

EIACP NEWSLETTER

STATUS OF ENVIRONMENT & RELATED ISSUES IN PUDUCHERRY

UTILIZATION OF WASTE PLASTICS IN THE CONSTRUCTION OF FLEXIBLE PAVEMENT



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EIACP PC HUB PUDUCHERRY (erstwhile ENVIS)

Environmental Information, Awareness, Capacity Building and Livelihood Programme

Hosted by Puducherry Pollution Control Committee

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Editorial Board **(EIACP PC Hub, PPCC)**

Dr. N. Ramesh
Member Secretary (PPCC)

Shri. P. VIPIN BABU
Scientist/EIACP Co-ordinator

Text Editors





Smt. J. NITHIYA
Programme Officer

Shri. S. JAGAN KUMAR
Information Officer

Shri. S. DHINESH
ITO / GIS Officer

Shri. N. SRIDHAR
Data Entry Operator

About EIACP

-  Environmental Information System (ENVIS) was renamed as EIACP (Environmental Information, Awareness, Capacity Building and Livelihood Programme).
-  ENVIS came into existence as a plan programme in 1983.
-  It is a project funded by the Ministry of Environment, Forests and Climate Change (MoEF&CC), to facilitate collection, analysis and dissemination of information on various facets of environment.
-  The information is being disseminated through the quarterly newsletter and website.

About Puducherry - EIACP PC HUB

Puducherry Envis Hub Centre was started on 22nd September, 2005. Our ENVIS centre located at the Puducherry Pollution Control Committee (PPCC), Puducherry focuses on special reference to "Status of Environment Related Issues". Activities of our centre include collection, analysis, storage, retrieval and dissemination of information in the subject area allotted. The information is being disseminated through the quarterly newsletter various environmental awareness program in schools and colleges for imparting Environmental comprehension among students.

Aims and Objectives

-  To nurture green, sustainable and inclusive workforce in order to enhance both living and environment standards while fostering gainful and self-employment of youth.
-  To conduct skilling courses not only in traditional areas but also in new emerging areas like electric vehicles, hazardous waste/ Bio-medical waste etc. considering their future scope, requirements and prospects.
-  To be involved in the Mission LiFE (Lifestyle for Environment) being conceptualized by the Ministry.
-  To facilitate technical and environmentally conscious industrial participation focused on sustainable development.
-  To develop national and international collaboration for knowledge exchange and skilling and facilitating attainment of the SDGs.
-  To aid sustainable livelihoods of tribal population especially in NER based on traditional knowledge and crafts.
-  To facilitate informed decisions and policy making by catering to demand for research, innovation and data on emerging issues related to environment.
-  To facilitate transition to environmentally conscious futuristic citizens including awareness among public/communities on environment related issues.

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Previous Newsletter



Reconnoiter study on the carbonation of concrete samples collected from different regions of Pondicherry using phenolphthalein indicator method.

Upcoming Newsletter



Status of Water Quality in the U.T. of Puducherry for the year 2022

UTILIZATION OF WASTE PLASTICS IN THE CONSTRUCTION OF FLEXIBLE PAVEMENT

Not to Ban but to Plan

Problem Being Addressed

This is plastic age. Plastics otherwise polymers have found uses in many fields like packaging, electrical and electronically, fertilizers, agriculture, toys and engineering materials, domestic appliances, building materials and so on. Ten metric tons is the expected consumption for 2017 and it will rise to 20 Metric tons in 2020. Today plastics have become common man friend. It occupies all the essential things in their life like furniture's, plates, etc. The most important application or use of the polymeric materials is their use in packaging industry as carry bags, tea cups, sheets and films, multi layered films and thermocols. This occupies 35 % to 40 % of the total plastics consumed every year. The polymers used for the manufacturing of packing materials are polyethylene, polypropylene and poly styrene. PVC is used in the manufacturing of wires, electrical tube, flex etc. These packing materials once used are thrown away into the environment / solid waste as waste materials. These materials get collected in places like water canals, rivers and mostly it will mix with the municipal solid waste (nearly 9 %).



This results in water clogging, creating stagnation of sewage water and poor hygienic conditions. Moreover plastics are not bio degradable. The accumulation of waste plastics at various corners is an eye shore. The presence of waste plastics in the MSW also contaminates the organic waste available in the MSW, which is used for manure conversion. Thus plastic waste had become a major cause for the environmental pollution.

Government does not have any clue to avoid this pollution; rather they are planning to ban the use of plastics. Plastic manufacturing is a major industrial development of our country, in which more than 10 crore peoples are engaged. More over the plastic industry comes under the subsidy industrial scheme of the government. Hence the banning of use plastics will result in a major economical disorder in the country. To avoid this situation the government had even taken various steps to reduce the use of plastics like increasing the thickness of carry bags, creating awareness to reduce the use of plastic material, recycling of recyclable waste plastics and reuse of waste plastics. So the banning of plastics will not be solution for plastic pollution. Finding solution to plastic pollution is the need of the hour. This scenario motivated us to work on the use of waste plastics and to dispose it in an ecofriendly way.

Today the technological development both in electrical and electronic products has resulted in the production of e waste having larger toxic compounds. Their disposal is also needed to be attended too. Work is going in this direction. The problems we face is needed to be attended through appropriate technology way so that the benefit can reach the common man.



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Critical Challenges

The process is very simple and in situ, no external industries are involved. The plastic tar roads are performing very well even after 10 years without any permanent deformations like rutting, raveling, edge cracking and potholes. It helps to use waste plastics and the process is eco friendly and hence the disposal of waste plastics is not a problem.

Yet we face challenges in the following areas

- Though plastics waste is available in large quantity it is not properly collected and made available for the use of this technique.
- Self help group consists of village ladies are being employed for the collection of waste plastics. They have been given financial aid and support by the government. Since the road laying contractors are not in favor of this technology, the self help groups are not able to get expected business.
- Awareness among the technology group is less and they show less interest in the process.

- Awareness camps can help the younger generation. But it is not properly extended or promoted in spite of government schemes like Swachh Bharat.
- This technology is made in India. Yet it has not taken off as expected.
- The role of politician is very important, who can only promote this technology.
- Presently, the addition of waste plastics in process of road laying is done manually. If the process is automated the process will become still more successful.
- Most of the contractors are not in favor of this technology as the plastic roads are durable in nature and cannot be relayed soon.



Source: UNIDO Report – Recycling of Plastics in Indian Perspective by Dr. Smita Mohanty

Scaling Up of the process

Utilization of waste plastics for flexible pavement is the project and a new technology has been developed and this technology is simple and can be adopted easily with less cost. Major road laying is done by the government only, either by Panchayat, municipalities or by corporations. The NHAI is doing major road works in India. The technology can be adopted by the consumers. India has not less than 41 lakhs Kms of road network of which 66, 000 Kms are Highways and 24, 00, 000 Kms are rural roads, state highways etc. More than 50, 000 Kms of roads have been already laid by using this technology. Nearly 11 states have started implementing the technology. Details of plastic roads laid are available in the NRRDA web page. In addition to this many other countries were also shown interest in the project and steps are being taken to extend technology transfer to them.

In the construction of plastic tar road, the technology can be used in both mini hot mix plan and in central mixing plant and hence there is no problem of scaling up of this technique to larger extent. In the case of financial benefits, by using this process an extent of 10 % of the total project cost will be reduced.

This is due to the reduction in the use bitumen and reduction in maintenance cost expenditure of the road. The life of the road is not less than 10 years. Many foreign countries like, Indonesia, Malaysia, Brunei, South Africa are requesting for this technology to be adopted in their respective countries.

How the Problem Addressed by the Project

Reuse of waste plastic in road construction is a suitable solution for the disposal of waste in an eco friendly and thus avoiding the pollution created by the plastics in the environment. Presently the waste plastics are either land filled or incinerated. Both the processes are non technical and it will affect the environment in near future. In this context since the project of plastic road laying avoids land filling and incineration of waste plastics, it is considered as an effective process for the disposal of waste plastics.

Scientifically plastics are the by product obtained from petroleum refineries and hence they are hydrocarbons only. Bitumen is also byproduct obtained from petroleum distillation. Hence there should be compatibility between plastics and bitumen and also with other products from petroleum distillation. This behavior was tested and proved technically.

Attempts were made to modify bitumen by dissolving plastics in bitumen. This was partly successful but we could dissolve only lower percentages of plastic (1 % to 3 %) in bitumen. Moreover the scaling is also very difficult and the process involves high costing. Hence there is a need for another alternative method. A newer method has been developed by coating waste plastics over hot stone aggregate and uses the same for road construction. Here the consumption of waste plastics is high (10 % to 15 %). This method is patented in 2002 by Dr. R. Vasudevan. This technology was also coded by the Indian Road Congress in 2013(IRC-SP-98-2013). Using this technology more than 50, 000 Kms of road has been laid in India.

For a 1 Km length road of width 3.75 m we need one ton of plastics. India has 41 lakhs Kms of roads. If all the roads are converted / made to plastic tar road we need more than 100 lakh tons of waste plastics and practically India does not have this much waste plastics. We have only 16 lakhs tons of waste plastics only.

The performances of the roads laid were also studied under the guidance of Central Pollution Control Board, New Delhi. The results obtained were highly encouraging. Moreover the use of waste plastics in this technology is high and we can use 10 % to 15 % of waste plastics to the weight of bitumen.

Further works helped to develop other products like PLASTONE blocks a substitute for paver blocks. This product consumes a large amount of waste plastics. Plastone blocks can be used as road side paver block. The Plastone blocks manufacturing process also helps in the reduction in the use of cement, sand and water, since the process use waste plastics as a binder. Hence by using these technologies almost all the plastic waste available in the country can be reused and the disposal of waste plastics will no longer be a problem.



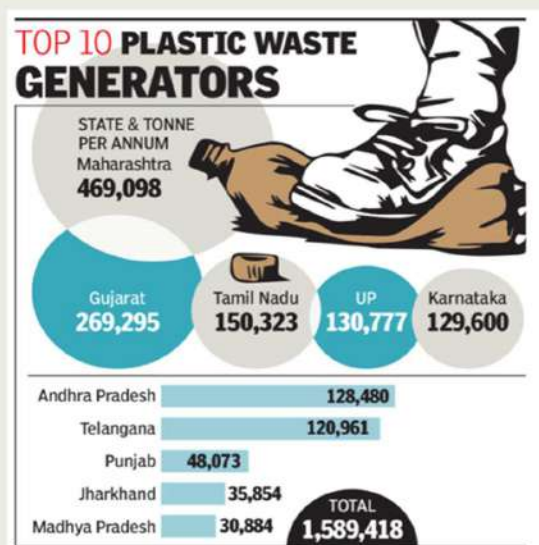
Moreover the waste plastics which were thrown to the streets will get a **value addition**. The use of waste plastics in the present project directly creates a demand for waste plastics in the market. Already in many states the self help group and some other NGOs are been involved in the process of collection waste plastics. They collect and shred the waste plastics and sell it to the concerned authorities for Rs 20 to 25 per Kg. This becomes a good employment.

The government is also taking measures under **Swachh Bharat**, which has become handy to collect the waste plastics. A system is to be developed to collect the waste plastics, shredding and construction of road. Cooperation from the engineers and the contractors is very much needed. If the system works well, the problem of disposal of waste plastics is almost solved.

The present project also insists in the practice of good garbage culture among the public. The project can become success if the segregation of waste plastics at source is practiced in all over the country. When the waste plastics mix with the MSW, the segregation becomes a tough job. The project also suggest various possibilities in collecting the waste plastics at source, like two bin system, awareness camps for the

public and own your ownership technique. Awareness camps and lectures are being organized to educate the school students to motivate them and help to collect the waste plastics at the source. It is partly successful too.

The roads constructed using this technology was well **appreciated both by the government and in the private sector**. In India almost 11 states had implemented this technology. The government is using the PMGSY scheme found for laying plastic roads on rural road sector. The Central Pollution Control board had published guidelines for laying plastics road in the year 2006 itself. This method is patented in 2002 by Dr. R. Vasudevan. This technology was also coded by the Indian Road Congress in 2013(IRC-SP-98-2013). Using this technology more than 50, 000 Kms of road has been laid in India.



Project Overview

Plastics are always common man's friend. It finds its use in every field and the consumption of plastics increases day by day. Nearly 50% of the plastic consumed is used for packing. The most used plastic materials for packing are carry bags, cups, thermocols and foams. These materials are made from polymers like Polyethylene, polypropylene and polystyrene. (The tubes and wires are made out of poly vinyl chloride).

These materials, once used are thrown out or littered by us more because of wrong culture. They mix with Municipal Solid Waste. As they are non-biodegradable, the disposal is a problem and they cause social problems contributing for environmental pollution as they are disposed either by burning or by land filling.

Yet these packing materials (either mono layer or laminated poly layers made out of poly ethylene, poly propylene and poly styrene) can be easily used for various uses like road construction and block making, without affecting the environment. (Poly Vinyl Chloride is not used –note) and it is the best way to dispose the waste plastics.

These plastic materials when heated to around 1200c to 1500c, they melt and in their molten state they can be used as a binder. Only if they are heated to temperature more than 2500c they may decompose producing gaseous products which results in air pollution. Coating molten plastic over granite stone can be done around 150 °C and the coating helps to bind with bitumen strongly resulting in better mix for road construction and the quality of the stone also improves by closing the voids. PVC is not used due to its toxic nature.

Plastics waste (Carry bags, cups, thermocols and foams) is shredded into small pieces (between 1.6mm – 2.5mm). The granite stone is heated to around 1700c. The shredded plastics waste is added to the stone. It gets melted and coated over stone in just 30 seconds. Then the bitumen is added and mixed. The mix is used for road construction. From rural roads to National Highways all types of roads can be laid using this technique.



Shredder Machine

Waste plastics like carry bags, disposal cups, thermocols, multi layer films and polyethylene and polypropylene foams can be used without segregation and cleaning. The process needs no new machinery and it is in situ process. The overall consumption of bitumen is less by 10 to 15% and thus the coat is reduced. By laying 1 Km single lane plastic road, 10 lakhs carry bags are consumed with a saving of 1 ton of bitumen (Rs 40,000). It also helps to avoid the entry of 3 tons of CO₂ in the atmosphere, if it is otherwise disposed by burning. Value addition to waste plastics is being created. Use of pavement scrap waste for plastic tar road reduces the cost by 50%.

Plastic tar road has double strength, compared to ordinary bitumen road. It can withstand both heavy load and heavy traffic. It is not affected by rain or stagnated water. And hence no pot hole is formed. There is no rutting and raveling. The life of the road is not less than seven years and there is no need for maintenance expenditure. Performance studies of the plastic tar road were carried out as per Central Road Research Institute specification and the results are very good. It has been published by CPCB and NRRDA as monographs.

A comparative study for 25mm thickness SDBC-10mm²

Material	Plain bitumen process	Plastic-tar road
60/70 Bitumen	30 kg	27 kg
Plastic waste	-	3 kg

Monitoring of test roads were carried out using structural evaluation, functional evaluation and conditional evaluation studies. Generally all the roads laid over a period from 2002 to 2006 are performing well. The results obtained for these roads helped to conclude that these roads are performing very well in spite of their age. Under the similar conditions most of the bitumen roads are not performing well at all. These roads have not developed even small cracking and a pothole. The roads were distributed over the different localities of Tamil Nadu exposed to various environmental conditions like temperature, rainfall, etc., yet the roads are performing well.



Plastic Carry Bags Granules


Reuse of road scrap in road laying is an important find. Normally when the road is laid the existing top layer scraped out and fresh layer of road is laid, to avoid the increase in the height of the road. The scrap is usually disposed as waste. In our lab we have developed a modified process for the reuse of scrap in road laying. The scrap is reused by mixing scrap and fresh mix in 50 – 50 %. Polymer coated aggregate can be used in the process of preparation of the fresh mix. By this process 1. We do not waste the scarp, 2. We use only 50 % of the raw materials and hence the cost is reduced by 50 %. Moreover the road level is not altered. This technology works very well and was already implemented in National Highways.


We have also developed a cold mix road laying process using emulsion and plastic coated aggregate and this can be used for laying roads in colder regions, where heating of aggregate is not done easily.


More other products like polymer modified bitumen roofing sheets, corrosion resistant reinforced steel bars for construction purpose are also been developed under this project. All the products use waste plastics as a binder.


Thus the problem created by the waste plastics has been addressed by the project called “Utilization of Waste plastics in the construction of flexible pavement”.

Plastic Road at Puducherry

 Plastic tar road was laid at Puducherry on 19th April 2022, Honourable Speaker of Puducherry Legislative Assembly **Mr. Embalam R. Selvam** had inaugurated the Program

 Senior Environmental Engineer at DSTE Dr. N Ramesh, Puducherry Municipal Commissioner, Ariyankuppam Commune Panchayat Commissioner PWD and Highways Engineer were also participated in the program.

 Initially, as a pilot project, a stretch of 200 metres at Edayarpalayam near the Lenovo plant in Pondicherry - Cuddalore Road was laid by the Ariyankuppam Commune Panchayat on April 19th 2022.

 Around 500 kg out of five tonnes of plastic seized by PPCC was used to lay the 200-metre road.

The road Was laid under the supervision of Dr. A. Ramalinga Chandrasekar Co-Coordinator TCE – EIACP PC RP and Dr. B. Sundarakannan, Program officer TCE –EIACP PC RP from the inventor group of Plastic tar road at Thiagarajar College of Engineering , Madurai.

Prior to the pilot project, a technical workshop was conducted by Dr. A. Ramalinga Chandrasekar Co-Coordinator TCE – EIACP PC RP for PWD officials and engineers, Local Administration Department, DSTE and local bodies on April 18th 2022.



EIACP PC HUB Puducherry Environment Events

Two days Brainstorming Session on Tourism and Coastal Regulation Zone/ Ecology under Marine Spatial Planning at Hotel Atithi, Puducherry on 5th October to 6th October 2022.

Puducherry EIACP Team participated two days Brainstorming Session on Tourism and Coastal Regulation Zone/ Ecology at Hotel Atithi, Puducherry on 5th October to 6th October 2022 organized by Puducherry Coastal Zone Management Authority, DSTE, Puducherry in collaboration with NCCR, MoES.

The Secretary to Government (Science, Technology & Environment), Director (Department of Science, Technology and Environment), Delegates from Norway, Officials from MoES, MoEF&CC, NCCR, NCSCM, Government of Lakshadweep, Stakeholder Departments of GoP and NGOs and other stakeholders participated in the event.

A team of Norwegian delegates from the Institute of Marine Research, Norway Environment Agency and Norwegian Embassy visited Puducherry and participated in the MSP Brain Storming Sessions.



International E-Waste Day on 14.10.2022

Puducherry EIACP Team delivered awareness lecture on E-Waste Management for the school student of Thiru Vi Ka Government High School, Arumbarthapuram, Puducherry on the occasion of International E-Waste Day held on 14.10.2022.



Celebration of Conservation Day (National Integration Week)

Puducherry EIACP Team delivered awareness lecture on 'Environmental Conservation' for the school student of class VI to VII from Government High School, Pillaiyarkuppam, Puducherry on the occasion of Conservation Day celebration (National Integration Week (Quami Ekta Week)) observed on 25.11.2022.



7 PLASTIC RECYCLING CODE THAT YOU SHOULD KNOW



PETE or PET



HDPE or PE-HD



PVC or V



LDPE or PE-LD



PP



PS



OTHER or O



EIACP PC HUB PUDUCHERRY (erstwhile ENVIS)

3rd Floor, Pondicherry Housing Board Building,
Anna Nagar, Nellithope, Puducherry – 605 005.

☎ (0413) 2201256 ✉ envis@py.gov.in



@eiacphubpdy