Plastic Waste Management in India

Plastic Roads – an innovative waste management approach

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“Only when the last tree has died,
and the last river been poisoned,
and the last fish been caught,
will we realise we cannot eat money?”

Enormity of the problem

- Global plastic production = 150-200 million tonnes per year
- Global per capita plastic consumption = 30 kg per year
- Plastic production in India = 12-15 million tonnes per year
- Per capita plastic consumption in India = 12 kg per year
- 45% of manufacture plastics used in packaging purpose in India (mostly single-use)
- Wide range of products - packaging films, wrapping materials, shopping and garbage bags, fluid containers, clothing, toys, household and industrial products, building materials etc.

Complexity of the problem

- Non-biodegradability of plastics (can remain in soil for ever without getting decomposed) – a major difference with paper, wood, metal, bio waste etc.
- Recycling and reuse of plastics – limited implementation in developing countries
- Common tendency – disposal in nature or garbage dump
- Serious problem to environment and urban life
- Environmental damage – landslide, hazard to marine life
- Choking of drains in cities, littering, toxic gases released by burning plastic waste

Difficulties in handling plastic waste

- Organized collection of waste – not always possible
- Segregation of different types of waste – must for effective recycling and reuse, but often not done
- Conventional methods – reuse, recycling, incineration, dumping
- Limited possibility for reuse
- Recycling of virgin plastics – possible only 2-3 times (shrinking/ thermal degradation)
- Mixing of colour, additives, stabilizers, flame retardants etc. can make recycled plastics more harmful

Difficulties in handling plastic waste

- Incineration releases toxic gases
- Burning plastic dump – similar problem
- Landfill/ disposal in nature/ water body – metal pigments (lead, cadmium etc), additives in plastic packages spreading to soil/ underground water/ water body
- Dumping causes landslide and also makes arable land in fertile (due to the barrier properties of plastics)
- Plastic carry bags, packaging films (< 40µm thickness) – difficult to recycle

Plastic debris affects at least 267 species worldwide, including 86% of all sea turtle species, 44% of all seabird species, and 43% of all marine mammal species

Plastic roads – eco-friendly disposal/ use of plastic waste at reduced cost

- Can process a wide variety of plastic waste - common plastic litter, not only thicker acrylics and bottles but also grocery bags and wrappers, cups, carry bags, polythene and polypropylene foams and thermocol (PVC/ Polyvinyl chloride cannot be used as it is toxic in nature)
- Molten plastics gives a coating on stone chips (used for laying roads) – creates better adhesive bond between stone chips, but using less bitumen
- Also better resistance to water logging

Steps for making plastic roads

- Plastic waste collection, segregation & storage
- Cleaning & drying of Plastic waste
- Shredding plastic waste into required size (2 to 4 mm)
- Stone aggregate (granite, ceramic) heated to around 160°C-170°C
- Shredded polymer waste is added to heated stone aggregate for 30-40 sec and mixed for uniform coating at surface of aggregate
- The coated aggregate is mixed with hot bitumen at temperature ranges from 155°C-163°C
- The mix (composite) known as waste plastic- aggregate-bitumen mix (130°C-140°C). This composite used for road laying at temperature between 110°C-130°C

Important points

- For every kilo of stone, 50 g of bitumen is used and 1/10th of this is plastic waste
- Heating temperature of 160°C-170°C is crucial so that plastic melts and does not burn. Burning releases toxic gases
- Bitumen use reduced by about 8% (saves cost)
- For every 1 km long and 4 m wide of road, 1 tonne of bitumen is saved.
- Method can accommodate the multilayered wrappings used for packing chips, cookies etc. These wrappings (consisting of a layer each of plastic, polyester, and aluminum) almost impossible to recycle

Some advantages

- Reduced stripping and pothole formation: During rainy season/ water logging, bitumen film gets stripped off the aggregates because of the penetration of water (pothole formation). When polymer is coated over aggregate, the coating reduces its affinity for water due to non-wetting nature of the polymer and resists the penetration of water.
- No leaching: Polymer does not leach out of the bitumen layer, even after laying the road
- Reduced effect of Bleeding: Waste polymer-bitumen blend shows higher softening temperature and reduces the bleeding of bitumen (common in summer).
- Reduced effect of Fly Ash: Roads made from plastic-bitumen mix inhibits leaching of toxic compounds into soil.


ஜம்புலிங்
தெரு
Jambuling
Street


JUSCO
THIS ROAD IS MADE
FROM
WASTE PLASTIC

How widely used?

- At least 11 States of India have some plastic roads
- Such road construction projects began in the State of Tamil Nadu followed by State of Karnataka in 2001
- Not yet widely used
- But its use is growing
- More than 34000 km of plastic roads in India
- Some States of India have made it mandatory for all road developers to use waste plastic with bituminous mix

What can Indian Embassy in Belgrade do?

- Serbians with commercial interest in plastic road projects can be put in contact with Indian organizations having the knowhow

  [Central Road Research Institute (CRRI), New Delhi; Thiagarajar College of Engineering, Madurai; Central Institute of Plastics Engineering & Technology, Chennai; Shriram Institute for Industrial Research, New Delhi; Indian Centre For Plastic In The Environment, Mumbai etc.]

- Free training in India (including air fare) offered under Indian Technical Economic Cooperation (ITEC) – details at http://www.itecgoi.in

  [For Example, Municipal Solid Waste Management course by Environment Protection Training and Research Institute, Hyderabad etc.]

Thank you