director Central Pollution Control Board North Eastern Zonal Office.

Pollution and its impact

Speaker: Resource person from Regional Director Central Pollution Control Board North Eastern Zonal Office.

Guidelines for solid and liquid waste management in rural areas

Speaker: Resource person from Regional Director Central Pollution Control Board North Eastern Zonal Office.

Bio Plastic

Speaker: Dr. H. Kharbani, HoD Zoology

Wast to Energy

Speaker: Mr. K. Nongsiej, HoD Chemistry

The participants who attended are BSc students from Nongstoin College, Class XII Science students from Sibsingh Memorial Goverment Higher Secondary School, Nongstoin, St. Peter's Higher Secondary School, Pyndengrei and Anderson Higher Secondary School, Nongstoin. All participants are benefitted from the topics delivered by the concern expert and also students are actively interacting with the scientist during the technical session.

Details below are the number of participants attended:-

No. Of students	55
No. Teachers	5
No. Of resource person	4
Others	6
Total	70

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Head, Dept
Zoology

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**Workshop on Waste Management
Organised by
Science stream Nongstoin College Nongstoin
In collaboration With IQAC cell Nongstoin College**

Date: 23rd September, 2017

Registration: 10.00 AM

Programme

10.30 AM: Inauguration programme

Co-ordinator: **Dr. H. Kharbani**, Head, Department of Zoology Nongstoin College

Chairman: **Shri B.K. Laitflang**, Principal, Nongstoin College

Welcome Address by the Principal, Nongstoin College

Presentation of bouquet and mementoes to the Chief Guest and other Dignitaries

Speech: **Chief Guest**

Dr. Zawthanglien Changsan Scientist 'E'
Regional Director
Central Pollution Control Board North Eastern Zonal Office Shillong.
Ministry of Environment, Forest & Climate Change, Govt. Of India.

11.00 AM- 1.00 PM: Technical Session-1

Chair by

Dr. T Dash, Coordinator IQAC Cell Nongstoin College

Topic: Introduction on Waste Management

Speaker: Dr. Z. Changsan Scientist E. Regional Director Central Pollution Control Board North Eastern Zonal Office.

Topic: Pollution and its impact

Speaker: Resource person from Regional Director Central Pollution Control Board North Eastern Zonal Office.

Topic: Guidelines for solid and liquid waste management in rural areas

Speaker: Resource person from Regional Director Central Pollution Control Board North Eastern Zonal Office.

Lunch Break

01.30PM- 03.00 PM: Technical Session-2

Topic: Bio Plastic

Speaker: Dr. Kharbani, HoD Zoology

Topic: Wast to Energy

Speaker: Mr. K. Nongsiej, HoD Chemistry

Vote of Thanks

Refreshment

Workshop

(23rd September 2017)

on

Waste Management

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Topic: Wast to Energy

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Introduction on waste management

Dr. Z. Changsan
Regional Director
Central Pollution Control Board, Shillong

Looking for his own comfort and development man is exploring natural resources and power from different region even disturbing the whole ecosystem/environment. The development activities of man with increasing population are generating environmental pollutants in the form of gas, solid and liquid wastes. Improper management of these wastes results to damage to the environment. Proper management of liquid and solid wastes is need for survival of living beings. For proper management liquid wastes like, industrial effluent and sewages, Water (Prevention and Control of Pollution) Act 1974 was notified on 23rd March, 1974. For management of solid wastes Six new wastes management Rules were notified in 2016 besides existing Rules. (1. E-Waste (Management) Rules, 2016, 2. Plastic Waste Management Rules, 2016, 3. Bio-Medical Waste Management Rules, 2016, 4. Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, 5. Solid Waste Management Rules, 2016 and 6. Construction and Demolition Waste Management Rules, 2016). These six new Wastes Management Rules are designed to be more effective than the previous Rules except C&D Rules. All concerned Ministry/Departments/Agencies/ organizations are given Duty/responsibility for management of Wastes. The Hon'ble Supreme Court directed all Industries obtaining consent from SPCBs to have operational primary ETP besides CETP for cluster of industries. All Cities/towns should have Sewage Treatment Plant for management of liquid Wastes. Strict Standards were notified for all industrial and other activities' effluents/liquid wastes to be discharged to surface water bodies in the environment. Proper Acts, Rules and guidelines are notified for solid and liquid wastes management for urban and rural areas. Both Solid and Liquid Wastes must be utilized as resources for management of the degrading environment and regeneration of a type of vegetation we need today.

Why we need Plants

We need plants for:

1. Production of Oxygen from leaves (Photosynthesis) to meet the requirement of our population
2. Absorption of Carbon Dioxide for balance Environment.
3. Control of extreme temperature Compensation of topsoil loss due to runoff water (rain water) in slope hilly terrain

Recommendations:

1. The species of tree/plant may be species with broad leaves for maximum Oxygen release and Carbon Dioxide intake

2. The species with dead bodies (Leaves, twig, branches and even the wood) be easily decomposed in the existing climate of Meghalaya to compensate and reclaim the topsoil lost/erosion
3. The plant species with big leave surface area for perspiration/evaporation and condensation for absorption and release of Latent heat to protect the area from extreme temperature (**Latent of evaporation of water 2264.76 Kj/kg or 539.23 Kcal**)

“SAVE THE EARTH”

Pollution and its Impacts

Ritesh Prasad Gurung
Joint Director
Central Pollution Control Board

What is Pollution?

- Introduction of contaminants to environment
- Cause adverse change
- Changes are harmful

Types of Pollution

- Water Pollution
- Air Pollution
- Soil Pollution
- Noise Pollution
- Light Pollution
- Thermal Pollution
- Radioactive Pollution

Air Pollution: Causes

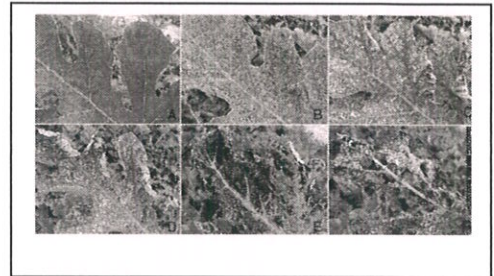
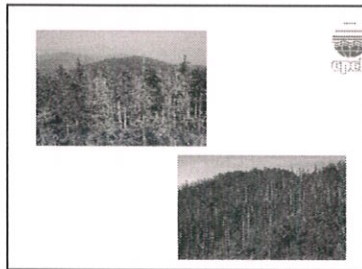
- Combustion of coal, oil, gas
- Burning gasoline, diesel and other fuels
- Emissions from various industrial processes
- Burning wood and other fuels for heating and cooking
- Agricultural burning, land clearing and other man-made fires
- Natural sources, including volcanoes, forest fires and dust storms

Physical Impacts of Air Pollution

- Irritation of the eyes, nose, and throat
- Wheezing, coughing, chest tightness, and breathing difficulties
- Worsening of existing lung and heart problems, such as asthma Increased risk of heart attack

Environmental Impacts of Air Pollution

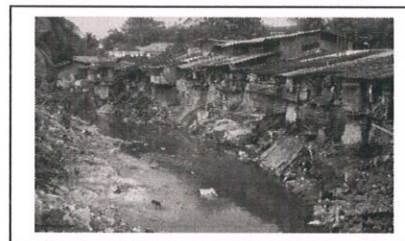
- Acid rain
- Haze
- Effects on wildlife
- Ozone depletion
- Crop and forest damage
- Global climate change



Causes of Water Pollution

- Industrial waste
- Sewage and waste water
- Mining activities
- Accidental Oil leakage
- Burning of fossil fuels
- Chemical fertilizers and pesticides
- Leakage from sewer lines
- Leakage from the landfills
- Animal waste

Underground storage leakage



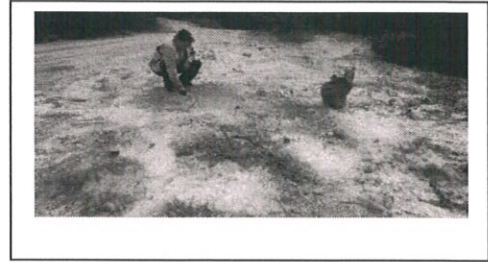
Causes of water pollution

Soil Pollution

- Compounds naturally present
- Amounts exceed natural levels

Causes of Soil Pollution

- Biological Agents
- Chemicals
- Urban Waste
- Industrial Waste



Soil pollution

*****Solution: Back to the roots**

Plastic Waste Management Rules, 2016

Dr. Z. Changsan
Regional Director
Central Pollution Control Board

- To implement these rules more effectively and to give thrust on plastic waste minimization, source segregation, recycling, involving waste pickers, recyclers and waste processors in collection of plastic waste fraction either from households or any other source of its generation or intermediate material recovery facility and adopt polluter's pay principle for the sustainability of the waste management system, the Central Government reviewed the existing rules;
- Notified these rules called, the Plastic Waste Management Rules, 2016 on the 18th March, 2016.
- 2. Application.- (1) These rules shall apply to every waste generator, local body, Gram Panchayat, manufacturer, Importers and producer.
- (2) The rule 4 shall not apply to the export oriented units or units in special economic zones, notified by the Central Government, manufacturing their products against an order for export: Provide this exemption shall not apply to units engaged in packaging of gutkha, tobacco and pan masala and also to any surplus or rejects, left over products and the like.
- 4. Conditions.- (1) The manufacture, importer stocking, distribution, sale and use of carry bags, plastic sheets or like, or cover made of plastic sheet and multilayered packaging, shall be subject to the following conditions, namely:-
 - (a) carry bags and plastic packaging shall either be in natural shade which is without any added pigments or made using only those pigments and colourants which are in conformity with Indian Standard : IS 9833:1981 titled as "List of pigments and colourants for use in plastics in contact with foodstuffs, pharmaceuticals and drinking water", as amended from time to time;
 - (b) Carry bags made of recycled plastic or products made of recycled plastic shall not be used for storing, carrying, dispensing or packaging ready to eat or drink food stuff;
 - (c) carry bag made of virgin or recycled plastic, shall not be less than fifty microns in thickness;
 - (d) plastic sheet or like, which is not an integral part of multilayered packaging and cover made of plastic sheet used for packaging, wrapping the commodity shall not be less than fifty microns in thickness except where the thickness of such plastic sheets impair the functionality of the product;

- (e) the manufacturer shall not sell or provide or arrange plastic to be used as raw material to a producer, not having valid registration from the concerned State Pollution Control Boards or Pollution Control Committee;
- (f) sachets using plastic material shall not be used for storing, packing or selling gutkha, tobacco and pan masala;
- (h) The provision of thickness shall not be applicable to carry bags made up of compostable plastic. Carry bags made from compostable plastics shall conform to the Indian Standard: IS 17088:2008 titled as Specifications for Compostable Plastics, as amended from time to time. The manufacturers or seller of compostable plastic carry bags shall obtain a certificate from the Central Pollution Control Board before marketing or selling; and
- (i) plastic material, in any form including Vinyl Acetate - Maleic Acid - Vinyl Chloride Copolymer, shall not be used in any package for packaging gutkha, pan masala and tobacco in all forms.
- 5. Plastic waste management.- (1) The plastic waste management by the urban local bodies in their respective jurisdiction shall be as under:-
 - (a) plastic waste, which can be recycled, shall be channelized to registered plastic waste recycler and recycling of plastic shall conform to the Indian Standard
 - (b) local bodies shall encourage the use of plastic waste (preferably the plastic waste which cannot be further recycled) for road construction as per Indian Road Congress guidelines or energy recovery or waste to oil etc. The standards and pollution control norms specified by the prescribed authority for these technologies shall be complied with.
 - (c) Thermo set plastic waste shall be processed and disposed off as per the guidelines issued from time to time by the CPCB. (d)
- 6. Responsibility of local body.- (1) Every local body shall be responsible for development and setting up of infrastructure for segregation, collection, storage, transportation, processing and disposal of the plastic waste either on its own or by engaging agencies or producers.
 - (2) The local body shall be responsible for setting up, operationalisation and co-ordination of the waste management system and for performing the associated functions, namely:-
 - (a) Ensuring segregation, collection, storage, transportation, processing and disposal of plastic waste;
 - (b) ensuring that no damage is caused to the environment during this process;
 - (c) ensuring channelization of recyclable plastic waste fraction to recyclers;

- (d) ensuring processing and disposal on non-recyclable fraction of plastic waste in accordance with the guidelines issued by the Central Pollution Control Board;
- (e) creating awareness among all stakeholders about their responsibilities;
- (f) engaging civil societies or groups working with waste pickers; and
- (g) ensuring that open burning of plastic waste does not take place.
- (3) The local body for setting up of system for plastic waste management shall seek assistance of producers and such system shall be set up within one year from the date of final publication of these rules in the Official Gazette of India.
- (4) The local body to frame bye-laws incorporating the provisions of these rules.
- 7. Responsibility of Gram Panchayat.- (1) Every gram panchayat either on its own or by engaging an agency shall set up, operationalise and co-ordinate for waste management in the rural area under their control and for performing the associated functions, namely,-
 - (a) ensuring segregation, collection, storage, transportation, plastic waste and channelization of recyclable plastic waste fraction to recyclers having valid registration; ensuring that no damage is caused to the environment during this process;
 - (b) creating awareness among all stakeholders about their responsibilities; and
 - (c) ensuring that open burning of plastic waste does not take place
- 8. Responsibility of waste generators:-
 - (1) The waste generator shall.-
 - (a) take steps to minimize generation of plastic waste and segregate plastic waste at source
 - (b) not litter the plastic waste and ensure segregated storage of waste at source and handover segregated waste to urban local body or gram panchayat or agencies appointed by them or registered waste pickers', registered recyclers or waste collection agencies;
 - (2) All institutional generators of plastic waste, shall segregate and store the waste generated by them in accordance with ... Rules and handover segregated wastes to authorized waste processing or disposal facilities or deposition centers either on its own or through the authorized waste collection agency.
 - (3) All waste generators shall pay such user fee or charge as may be specified in the bye-laws of the local bodies for plastic waste management such as waste collection or operation of the facility thereof, etc.;

- (4) Every person responsible for organising an event in open space, which involves service of food stuff in plastic or multilayered packaging shall segregate and manage the waste generated during such events in accordance with ... Rules
- 11. Marking or labelling.- (1) Each plastic carry bag and multilayered packaging shall have the following information printed in English namely, name, registration number of the manufacturer and thickness in case of carry bag; name and registration number of the manufacturer in case of multilayered packaging; and name and certificate number [Rule 4(h)] in case of carry bags made from compostable plastic.
- (2) Each recycled carry bag shall bear a label or a mark “recycled” as shown below and shall conform to the Indian Standard: IS 14534: 1998 titled as “Guidelines for Recycling of Plastics”, as amended from time to time.
- 14. Responsibility of retailers and street vendors- (1) Retailers or street vendors shall not sell or provide commodities to consumer in carry bags or plastic sheet or multilayered packaging, which are not manufactured and labelled or marked, as per prescribed under these rules.
- (2) Every retailers or street vendors selling or providing commodities in, plastic carry bags or multilayered packaging or plastic sheets or like or covers made of plastic sheets which are not manufactured or labelled or marked in accordance with these rules shall be liable to pay such fines as specified under the bye-laws of the local bodies.
- 15. Explicit pricing of carry bags.- (1) The shopkeepers and street vendors willing to provide plastic carry bags for dispensing any commodity shall register with local body. The local body ... shall all make provisions for such registration on payment of plastic waste management fee of minimum rupees forty eight thousand @ rupees four thousand per month. The concerned local body may prescribe higher plastic waste management fee, depending upon the sale capacity. The registered shop keepers shall display at prominent place that plastic carry bags are given on payment.
- (2) Only the registered shopkeepers or street vendors shall be eligible to provide plastic carry bags for dispensing the commodities.
- (3) The local body shall utilize the amount paid by the customers for the carry bags exclusively for the sustainability of the waste management system within their jurisdictions.

Solid Waste Management Rules, 2016

Dr. Z. Changsan
Regional Director
Central Pollution Control Board

Application: These rules shall apply to every urban local body, outgrowths in urban agglomerations, census towns as declared by the Registrar General and Census Commissioner of India, notified areas, notified industrial townships, areas under the control of Indian Railways, airports, airbases, Ports and harbours, defence establishments, special economic zones, State and Central government organisations, places of pilgrims, religious and historical importance as may be notified by respective State government from time to time and to every domestic, institutional, commercial and any other non residential solid waste generator situated in the areas except other Wastes... that are covered under separate rules framed under the Environment (Protection) Act, 1986

Duties of waste generators:-

- (1) Every waste generator shall
 - (a) Segregate and store the waste generated by them in three separate streams namely bio-degradable, non bio-degradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorised waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;
 - (b)
 - (c)
 - (d)
- (2) No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.
- (3) All waste generators shall pay such user fee for solid waste management, as specified in the bye-laws of the local bodies.
- (4) No person shall organise an event or gathering of more than one hundred persons at any unlicensed place without intimating the local body, at least three working days in advance and such person or the organiser of such event shall ensure segregation of waste at source and handing over of segregated waste to waste collector or agency as specified by the local body.
- (5) Every street vendor shall keep suitable containers for storage of waste generated during the course of his activity such as food waste, disposable plates, cups, cans, wrappers, coconut shells, leftover food, vegetables, fruits, etc., and shall deposit such waste at waste storage depot or container or vehicle as notified by the local body.
- (6) All resident welfare and market associations shall, within one year from the date of notification of these rules and in partnership with the local body ensure segregation of waste

at source by the generators... The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible.

(7) All gated communities and institutions with more than 5,000 sqm area shall, ... ensure segregation of waste at source by the generators as prescribed in these rules,... The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible.

(8) All hotels and restaurants shall, within one year from the date of notification of these rules and in partnership with the local body ensure segregation of waste at source as prescribed in these rules, facilitate collection of segregated waste in separate streams,... The bio-degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible.

The residual waste shall be given to the waste collectors or agency as directed by the local body

Duties of District Magistrate or District Collector or Deputy Commissioner:- The District Magistrate or District Collector or as the case may be, the Deputy Commissioner shall, -

(a) facilitate identification and allocation of suitable land as per clause (f) of rules 11 for setting up solid waste processing and disposal facilities to local authorities in his district in close coordination with the Secretary-in-charge of State Urban Development Department within one year from the date of notification of these rules;

(b) review the performance of local bodies, at least once in a quarter on waste segregation, processing, treatment and disposal and take corrective measures in consultation with the Commissioner or Director of Municipal Administration or Director of local bodies and secretary-in-charge of the State Urban Development.

Duties and responsibilities of local authorities and village Panchayats of census towns and urban agglomerations.- The local authorities and Panchayats shall.-

(a) prepare a solid waste management plan as per state policy and strategy on solid waste management within six months from the date of notification of state policy and strategy and submit a copy to respective departments of State Government or Union territory Administration or agency authorised by the State Government or Union territory Administration;

(b) arrange for door to door collection of segregated solid waste from all households including slums and informal settlements, commercial, institutional and other non residential premises. From multi-storage buildings, large commercial complexes, malls, housing complexes, etc., this may be collected from the entry gate or any other designated location;

(c) establish a system to recognise organisations of waste pickers or informal waste collectors and promote and establish a system for integration of these authorised waste-pickers and

waste collectors to facilitate their participation in solid waste management including door to door collection of waste;

(d) facilitate formation of Self Help Groups, provide identity cards and thereafter encourage integration in solid waste management including door to door collection of waste;

(e) frame bye-laws incorporating the provisions of these rules within one year from the date of notification of these rules and ensure timely implementation;



(k) direct street sweepers not to burn tree leaves collected from street sweeping and store them separately and handover to the waste collectors or agency authorised by local body;

(m) collect waste from vegetable, fruit, flower, meat, poultry and fish market on day to day basis and promote setting up of decentralised compost plant or bio-methanation plant at suitable locations in the markets or in the vicinity of markets ensuring hygienic conditions.

(t) involve communities in waste management and promotion of **home composting, bio-gas generation**, decentralised processing of waste at community level subject to control of odour and maintenance of hygienic conditions around the facility;

(u) phase out the use of chemical fertilizer in two years and use compost in all parks, gardens maintained by the local body and wherever possible in other places under its jurisdiction. Incentives may be provided to recycling initiatives by informal waste recycling sector.

(zf) frame bye-laws and prescribe criteria for levying of spot fine for persons who litters or fails to comply with the provisions of these rules and delegate powers to officers or local bodies to levy spot fines as per the bye laws framed; and

- (zg) create public awareness through information, education and communication campaign and educate the waste generators on the following; namely:-
- (i) not to litter (b) minimise generation of waste; (iii) reuse the waste to the extent possible; (iv) practice segregation of waste into bio-degradable, non-biodegradable (recyclable and combustible), sanitary waste and domestic hazardous wastes at source; (v) **practice home composting, vermi-composting, bio-gas generation or community level composting**; (vi) wrap securely used sanitary waste as and when generated in the pouches provided by the brand owners (vii) storage of segregated waste at source in different bins (viii) handover segregated waste to waste pickers, waste collectors, recyclers or waste collection agencies (ix) pay monthly user fee or

charges to waste collectors or local bodies or any other person authorised by the local body for sustainability of solid waste management

Criteria and actions to be taken for solid waste management in hilly areas:- In the hilly areas, the duties and responsibilities of the local authorities shall be the same as mentioned in rule 15 with additional clauses as under:

- (a) Construction of landfill on the hill shall be avoided. A transfer station at a suitable enclosed location shall be setup to collect residual waste from the processing facility and inert waste. A suitable land shall be identified in the plain areas down the hill within 25 km for setting up sanitary landfill. The residual waste from the transfer station shall be disposed of at this sanitary landfill.
- (b) In case of non-availability of such land, efforts shall be made to set up regional sanitary landfill for the inert and residual waste.
- (c) Local body shall frame Bye-laws and prohibit citizen from littering wastes on the streets and give strict direction to the tourists not to dispose any waste such as paper, water bottles, liquor bottles, soft drink canes, tetra packs, any other plastic or paper waste on the streets or down the hills and instead direct to deposit such waste in the litter bins that shall be placed by the local body at all tourist destinations.
- (d) Local body shall arrange to convey the provisions of solid waste management under the bye-laws to all tourists visiting the hilly areas at the entry point in the town as well as through the hotels, guest houses or like where they stay and by putting suitable hoardings at tourist destinations.
- (e) Local body may levy solid waste management charge from the tourist at the entry point to make the solid waste management services sustainable.
- (f) The department in- charge of the allocation of land assignment shall identify and allot suitable space on the hills for setting up decentralised waste processing facilities. Local body shall set up such facilities. Step garden system may be adopted for optimum utilisation of hill space.
- **Specification for Sanitary Landfill**
- **I. Criteria for special provisions for hilly areas.-**Cities and towns located on hills shall have location-specific methods evolved for final disposal of solid waste by the local body with the approval of the concerned State Pollution Control Board. **The local body shall set up processing facilities for utilisation of biodegradable organic waste.** The non-biodegradable recyclable materials shall be stored and sent for recycling periodically. The inert and non-biodegradable waste shall be used for building roads or filling-up of appropriate areas on hills. In case of constraints in finding adequate land in hilly areas, waste not suitable for road-laying or filling up shall be disposed of in regional landfills in plain areas.

- **Time frame for implementation**
- Necessary infrastructure for implementation of these rules shall be created by the local bodies and other concerned authorities, as the case may be, on their own, by directly or engaging agencies within the time frame specified.
- **Accident reporting-** In case of an accident at any solid waste processing or treatment or disposal facility or landfill site, the Officer- in- charge of the facility shall report to the local body and the local body shall review and issue instructions if any, to the in-charge of the facility.

Save the Earth

Bio-plastics

Dr. H. Kharbani
Department of Zoology
Nongstoin College Nongstoin-793119

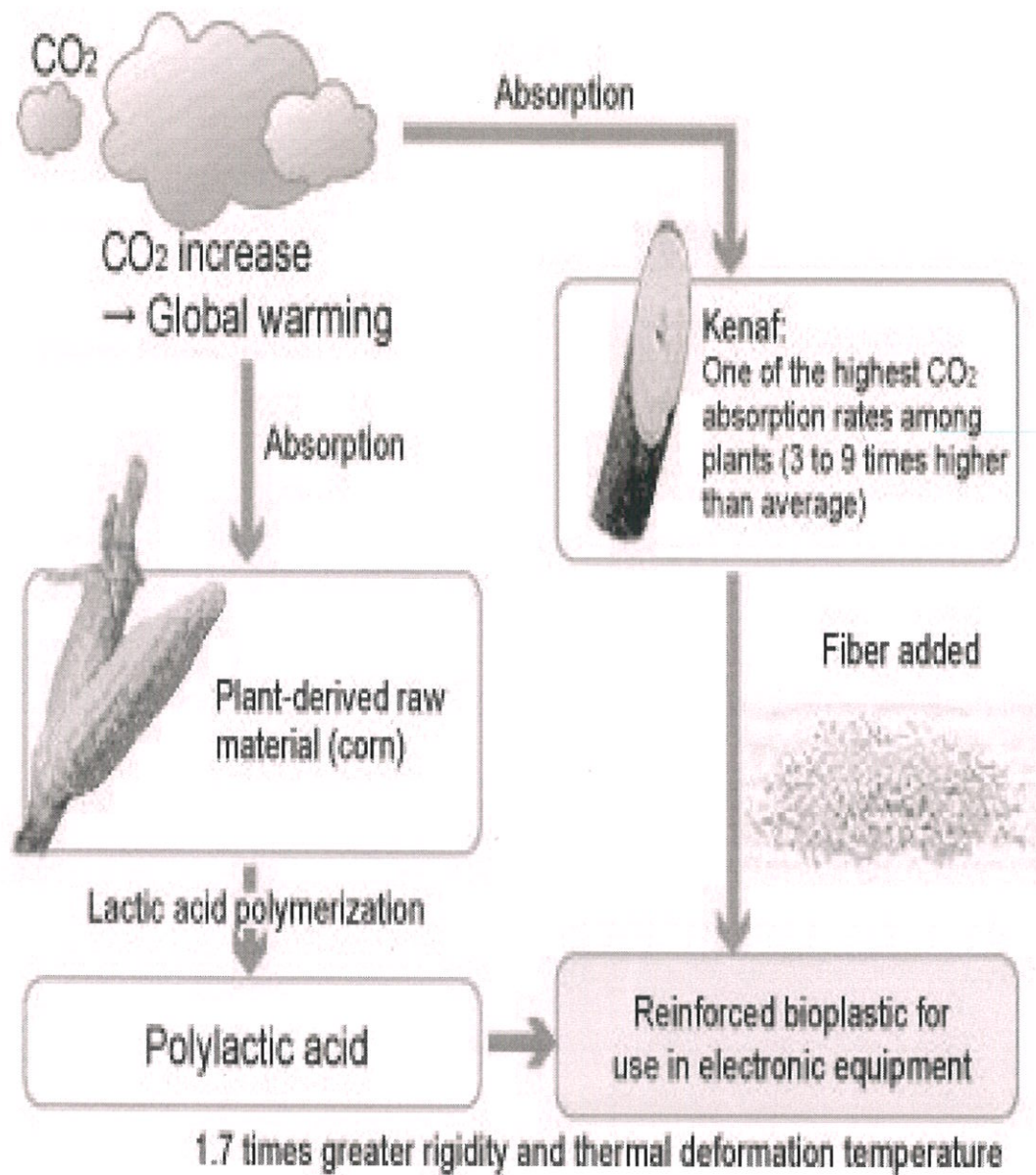
What are Bio-plastics?

Bio-plastics are a form of plastics derived from plant sources such as sweet potatoes, soya bean oil, sugarcane, hemp oil, and corn starch. These polymers are naturally degraded by the action of microorganisms such as bacteria, fungi and algae. Bio-plastics can help alleviate the energy crisis as well as reduce the dependence on fossil fuels of our society.

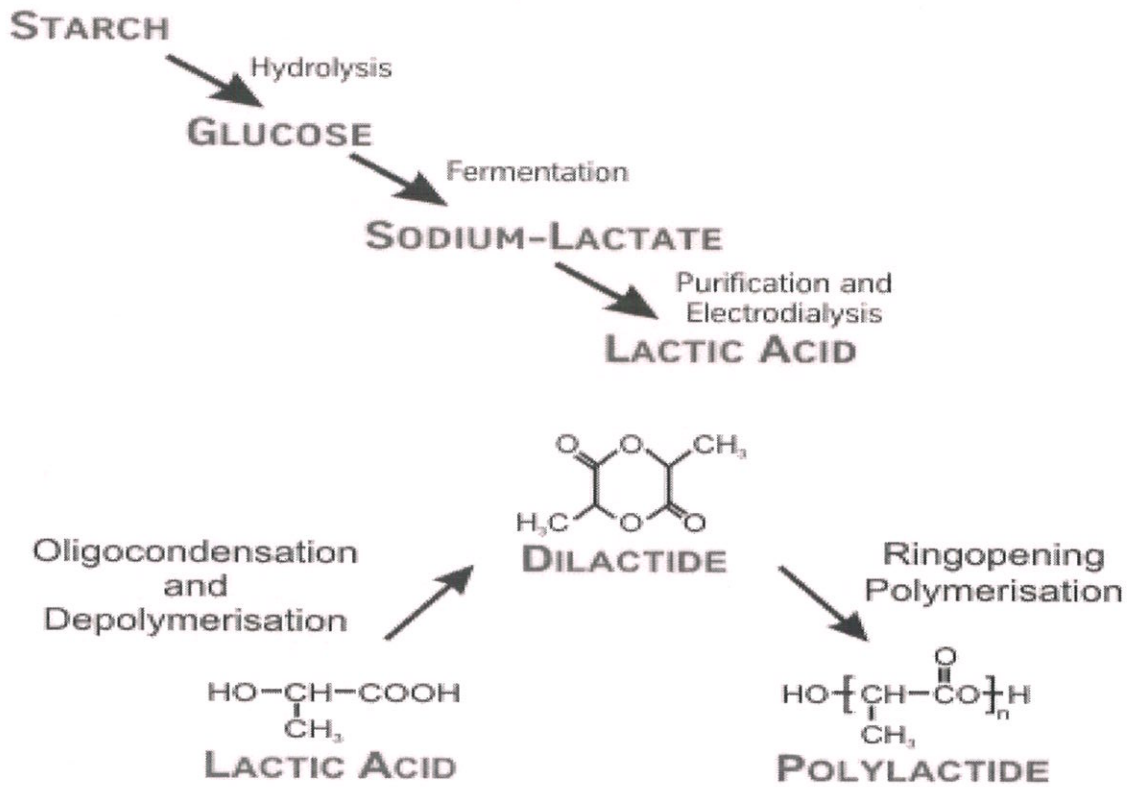
Composition:

- Polylactic acids (PLA)
 - Similar to regular plastic
- Polyhydroxyalkanoic acids (PHAs)
 - Aliphatic polyester that does not require synthetic processing
 - Uses bacteria/enzymes
 - Better heat resistance than PLA
 - Broader range of materials can be used to make PHAs
- Polyhydroxybutyrate-co-valerate (PHBV)s
- Polyols
 - Plant oil
- Variety of other Bioplastics
- Extracted or Used
 - oil, starch, sugars, lactic acid, fatty acids, proteins, bacteria, fibers

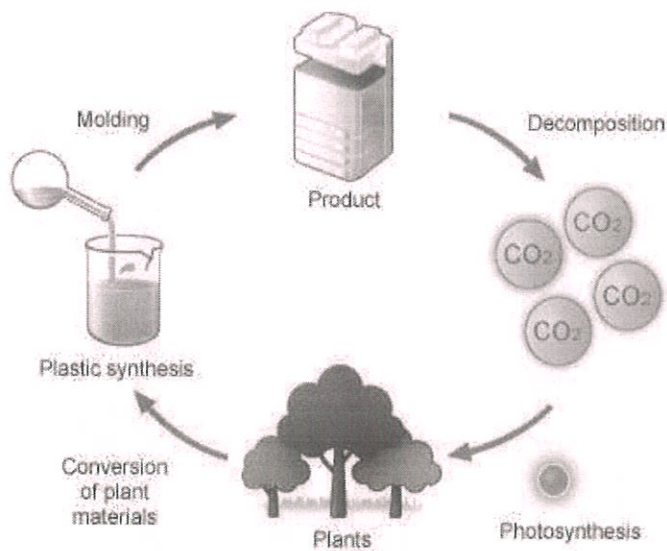
Composition

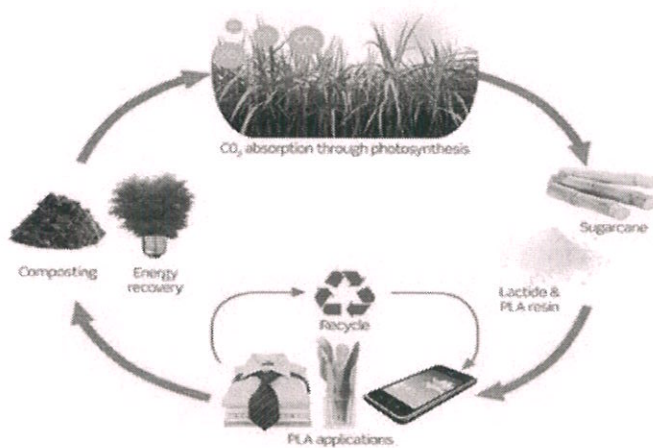


Lactic Acid Polymerization



Life cycle of Bio plastic





APPLICATIONS/USES OF BIO-PLASTICS Applications of Bio-plastics include single-use items such as plates, utensils, cups, and film wrap plastic bottling and as paper coatings by fast-food companies, clothing fibers compost bags, in the biomedical field, etc.



Packaging

- The use of bioplastics for shopping bags is already very common.
- After their initial use they can be reused as bags for organic waste and then be composted.
- Trays and containers for fruit, vegetables, eggs and meat, bottles for soft drinks and dairy products and blister foils for fruit and vegetables are also already widely manufactured from bioplastics.

Catering products

- Catering products belong to the group of perishable plastics.
- Disposable crockery and cutlery, as well as pots and bowls, pack foils for hamburgers and straws are being dumped after a single use, together with food-leftovers, forming huge amounts of waste, particularly at big events.

Sanitary Products

- Due to their specific characteristics, bioplastics are used as a basis for the production of sanitary products.

- These materials are breathable and allow water vapor to permeate, but at the same time they are waterproof.
- Foils made of soft bioplastic are already used as diaper foil, bed underlay, for incontinence products, ladies sanitary products and as disposable gloves.

Medical Products

In comparison to packaging, catering or gardening sectors, the medical sector sets out completely different requirements with regards to products made of renewable and reabsorbing plastics.

Why Use Bioplastics?

- Cheap and Easy to Manufacture
- Good Commercial Properties

Limitation

- Complex entanglements of polymer chains make it hard to decompose
- Relies heavily on petrochemicals
- Needs processing
- Recycling requires energy and money
- Releases toxic chemicals
- Fragmentation or Cyclization occurs
- 200 million tons produced each year and most of it is not recycled

Advantages

(i) Reduced CO₂ emissions: One metric ton of bioplastics generates between 0.8 and 3.2 fewer metric tons of carbon dioxide than one metric ton of petroleum-based plastics.

(ii) Cheaper alternative: Bio-plastics are becoming more viable with volatility in oil prices

(iii) Waste: Bio-plastics reduce the amount of toxic runoff generated by the oil-based alternatives.

(iv) Benefit to rural economy: Prices of crops, such as maize, have risen sharply in the wake of global interest in the production of bio-fuels and bio-plastics, as countries across the world look for alternatives to oil to safeguard the environment and for attaining energy security.

(v) Reduced carbon footprint: Oil based plastics require fossil fuel as a key raw material. In addition, oil based plastics require more energy during the plastic development process when compared with bioplastics.

Oil based plastics CO₂ emissions are 4 times higher than the CO₂ emissions for Poly Lactic Acid (PLA) resin.

(vi) Multiple end-of-life options: valuable raw materials can be reclaimed and recycled into new products, reducing the need for new virgin material and negative environmental impact of 'used' plastic products can be greatly reduced, if not, eliminated.

Disadvantages of Bio-plastics

As nothing is complete in this world, biodegradable plastics, which are preferred over the conventional ones, they have few drawbacks, such as:

(i) Biodegradable plastic is not meant to be recycled with other types of plastics.

(ii) If biodegradable plastic are not properly disposed of, it leads to an inefficient breakdown of the plastic, which can release toxins (carbondioxide, methane etc) into the environment.

TABLE – Bio-plastics vs oil based Plastics

Property	Bio-plastic	Oil based Plastic
Renewable	Yes	Partially No
Break down in the environment	Biodegradable and/or compostable	Some degradable by polymer Oxiidation
GHG emissions	Usually low	Relatively high
Fossil fuel usage	Usually low	Relatively high

Bioplastics can provide excellent biodegradability , helping the world deal with the increasing problems of litter, particularly in the world's rivers and seas.

Durable plant-based bioplastics can also be recycled as well as their conventional equivalents assisting the growth of a more sustainable world economy.