अप्पा जोशी प्रतिष्ठान

Charitable Trust working in the field of Environmental Excellence
Regd. No. E5276/Thane.

भूमिरापोनलो वायुः खं मनो बुद्धिरेव च।
अहङ्कार इतीयं मे भिन्ना प्रकृतिरष्टधा।।

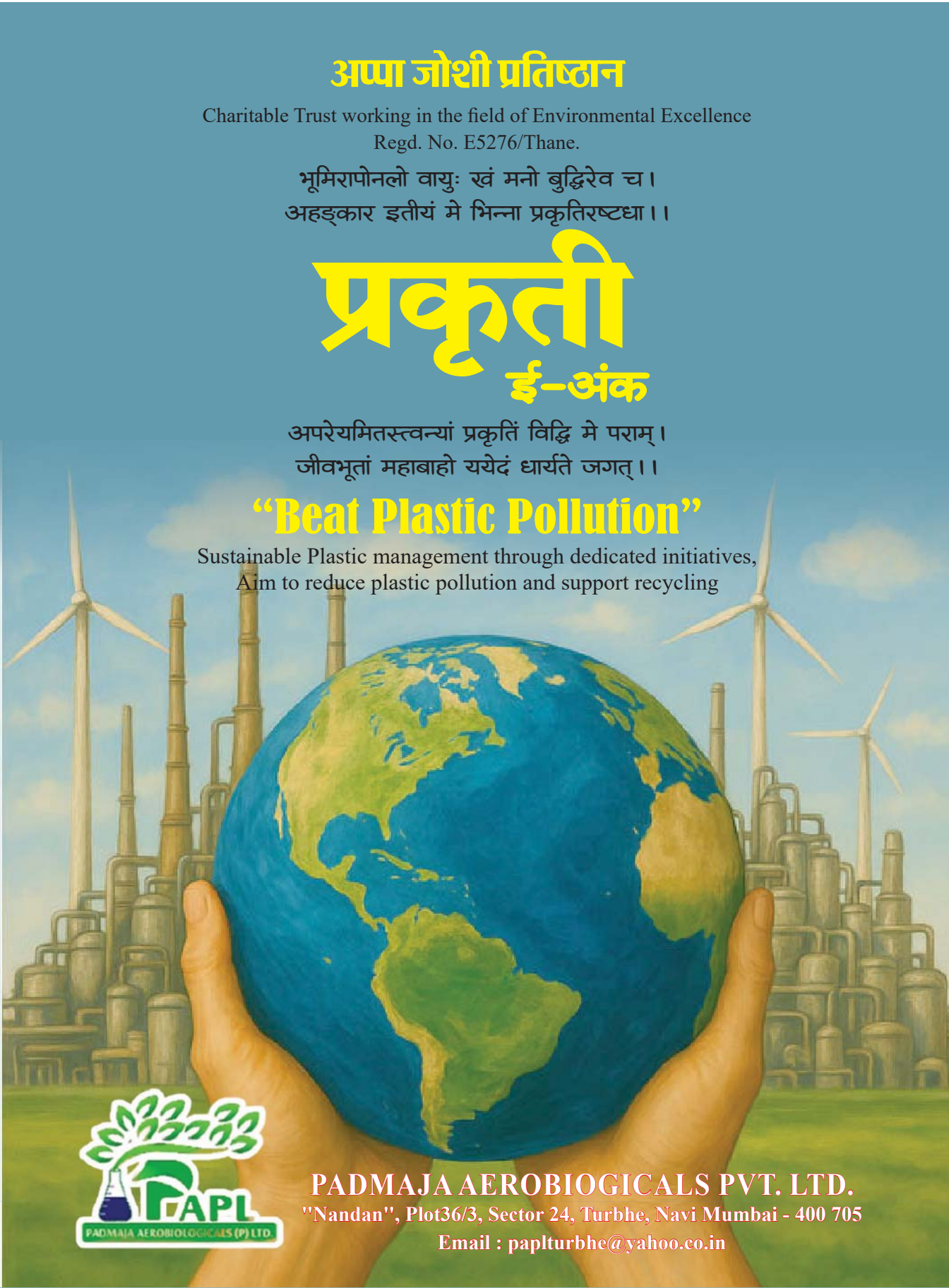
प्रकृती

ई-अंक

अपरेयमितस्त्वन्यां प्रकृतिं विद्धि मे पराम्।
जीवभूतां महाबाहो ययेदं धार्यते जगत्।।

"Beat Plastic Pollution"

Sustainable Plastic management through dedicated initiatives,
Aim to reduce plastic pollution and support recycling



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PADMAJA AEROBIOLOGICALS (P) LTD.

PADMAJA AEROBIOGICALS PVT. LTD.
"Nandan", Plot36/3, Sector 24, Turbhe, Navi Mumbai - 400 705
Email : paplturbhe@yahoo.co.in

Enviroment day

Preparation of Compost from wet-waste
Awareness and Social Activities at school

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INDEX

Editorial

Every time you sip water from a plastic bottle or toss a plastic wrapper, a part of it might end up in a river, an oceanor even in your own body. Over the years, plastic has silently crept into every corner of our planet, from the deepest oceans to the food we eat and the air we breathe.

We at Appa Joshi Pratishthan under the leadership of Dr Nandkishor Joshi thought to bring out an E Magazine which details latest and best-known examples of how to reduce or eliminate industrial pollution in various industries.

These industries like Dyestuff industry, Leather industry and the Paper & Pulp industry are the backbone of any economy. However, they are plagued by inefficient stripping of waste water or waste effluents from within the industry.

Here we present some examples of increasing efficiency in the process as well as generating revenue from Waste streams, as explained by the industry leading experts. These experts have been chosen carefully because they also have practiced in the industry, so they know what they are talking of and how to do it.

We hope that these real life examples will inspire all of you, our readers and industry experts, to experiment in their respective industry to improves processes. The improved processes will definitely lead to better efficiency of operation, better yield and better profits to our dear readers.

Thank You.

- Manish Kulkarni

Circular Economy :
A Pathway for Sustainable Development

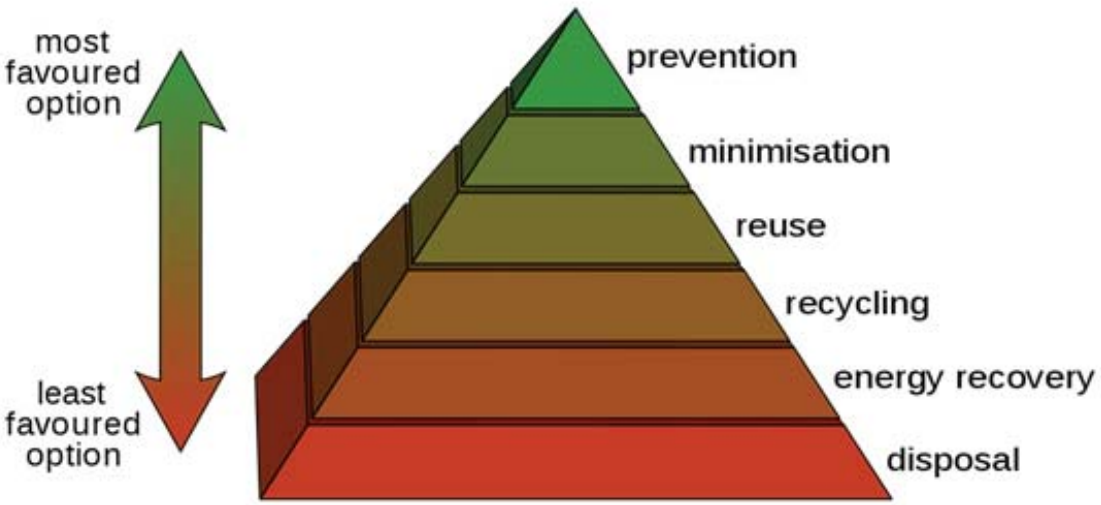
Waste management is a critical challenge for rapidly urbanizing states like Maharashtra. Viewing waste management through the lens of a circular economy offers a promising solution to transform waste from an environmental burden into a valuable resource. A circular economy is an economic system aimed at eliminating waste and promoting the continual use of resources. It encompasses cleaner production, efficient service delivery, end-of-life collection, remanufacturing, recycling, and reuse of resources, ultimately fostering green product development. Unlike the traditional linear economy of 'take-make-dispose,' circular economy emphasizes resource efficiency and waste minimization.

In India, the implementation of circular economy principles is strongly supported by the Extended Producer Responsibility (EPR) framework. EPR mandates producers to manage the environmental impacts of their products throughout the product lifecycle, especially for non-degradable or hard-to-recycle wastes such as plastics, electronic waste, tyres, and batteries.

The Ministry of Environment, Forest and Climate Change (MoEF&CC) has re-notified several key waste management rules to support sustainable waste handling: -

- Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016
- Solid Waste Management Rules, 2016
- E-Waste Management Rules, 2022
- Plastic Waste Management Rules, 2016
- Construction and Demolition Waste Management Rules, 2016
- Bio-Medical Waste Management Rules, 2016
- Batteries Waste Management Rules, 2022

These regulations prioritize waste hierarchy: waste minimization, reduction, reuse, recycling, and finally disposal as the least preferred option. They mandate source segregation to channel waste towards recovery and recycling, thereby improving the quality of end products and reducing environmental hazards.



Maharashtra, one of India's most industrialized states, generates substantial waste quantities:

- Municipal Solid Waste (MSW): 8.3 million tons annually
- Plastic Waste (within MSW): 410,000 tonnes/Annually
- Hazardous Waste (mostly industrial): 3 million tonnes/Annually
- E-Waste: 1 million tonnes and rising

The state has developed a robust infrastructure with over 510 Material Recovery Facilities (MRFs) across 374 urban local bodies.

Municipal Solid Waste generally comprises of three main components:

1. Organic/Biodegradable Waste: Includes vegetable remains, food waste, and leaves. It is primarily processed through composting, bio-methanation, incineration, or pyrolysis depending on facility availability.
2. Non-Biodegradable Recyclables: Such as paper, plastic, glass, and metals, sorted at MRFs and sent to recyclers.
3. Domestic Hazardous Waste: Includes sanitary products, managed mainly through incineration.

Waste Processing Technologies

- Reuse and Recycling : The most environmentally friendly approach, focusing on diverting dry waste from landfills via source segregation and processing at MRFs.
- Composting : Converts organic waste into nutrient-rich soil amendments. Technologies like windrow, aerated static pile, and in-vessel composting are employed based on feasibility.
- Waste-to-Energy through Bio-digestion : Anaerobic digestion breaks down organic waste to produce biogas for electricity or heat. Successful examples include Solapur's 4 MW plant and Pune's bio-CNG production from hotel waste.
- Waste-to-Energy Combustion : Converts high-calorific-value waste into electricity, with plants operational in cities like Delhi and Jaipur and proposed in Nagpur and Thane.
- Pyrolysis : A thermal process converting plastic waste into liquid or gaseous fuels, though still emerging in India.

- Domestic hazardous waste is generally treated and disposed through Hazardous waste facilities.

Plastic Waste Management

A global theme related to the environment is created every year on the occasion of Environment Day i.e,5Th June. The theme of this year's Environment Day, 2025, has been set by the United Nations as ***"Ending Plastic Pollution globally".***

Plastic waste was one of the reasons for the flooding in Mumbai in June 2005. In order to solve the various pollution problems caused by plastic waste, the Maharashtra Government has enacted the Maharashtra Non-Biodegradable Waste (Control) Act, 2006. Maharashtra is the first state in India to issue a notification for banning on Manufacture, Sale and Use of Single Use Plastic .Subsequently Mistry of Environment,Forest and Climate change, Government of India issued a notification regarding banning of Single use plastics PAN India level in August 2021. The information regarding single use plastic ban is available on the website of Maharashtra Pollution Control Board (www.mpcb.gov.in).

Plastics constitute about 5-6% of household solid waste but present significant recycling potential. Mechanical recycling dominates, involving shredding, washing, and pelletizing plastics for reuse. Chemical recycling technologies such as pyrolysis, gasification, and depolymerization are gaining traction for more complex plastics.

Other innovative uses include co-processing plastic waste as fuel in cement plants and incorporating plastic in road construction as a binder, supported by government regulations.

Despite progress, challenges remain, including low segregation rates, mixed plastic recycling difficulties, and the need for greater public awareness and infrastructure investment. Strengthening enforcement of EPR, expanding material recovery facilities, and promoting citizen responsibility are critical steps.

Status of Recycling Units in the state of Maharashtra

As urbanization accelerates, Maharashtra stands at the forefront of sustainable waste management, adopting a circular economy approach to minimize environmental degradation. Moving beyond the conventional "use-and-dispose" model, the state is reinventing waste as a resource, driving efficiency in reuse, recycling, and recovery, and reducing dependence on landfills. There are Plastic recycling Hubs located at Malegaon and Jalgaon. Ferrous Metal Scrap recycling hub is located in Jalna.

The following are numbers of recyclers authorized by the MPC Board:-

Sr No	Type of Recyclers	Total
1	PLASTIC WASTE REPROCESSORS	441
2	NON-FERROUS METAL SCRAP RECYCLERS	126
3	END OF LIFE VEHICLES SCRAPPING RECYCLERS	6
4	FERROUS METAL SCRAP RECYCLERS	45
5	SPENT/ MIXED SOLVENT RECYCLERS	90
6	ELECTRONIC-WASTE RECYCLERS	260
7	USED OIL / WASTE OIL RECYCLERS	86
8	TYRE WASTE RECYCLERS	92
9	BATTERY WASTERECYCLERS	94

Maharashtra pollution Control board has prepared a directory of Recycling units of different wastes with their capacities and contact details. The directory is available on the website of MPCB

By redefining waste as a valuable resource, It is not only addressing pollution but also unlocking economic opportunities through recycling industries, clean energy solutions, and innovative waste repurposing technologies. Through strategic interventions, Maharashtra is positioning itself as a leader in sustainable waste management, setting an example for other states to follow.

- Nandkumar Gurav
Assistant Secretary,
MPCB, Mumbai

World Environment Day, marked annually on 5 June, was established by the United Nations General Assembly in 1972. Over the past five decades, the Day has grown to be one of the largest global platforms for environmental outreach. Tens of millions of people participate online and through in-person activities, events and actions around the world.

World Environment Day is the United Nations' principal vehicle for encouraging worldwide awareness and action for the environment. Held annually since 1973, the Day has also become a vital platform for promoting progress on the environmental dimensions of the Sustainable Development Goals. With the United Nations Environment Programme (UNEP) at the helm, over 150 countries participate each year. Major corporations, non-governmental organizations, communities, governments and celebrities from across the world adopt the World Environment Day brand to champion environmental causes.

It is every bodies mission to conserve natural and living environments, prevent environmental pollution, and conserve, utilize, and develop water resources in a sustainable manner.

The world produces more than 430 million tonnes of plastic annually, two-thirds of which are short-lived products that soon become waste, filling the ocean and, often, working their way into the human food chain.

The world is aiming to develop an international legally binding instrument on plastic pollution, as mandated by United Nations Environment Assembly resolution 5/14.

Ridding the planet of plastic pollution is an important contribution to achieving the Sustainable Development Goals, including those on climate action, sustainable production and consumption, protection of seas and oceans and repairing ecosystems and retaining biodiversity.

“Beat Plastic Pollution” was the theme of world environment day 2018. “Solutions to Plastic Pollution” was the theme of world environment day 2023. “Ending Plastic Pollution” is again the theme of world environment day 2025.

In India Ministry of Environment and Forest and Climate Change has framed Plastic waste management Rules 2016 and amended from time to time.

Government of Maharashtra has issuedMaharashtra Plastic and Thermocol Notification, 2018 for control of plastic pollution.

Maharashtra rules ban Plastic bags with handle and without handle completely. Central rules allow Plastic bagsof thickness > 120 microns.

Maharashtra as well as central rules ban Non-woven polypropylene carry bags of 60GSM (grams per square meter)

Maharashtra as well as central rules ban Plastic packaging at manufacturing stage (except cases where thickness of plastic sheets impair functionality of product) of 50 microns

Maharashtra rules ban Compostable plastic carry bags(except for plant nurseries, horticulture, agriculture, handling of solid waste purposes (CPCB certification required) completely. Central rules allow Compostable plastic carry bags with CPCB certification.

Compostable plastic commodities are allowed by Both.

Biodegradable plastic carry bags and single use commodities completely banned in Maharashtra, but allowed with CPCB certification at center.

Disposable dish, cups, plates, glasses, fork, bowl, container, disposable dish/ bowl used for packaging food in hotels, spoon, straw etc. made from plastic and thermocol and Thermocol and plastic for decoration banned in Maharashtra.

At Central level there is Ban on-(a) Ear buds with plastic sticks, plastic sticks for

balloons, plastic flags, candy sticks, ice-cream sticks, polystyrene [Thermocol] for decoration

and (b) Plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping or packing

films around sweet boxes, invitation cards, and cigarette packets, plastic or PVC banners

less than 100 micron, stirrers.

Plastic coated and laminated disposable dish, cups, plates, glasses, fork, bowl,

container (Single use products)" made from paper/Aluminum are banned by both – state and center.

Printing of buy- back price on plastic packaging is compulsory in Maharashtra but not mandatory in central rules.

Central Government has also issued Guidelines on EPR for Plastic Packaging

Obligated Entities are :

1. **Producer (P)** of plastic packaging;
2. **Importer (I)** of all imported plastic packaging and / or plastic packaging of imported products;
3. **Brand Owners (BO)** including online platforms/marketplaces and supermarkets/retail chains other than micro and small enterprisesas per criteria of Ministry of MSME, Govt. of India
4. **Plastic Waste Processors (PWP)**

In spite of the framing of rules and regulations for control of plastic pollution, no noticeable improvement is seen. We still see plastic wastes littered here and there.

Can we have look at some old practices, wherein we were not using packaging

material.

For example, we were getting Milk from the vender through the measures directly in our container. Milk was also being delivered in glass bottles. The old bottle was cleaned and given back to the supplier and was getting recycled.

Same was true with cold drinks. The cold drinks were delivered in glass bottles and empty bottles were collected back and reused.

Cooking oil was also weighed and delivered in a container. Now, except for bulk consumers, using cooking oil in tins, everybody is getting cooking oil with number of brand names in plastic pouches or bottles/ cans.

The venders are preferring sailing of packaged goods and not loose material. The issue of "PURITY" is also raised while supporting sale of packaged items.

The vender does not have any responsibility to collect the packaging material back for reuse / recycle.

Can we think of bringing back some of the old environment friendly practices back?

EPR is making the venders to think about their responsibility about the packaging material going to environment from his end but nobody is sure about the result- success in getting the wastes in circulation through EPR.

Printing of buy- back price on plastic packaging is compulsory in Maharashtra but not seen to be effective at ground level.

Plastic littering is not stopped. We can observe during the journeys in trains or buses, that people throw out the empty bottles, pouched out of the windows, on railway tracks and roads. There is nobody, who will pick it up from there?

Lot of efforts will be required for creating public awareness amongst the passengers.

The production and consumption of plastic material is increasing day by day. There is no viable alternative packaging material found so far.

Plastic pollution is surely going to haunt us for a long time.

- Mr. Ramchandra Pethe
Ex MPCB Joint Director

“Pollution Control Turned into Profit ”

Introduction

Necessity is the mother of invention. Similarly, scarcityis the mother of water conservation and reuse.

Peopledo something only when they start feeling the shortage.

Self-motivation is the other route for achievingdesirable ends and is often the best form of regulationand control.

National Association of Manufactures USA, reportedfrom a survey some years ago that potential for reusein industries is from 15% to 52%, mostly from the directreuse of cooling water and wash water.

The potentialfor direct reuse for pulp and paper industry is 52%,whereas for chemicals and drug industry is 35% andfor Textile industry is 15%.

The growth of waste market increasing resources scarcity and availability of new technologies are offering opportunities for greening the waste water. Greening the

waste sector includes in 1st Phase, the minimization of the waste. Where waste cannot be avoided, recovery of the materials and energy from the waste as well as manufacturing and recycling the waste into usable product should be second option.

Greening of the waste sector requires financial, economic incentives, policy and regulatory measures and institutional arrangements.

Cost recovery from improved waste management and avoided environmental and health cost can help reduces financial pressure on Government. Private Sector participation can also significantly reduce the costs as well as enhance the service delivery.

Cleaner manufacturing process have been developed over the year producing less and less waste water than in the past. Indian experience has also developed in the same directions, moving step-wise over the years as follows :

• Plain water conservation

• Reuse without any treatment

• Reuse after treatment using on site toilet water and some easily treatable industrial waste water

• Reuse after treatment using offsite sources of municipal waste water

• Interestingly, all reuse in India has been achieved at affordable cost and some industries have, in fact save the money by reusing their waste water.

• In this paper attempts are done to recover by-products, as well as resources from waste watermaterial from various industries like pulp and paper,pharmaceutical,

chemicals,dye and dye-intermediate, agro base industry, tyre industry andrefineries.

It can be seen that recovery of the byproduct and other recourses definitely increasing theprofit of the industry by way of increasing the yield ofthe product, reducing the waste, recycling of thewaste, heat/ electrical energy recovery and alsotrading of the waste water.

This recovery usefulchemical/material has also given up carrierdeveloping of young Environment Engineer/ Chemistas well as consultant in this field.

Recovery of By-Product

. In the Dyes-Dye Intermediate industry particularly in themanufacturing of Fast Red B Base (2-Amino 5 – NitroAnisole) By-Product get the recovery of Fast Scarlet R -Base (i.e. 4 Nitro Ortho Anisole). The molecular weightof the both the Red B and Scarlet R Base is the samei.e. 168 and chemical formula is also same. $C_7H_8N_2O_3$.

Whereas, colour of the Red B is bright orange powderand the Scarlet are is bright golden yellowish powder.

The economics of the has increased due to the recoveryof the by-product. Otherwise the said by-product wasbeing discharge in the effluent f the Red-B. The cost oftreatment of the effluent of Red-B and the cost of thedisposal of the Hazardous Waste has also eliminateddue to recovery of the by-product.

In the Pulp and Paper industry. In the black liquorgenerated from Baggase Pulping. The caustic (sodiumhydroxide) is recover as a by-product and use for theCaptive Consumption due to which there is no need topurchase fresh caustic from the market. This hasincrease economy of the industry and also reduces thepollution load. Lignin is the measure constituent of thewaste water from the pulping process, which is a nonbiodegradable in

nature.

In bleaching process thewaste water content absorbable organic halides inaddition to lignin due to which use of chlorine asbleaching agent. To avoid the formation of such toxiccompounds, chlorine free bleaching is encouraged inseveral pulp and paper mill.

Black liquor is already practiced for energy recovery in most of the large scale industries due to its good calorific value. Besides, wastewater sludge can also be

co-utilised for energy recovery with fossil fuels. Using such 'biomass rich' waste materials, greenhouse gas emissions from the industry can be suppressed significantly. Alternatively, these materials can be subjected to other advanced thermal processes like gasification, pyrolysis and wet air oxidation. Pulp and paper sludge as well as boiler ash can be used as low cost adsorbents in water and wastewater treatment plants after proper treatment.

Recovery of Resources Material from the Waste Water

• Ethanol and biodiesel production and its usage in Canada are increased from less than 200 MT in 1990 to 1,777 MT in 2010. There are 16 commercial ethanol plants in Canada either operating or under construction in 2010. The feedstock for biodiesel plants is usually animal fats; alternative feedstock includes used vegetable oil and tallow.

In western Canada (Manitoba, Saskatchewan, and Alberta), the usual feedstock for biodiesel is oil derived from canola. Gasification allows thermochemical conversion of heterogeneous feedstock into a consistent synthetic gas (syngas) which can b used as a fuel for power generation or as a feedstoo for production of fuels and chemicals.

• Sustainable value-addition of agro-industrial wastes into bio-products and their application.

• Brewery spent grain (BSG), lignocelluloses agricultural wastes;food and vegetable liquid and solid wastes; and agro-processingwastes are the agro-industrial wastes which are either treated ordisposed abundantly into landfills in Canada. These lignin andcellulose rich agro-industrial wastes have a big potential in theproduction of multiple bio-products, such as enzymes, bio-pesticides, bio-fertilizers, bio-control agents and bio-energy bysupplying economical source of raw material.

• In the manufacture of alum particularly from the waste sulphuricacid - The sulphuric acid is utilized from the waste by -productfrom the fertilizer industry /chemical industry. The neutralizationcost of sulphuric acid as well as the sludge handling andtreatment being a Hazardous Waste is also costly matter. Butreusing of the waste sulphuric acid from the manufacture of thealum is more useful and reducing the pollution load as well asgetting the useful product.

Conservation of Other Resourcesbesides Water

Resources recovery in industries where some product isrecovered alongwith reusable water can be seen in the following :

• Steam recovery in industries :- The most common form ofreuse done in industries is steam recovery because both waterand heat are recovered.

• Fermentation Industry :- Several plants of this type exist in Indiausing anaerobic digestion (in the form of UASB', Bacardi andother processes) to generate bio-gas from high BOD wastewatersfollowed by further treatment for land irrigation or river discharge. Thus, water reuse is achieved alongwith fuel conservation.

• Leather Industry :- In the leather industry, chromium has beenshown to be economically recoverable for reuse. Chromiumremoval also helps safe disposal of the sludge from the treatmentplant and makes some reuse possible.

• Pulp and Paper Industry :- A pulp and paper mill in Puneachieved considerable savings in fuel usage through bio-gasproduction from their pulp-mill wastewaters.

Industrial reuse to meet chronic water shortages

Industrial reuse to meet chronic water shortages in India first began in Mumbai, in 1964. Reuse began with plain conservation and progressively developed into more and more complicated methods, as described below :

• Plain water conservation came first in the textile industry in Mumbai where the author's group surveyed 22 mills and showed that 15-20% water could be reused directly without any treatment. One had to find out the manufacturing steps from which the wastewater could be just held in a tank and recycled in other processes where quality was not important.

Higher percentage of reuse was possible if the wastewaters were pre-treated and then reused.

Tertiary Treatment using sewage

•The toilet waters were given tertiary treatment in the basement of these buildingsand the treated waters pumped up for reuse as make-up waters for coolingtowers of central A/C plants. Provision of centralized A/C thus became possiblefor the whole building in case of prestigious buildings in spite of water shortage,like in the Air India Bldg at Nariman Point, Mumbai, where it was first done.

• Operating costs at that time worked out to Rs.5 to 8 per 1,000 litres. This madereuse water cheaper than fresh municipal water, and more assured. Someplants over 35 years old, have now been renovated retaining the oldprocesses.

• For larger consumers like factories, sewage was taken from municipal sewersand tertiary treatment given. This again started first in Mumbai in 1968 with theUnion Carbide factory at Chembur where the author's group developed thetreatment process.

•Years later, two more tertiary treatment plants came up in Chennai for MadrasRefineries and Madras Fertilizers, using more concentrated Chennai sewageand later one more plant came up in Mumbai for Rashtriya Chemicals andFertilizers (RCF) at Chembur. They all gace reusable water at costs ranging fromRs.12/- upto as much as Rs.35/- per 1000 L depending on the nature of theoriginal wastewater and the more elaborate treatment required.

Pollution Allowance

Pollution allowance or emission rights, government-issued permit to emita certain amount of a pollutant. The holder of the permit may use it topollute legally, may trade permits, or may sell the permit for a profit. Theallowance issued to a polluter is reduced over time as permitted levels ofa pollutant are cut.

By specifying reductions in emissions but leaving thepolluter to decide how to cut them, the system is intended to providefree-market incentives to lessen both pollution (principally acid rain) andcompliance costs.

A company that cuts its pollution below its permittedlevel may sell the surplus allowance; a company that exceeds its limitswithout purchasing an extra allowance is fined.

Under the Clean Air Actof 1990, federal allowances for Sulphur Dioxide emissions are issued topolluters, and additional allowances are auctioned. Usually bought bycompanies, allowances are sometimes purchased by environmentalistswho retire them in order to reduce overall emissions.

Sponsored by theEnvironmental Protection Agency and run by the Chicago Board ofTrade, the first U.S. air pollution auction was held in 1993. While manyhave praised the system's innovative market-driven approach to theproblem of environmental pollution, critics question its monitoringprovisions and raise the possibility that it may merely shift pollution fromone region to another. Under the 1997 Kyoto Protocol on greenhousegases (as amended in 2001; effective 2005; extended to 2020 in 2012),nations that emit fewer such gases than permitted under the accord maysell their surplus emission rights to other nations.

Conclusion

It can be concluded that Pollution control is notonly related to the implementation

of the laws, butit is production yield increasing, reuse of theresources material and also getting the by-product which were going alongwith the effluent.

Thus we find that the Pollution control is definitely a Profit makingactivity in long turn period.

References

1) Water Conservation and Reuse in Industry and Agriculture,Chapt.14 Page No.396 Book on Waste Water Treatmentfor Pollution Control and Reuse, Third Edition by SoliArceivala& Shyam R. Asolekar.

2) Management of Pulp and Paper Mill Residues by A. Gargfrom Central for Environmental Science and EngineeringIIT Bombay, Powai, Mumbai-400076, India, MVIAW,Bombay, India, October 12, 2011.

3) Sustainable value-addition of agro-industrial wastes intobio-products and their application. S.K. Brar' and Others,INRS-ETE, Universite du Quebec, 490, Rue de laCouronne, Quebec, Canada G1K9A9, MVIAW, Bombay,India, October 12, 2011.

4) Information from the Internet.

5) AuthorsExperience Whileworking in dyes-dyeintermediate industry in the year 1973-75.

- Dr. P. P. Nandusekar
Retd. Principal Scientific Officer,
MPCB, Advisor (Env), Mumbai.

World Environment Day

Building a Climate-Resilient Maharashtra Together

Climate change is no longer a distant possibility - it is a lived reality. Across the globe, we are witnessing its devastating impacts: more intense and frequent heatwaves, rising sea levels, erratic rainfall patterns, severe droughts, and destructive floods. These shifts are not merely environmental issues; they threaten food security, water availability, public health, and overall well-being.

In India, the signs are undeniable. From melting glaciers in the Himalayas to rising sea levels along our coasts, climate change is affecting both our natural ecosystems and our socioeconomic systems. Climate-sensitive states like Maharashtra are particularly vulnerable. With its long coastline, drought-prone regions, bustling cities, and rich biodiversity, Maharashtra faces a unique mix of climate-related challenges. Erratic monsoons, extreme heat, increasing incidences of floods and droughts, and rising health risks are already impacting lives and livelihoods across the state.

On this World Environment Day, we must reflect on where we stand and where we need to go. Climate action is not optional - it is essential. And it must be collective. This is a time to unite as citizens, communities, professionals, institutions, and governments.

So, what does climate action look like? It broadly involves two essential strategies: adaptation and mitigation.

Adaptation means adjusting our systems, practices, and infrastructure to cope with the current and future impacts of climate change. For example, using drought-resistant crops, rainwater harvesting, constructing climate-resilient infrastructure, and preparing communities for extreme weather events.

Mitigation, on the other hand, focuses on tackling the root cause of climate change - greenhouse gas emissions. This includes promoting renewable energy, encouraging electric vehicles, enhancing energy efficiency, increasing green cover, and adopting sustainable consumption practices. While adaptation addresses the immediate and visible challenges, mitigation is about securing the future by limiting temperature rise and avoiding irreversible damage to our planet.

India's National and Global Commitments

India has shown strong leadership in climate action. The National Action Plan on Climate Change (NAPCC) includes eight national missions focusing on solar energy, sustainable agriculture, water conservation, energy efficiency, and more. Each state and Union Territory has been tasked with preparing its State Action Plan on Climate Change (SAPCC) to address region-specific vulnerabilities and opportunities.

Internationally, India is a committed signatory to the Paris Agreement, pledging to reduce the emissions intensity of its GDP, increase forest and tree cover, and expand non-fossil energy capacity. The launch of Mission LiFE (Lifestyle for Environment) reflects India's people-centric approach to sustainability, encouraging individuals to make small, everyday changes that collectively have a big impact. From using public transport and conserving energy to avoiding single-use plastics, Mission LiFE is about embedding climate-conscious behaviour into our daily lives.

Maharashtra's Pioneering Role in Climate Leadership

Maharashtra has emerged as one of India's leading states in the climate action movement. The state has revised its State Action Plan on Climate Change, adopting a multi-sectoral and inclusive approach. The SAPCC outlines comprehensive adaptation strategies across agriculture, water, public health, tourism, and tribal development, as well as mitigation strategies in energy, industry, transport, and forestry. It also introduces a State Cooling Action Plan aligned with the National Cooling Action Plan, promotes Decentralized Renewable Energy (DRE) for rural livelihoods, and incorporates a Climate Budget - a financial tool to track and prioritize climate-relevant expenditure.

To implement these measures effectively, the Government of Maharashtra has set up the State Climate Action Cell, a nodal agency for coordinating with the central government, local bodies, academic institutions, and civil society organizations. The state is also decentralizing climate planning by developing district and City-level Climate Action Plans (CCAPs). CCAPs have already been prepared for four major AMRUT cities- Mumbai, Solapur, Nashik, and ChhatrapatiSambhajinagar with more to follow.

Further strengthening grassroots climate governance, the state has established dedicated climate action cells in all 43 AMRUT cities, along with similar cells at the district and revenue division levels. These cells serve as local hubs for planning, monitoring, and capacity building, ensuring that climate resilience becomes a reality across urban and rural Maharashtra.

Nature-Based Solutions and Just Transition

Maharashtra is embracing nature-based solutions to address climate change while supporting rural livelihoods. Under the guidance of the Chief Minister's Task Force for Environment and Sustainable Development, the state is promoting bamboo cultivation on a large scale. Bamboo is not only fast-growing and climate-resilient, but it also sequesters significant amounts of carbon, making it an ideal climate-friendly alternative to fossil fuel-based products.

The initiative aims to plant bamboo on barren lands, along riverbanks and roadsides, and on private agricultural land. It will be integrated with MGNREGA to generate rural employment and develop value chains in sectors like furniture, food, textiles, medicine, and construction.

Recognizing its responsibility as India's largest sub-national economy, Maharashtra has also launched a Just Transition Roadmap to ensure that the shift to clean energy is socially and economically inclusive. The roadmap addresses the challenges faced

by communities dependent on traditional high-emission industriessuch as coal mining, thermal power, cement, and steel, and lays the groundwork for preparing Just Transition Policies and Regional Transition Plans for 14 districts. These plans focus on retraining workers, promoting green jobs, and safeguarding social welfare while enabling low-carbon economic growth.

Urban Innovation for a Sustainable Future

The Government of Maharashtra, in collaboration with C40 Cities, has developed the Maharashtra City Decarbonisation Roadmap for the energy and building sectors. This roadmap outlines actionable steps for cities to reduce energy consumption, embrace renewable technologies, retrofit old infrastructure, and shift to clean cooking solutions. It supports the scaling up of solar energy, energy-efficient buildings, and sustainable construction materials laying the foundation for climate-resilient urban centers.

A Shared Responsibility

This World Environment Day, let's move beyond symbolic gestures and embrace real change. Climate action is a shared responsibility. It needs everyone - students, professionals, industries, scientists, NGOs, and citizens- to work together.Let's support innovation, demand forward-looking policies, and adopt eco-friendly habits.Together, we can build a climate-resilient Maharashtra and contribute to a stronger, more sustainable India and a greener planet for future generations.

- Joy Shrikant Thakur
Scientist-1,
Environment and Climate Change Department,
Government of Maharashtra

ACHIEVING SUSTAINABILITY THROUGH CIRCULAR ECONOMY

1. Introduction

The world is facing unprecedented environmental challenges, including climate change, resource depletion, and pollution. Traditional linear economic models - based on a take-make-dispose approach - are no longer sustainable. In response, the circular economy has emerged as a transformative solution that promotes sustainability by minimizing waste, extending product lifecycles, and regenerating natural systems.

This article explores the principles of the circular economy, its benefits, real-world applications, and how it can drive global sustainability efforts.

2. What is a Circular Economy?

A circular economy is an economic system designed to eliminate waste and continually reuse resources. Unlike the linear economy, which follows a one-way path from production to disposal, the circular economy emphasizes:

a) Designing Out Waste and Pollution - Products are designed for durability, repairability, and recyclability.

b) Keeping Products and Materials in Use - Through reuse, refurbishment, remanufacturing, and recycling.

c) Regenerating Natural Systems - Shifting to renewable energy and restoring ecosystems.

This model not only reduces environmental impact but also creates economic opportunities and enhances resilience.

3. Key Principles of the Circular Economy

a) Rethinking Product Design

Sustainable design is at the core of the circular economy. Companies are adopting:

- Modular designs for easy repair and upgrades.
- Biodegradable materials that safely return to nature.
- Non-toxic, recyclable materials to facilitate closed-loop recycling.

b) Extending Product Lifecycles

Instead of discarding products, strategies like repair, refurbishment, and remanufacturing keep them in use longer. Examples include:

- Electronics: Companies like Fairphone design modular smartphones for easy repair.
- Fashion: Brands like Patagonia encourage garment repairs and recycling.

c) Recycling and Resource Recovery

Advanced recycling technologies help recover valuable materials from waste. Initiatives include:

-Urban mining (extracting metals from e-waste).
- Chemical recycling (breaking down plastics into raw materials).

d) Shifting to Renewable Energy and Bio-based Materials

A circular economy relies on renewable energy (solar, wind) and bio-based materials (plant-based plastics) to reduce dependence on finite resources.

e) Adopting Service-Based Business Models

Companies are shifting from selling products to offering services, such as:

- Product-as-a-Service (PaaS): Leasing instead of selling (e.g., Philips' Light as a Service).
- Sharing Economy: Platforms like Airbnb and Uber maximize asset utilization.

4. Benefits of a Circular Economy

a) Environmental Benefits

- Reduces Waste : Diverts materials from landfills and incinerators.
- Lowers Carbon Emissions : Recycling and remanufacturing require less energy than virgin production.
- Preserves Biodiversity : Reduces resource extraction and pollution.

b) Economic Benefits

- Cost Savings : Businesses save on raw materials through recycling and reuse.

- New Revenue Streams: Opportunities in repair, refurbishment, and recycling industries.
- Job Creation: The circular economy could generate millions of jobs in waste management and green manufacturing.

c) Social Benefits

- Improved Health: Reducing pollution leads to cleaner air and water.
- Greater Equity: Affordable, long-lasting products benefit low-income communities.

5. Real-World Examples of Circular Economy Success

a) The Netherlands' Circular Ambitions

The Netherlands aims to be fully circular by 2050, with initiatives like:
- Circular textiles : Recycling old clothing into new fabrics.
- Circular construction: Using recycled and bio-based building materials.

b) Adidas' Recycled Shoes

Adidas partnered with Parley for the Oceans to create sneakers from recycled ocean plastic, selling over 15 million pairs since 2015.

c) Toyota's Remanufacturing Program

Toyota remanufactures car parts like engines and transmissions, reducing waste and costs.

d) Loop by TerraCycle

Loop is a shopping platform that delivers products in reusable containers, which are collected, cleaned, and refilled.

6. Challenges to Implementing a Circular Economy

Despite its benefits, transitioning to a circular economy faces obstacles:

a) High Initial Costs: Shifting from linear to circular models requires investment in new technologies and infrastructure.

b) Consumer Behaviour: Many consumers still prefer disposable products over reusable alternatives.

c) Regulatory Barriers: Some laws favor linear models, making it difficult for circular businesses to compete.

d)Supply Chain Complexity: Tracking and recovering materials across global supply chains is challenging.

7. How Governments and Businesses Can Accelerate the Transition

a) For Governments :

- Implement Extended Producer Responsibility (EPR): Hold manufacturers

accountable for product end-of-life.

- Offer Tax Incentives: Encourage businesses to adopt circular practices.
- Invest in Recycling Infrastructure: Improve waste collection and processing systems.

b) For Businesses :

- Adopt Circular Design Principles: Create products that last longer and are easier to recycle.
- Collaborate Across Industries: Share resources and knowledge to close material loops.
- Educate Consumers: Promote sustainable consumption habits.

b) For Individuals :

- Choose Quality Over Quantity : Buy durable, repairable products.
- Recycle and Compost : Properly dispose of waste to support circular systems.
- Support Circular Brands : Purchase from companies committed to sustainability.

8. Conclusions

• The circular economy is not just an environmental necessity - it's an economic opportunity. By rethinking how we design, produce, and consume,

we can create a sustainable future where waste is minimized, resources are preserved, and economic growth aligns with planetary health.

• Governments, businesses, and individuals all have a role to play in accelerating this transition. The shift to a circular economy is not only possible but essential for long-term sustainability. By embracing circular principles today, we can build a resilient, regenerative, and equitable world for future generations.

- Dr. Shirish Naik

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• About the author :

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Miyawaki Dense Forest at Village Devchole, Bhiwandi :

A Sustainable Approach to Reforestation

Introduction

The Rotary Club of Satellite City Navi Mumbai has undertaken a significant environmental initiative by developing a Miyawaki Dense Forest at Village Devchole, Bhiwandi. The project covers a gross area of 3.5 acres, with 2.5 acres dedicated to dense forestation, incorporating 22,550 indigenous saplings from 60 native species. The site was barren and uneven devoid of any major plantations. This initiative aligns with global sustainability efforts by fostering rapid afforestation, enhancing biodiversity, and mitigating carbon emissions. The Joint Forest Management Committee (JFMC), is the local project partner.

Miyawaki Method and Its Advantages

The Miyawaki method, pioneered by Japanese botanist Dr. Akira Miyawaki, is a highly effective afforestation technique designed to cultivate dense, native forests in a short period. By mimicking natural ecosystems, the method ensures rapid tree growth, increased biodiversity, and improved soil health.

Key advantages of the Miyawaki Dense Forest include :

- **Accelerated Growth :** Trees grow 10 times faster compared to conventional afforestation techniques.
- **High Biodiversity :** The forest consists of a diverse mix of 60 native species, contributing to ecological stability.
- **Enhanced Carbon Sequestration :** Dense plantations absorb more carbon

dioxide, helping combat climate change.

- **Improved Microclimate :** The dense tree cover reduces heat island effects, providing cooling benefits.
- **Water Conservation :** The forest enhances soil retention and groundwater recharge, aiding local water security.
- **Community Engagement :** By involving local stakeholdersespecially the JFMC and local labour, the project promotes environmental awareness and social responsibility.

Project Implementation and Cost

The forest development was inaugurated on June 5, 2022, marking a milestone in urban sustainability efforts. The project, initially budgeted at Rs. 54.00 lakhs, experienced a revision post-fire, bringing the total cost to Rs. 57.00 lakhs. The funding was sourced as follows:

Source of Funding	Amount (Rs. in Lakhs)
CSR funds by Atos	46.00
Rotary District Grant	4.00
Aarambh	4.00
India Glycol	3.00
Total	57.00

The funds were provided for the saplings, soil nutrients, local labour – plantation and maintenance including de-weeding, fencing, and installation and operations of drip irrigation system. The financial support underscores the role of corporate social responsibility (CSR) and institutional grants in advancing environmental projects.

Friends Of Forests

As reported by the locals and members of JFMC, at the project site python, peacock, wild boar, nilgai (Blue Bull), patridge, bengalmonitor lizard, greater coucal (Crow Pheasant), owl, different varieties of butterflies, spiders, spittle bug, grasshoppers, and beetles have been spotted at the site indicating the rich biodiversity and ecosystem.

Long-Term Benefits and Sustainability

The Miyawaki Dense Forest at Devchole is expected to serve as a natural carbon sink, offsetting emissions and promoting biodiversity conservation. The Miyawaki Dense Forest improves soil health by encouraging deep-root systems and natural microbial activity.

Additionally, it provides a habitat for local fauna, strengthens ecosystem resilience, and acts as a model for similar urban reforestation projects.

The plantation site could be promoted for developing as a 'Biodiversity Zone' and interested nature groups can train people for appreciating and learning from the nature.

Conclusion

The Rotary Club of Satellite City Navi Mumbai's initiative is a remarkable step toward sustainable urban development. By employing the Miyawaki method, this project not only contributes to environmental restoration but also fosters community involvement, ecological conservation, and climate mitigation. As cities and their surrounding regions face increasing environmental challenges, such efforts pave the way for a greener, more resilient future.

Photographs 'Before' and 'After'PPT attached.

- Rtn. KedarNath Rao Ghorpade

Former Chief Planner, MMRDA, Environmentalist

ROTARY ACTIVITIES – SOCIAL REFORMS

Rotary is a license to do good things for society- to repay to the Society. It opens many doors for doners and also opens our eyes to see through the needs of have-nots… There isa huge gap between what we perceive to be others' problems and the reality.

Rotarians are the bunch of enthusiasts who live for other's lives, do not stop until objective is achieved and yet remain anonymous. We as Rotarians have following ***seven areas of focus*** :

1. Peacebuilding and conflict prevention,
2. Disease prevention and treatment,
3. Water, sanitation, and hygiene,
4. Maternal and child health,
5. Basic education and literacy,
6. Community economic development, and
7. Supporting the environment.

Rotary International, founded in 1905 by Paul Harris, is a global network of over 46,000 clubs and 1.4 million members dedicated to humanitarian service and fostering goodwill. Through its Five Avenues of Service Club, Vocational, Community, International, and Youth Service Rotary clubs drive impactful social reforms worldwide.

Rotary clubs address critical social issues through targeted projects. They promote peace by fostering international understanding and supporting conflict resolution initiatives. In healthcare, Rotary's fight against polio, launched in 1979, has reduced cases by 99.9%, notably through immunization projects like the one for 6 million children in the Philippines. Clubs also tackle disease prevention, provide clean water to remote communities, and support maternal and child health programs. Education and literacy

initiatives empower communities, while economic development projects, such as microfinance and vocational training, uplift local economies. Environmental conservation, including community clean-ups and sustainable projects, reflects Rotary's commitment to addressing modern challenges.

Rotary's youth programs, such as Rotaract and Interact, engage young leaders aged 12–30 in service projects that promote ethical standards and leadership. For example, Interact clubs in Nepal have launched hygiene campaigns, while Rotaract clubs undertake annual projects to enhance community welfare. Additionally, Rotary's emphasis on serving the elderly, as urged by the RI Board in 1990, focuses on intergenerational activities to combat loneliness and promote independence.

Through fundraising events like gala dinners, walkathons, and online campaigns on platforms like WhyDonate, Rotary clubs finance their initiatives. These efforts, combined with partnerships with local businesses and global organizations like the United Nations, amplify their impact. By promoting integrity, diversity, and ethical standards, Rotary clubs create lasting social change, uniting communities to address pressing needs while fostering fellowship and goodwill.

Rotary's grassroots approach and collaboration with local communities, governments, and international organizations have led to sustainable and impactful social reform across the globe. As a club President, which ideally happens only once in life-time, you know you can make impact on society. The projects I successfully handled and enjoyed during my tenure are:

1. ***Mangrove development :*** In Navi Mumbai depleting mangroves is one of the major concerns that affects environment imbalance. We, with the help of other clubs and Forest department planted hundreds of mangroves that- saves beaches, increases Oxygen producing plant populations, saves Sea creatures and other ecosystem like birds and small creatures.
2. ***Adopting Schools :*** Many schools in Adivasi areas need support from outside the system. Making means available, Talking to Students and Parents, keeping in touch with happenings in Society and most importantly Guiding them to the right careers is one of the most important aspects of Social reforms
3. ***Mental Health Awareness :*** One of the most important issues new generations facing. We are completely at loss when reality was seen. Single Child, Both parents working, Rat race for superiority, loneliness, exposure to media- social as well as other-, over freedom are the basis of mental problems that are identified to disturb adolescents. Timely change is social fabric

and balanced view of life are very important factors experts have identified.

4. ***Legal Awareness in Unskilled women :*** Legality of having documents, right documents, pros and cons of acceptance of conventional systems are basic necessities for unfortunate women. Glaring example of not registering marriage can lead to succession problems, title of properties and even disputes within families. This project is taken and spread by Rotary very seriously and successfully.
5. ***Good touch-Bad Touch :*** One of the fundamental requirements of contemporary life. Applicable for both boys and girls. An eye opener to many and necessity of present time where the line between Freedom and Vulgarity is very thin. This is the need of present teaching and spreading the same.
6. ***Project End Thalassemia Now :*** Most of under reported and also most dangerous, life-threatening Blood Disorder that can ruin families. This is genetic blood disorder can save future lives , if not present one. Rotary Clubs of Navi Mumbai have taken this project with complete devotion and commitment. Dr. D Y Patil Hospital has provided with a Ward dedicated to this cause. We serve about 30-45 children, twice a week with Blood transfusion, doctor consultation, filters and more.
7. ***Project CC TV/Cameras :*** Need of the contemporary systems, whether in Schools, Offices or places of public gatherings. Immense pleasure to be part of this prestigious project which proved to most helpful just within weeks from our completion. Unfortunate incidence in Maharashtra was an eye opener… We were ahead.

   After almost eradicating POLIO, next target is to conquer Thalassemia. It is not overnight job… it will take generations to win..but we Rotarians never give up!..

AND the best part of Rotary is FELLOWSHIP… You get to know likeminded people, you get energized by them, you adore some, you are followed by some. This is the best place to know your own abilities and strengths. You come across amazing people and learn ways of life through them. They help you and inspire you to help others. That is the best of Rotary.

- Rtn. Shekhar Joshi

वैश्विक प्लास्टिक प्रदूषण को समाप्त करना

यह थीम पर्यावरण और मानव स्वास्थ्य पर प्लास्टिक कचरे के व्यापक प्रभाव को संबोधित करने पर केंद्रित है, जिस का लक्ष्य संधारणीय प्रथाओं को प्रोत्साहित करना और प्लास्टिक की खपत को कम करना है।

वैश्विक प्लास्टिक प्रदूषण को समाप्त करने के लिए एक बहुआयामी दृष्टिकोण की आवश्यकता है, जिसमें एक वैश्विक संधि विकसित करना, एकल-उपयोगवाले प्लास्टिक को कम करना, अपशिष्ट प्रबंधन में सुधार करना और संधारणीय प्रथाओं का समर्थन करना शामिल है। संयुक्त राष्ट्रने २०२४ तक कानूनी रूप से बाध्यकारी समझौते की दिशा में महत्वपूर्ण प्रगतिकी है, और २०२५ के विश्व पर्यावरण दिवस की थीम #BeatPlasticPollution पर केंद्रित है।

प्लास्टिक प्रदूषण को समाप्त करने के लिए प्रमुख कार्य :

वैश्विक संधि :

संयुक्त राष्ट्र के तहत बातचीत की जा रही एक वैश्विक संधिका उद्देश्य एक समान खेल का मैदान बनाना और प्लास्टिक की खपत और प्रदूषण को कम करने के लिए राष्ट्रीय कार्यों को प्रोत्साहित करना है।

एकल-उपयोग प्लास्टिक को कम करें :

व्यक्ति और व्यवसाय पुनः प्रयोज्य विकल्प चुनकर, बैग प्रतिबंध और करों का समर्थन करके और न्यूनतम पैकेजिंग के साथ थोक खरीद का विकल्प चुन कर एकल-उपयोग प्लास्टिक पर अपनी निर्भरता को सक्रिय रूप से कम कर सकते हैं।

अपशिष्ट प्रबंधन में सुधार :

प्लास्टिक को पर्यावरण में प्रवेश करने और परिस्थिति की तंत्र को नुकसान पहुँचाने से रोकने के लिए रीसाइक्लिंग, भस्मीकरण और उचित लैंडफिल निपटान सहित कुशल अपशिष्ट प्रबंधन प्रणालियाँ महत्वपूर्ण हैं।

संधारणीय प्रथाएँ :

शून्य-अपशिष्ट जीवनशैली को अपनाना, संधारणीय उत्पादों को चुनना और संधारणीयता को प्राथमिकता देनेवाले स्थानीय व्यवसायों का समर्थन करना समग्र प्लास्टिक की खपत में कमी लाने में योगदान दे सकता

है।

नीति और विनियमन :

सरकारें ऐसी नीतियों को लागू करने में महत्वपूर्ण भूमिका निभा सकती हैं जो परिपत्र अर्थव्यवस्था सिद्धांतों को बढ़ावा देती हैं, समस्याग्रस्त प्लास्टिक परप्रतिबंध लगाती हैं और अपशिष्ट प्रबंधन के लिए प्रदूषकों को उत्तरदायी बनाती हैं।

शिक्षा और जागरूकता :

प्लास्टिक प्रदूषण के प्रभावों के बारे में सार्वजनिक जागरूकता बढ़ाना और संधारणीय प्रथाओं को बढ़ावा देना व्यवहार में बदलाव को प्रोत्साहित कर सकता है और सामूहिक कारवाई को बढ़ावा दे सकता है।

प्रभावी रणनीतियों के उदाहरण :

बैग प्रतिबंध और कर :

कई शहरों और देशोंने डिस्पोजेबल प्लास्टिक बैग के उपयोग को कम करने के लिए बैग प्रतिबंधया कर लागू किए हैं, जिससे पुनः प्रयोज्य विकल्पों की ओर बदलाव हुआ है।

पुनर्चक्रण कार्यक्रम :

प्लास्टिक कचरे को लैंड फिल से हटाने और वर्जिन प्लास्टिक उत्पादन की आवश्यकता को कम करने के लिए मजबूत पुनर्चक्रण कार्यक्रम आवश्यक हैं।

परिपत्र अर्थव्यवस्था :

एक परिपत्र अर्थव्यवस्था मॉडल को अपनाना, जो सामग्री को कम करने, पुनः उपयोग करने और पुनर्चक्रण पर ध्यान केंद्रित करता है, अपशिष्ट को कम कर सकता है और संसाधन दक्षता को अधिकतम कर सकता है।

टिकाऊ उत्पाद डिजाइन :

पुनः भरने, पुनः उपयोग और विघटन को ध्यान मेंरखते हुए उत्पादों को डिजाइन करने से उपयोग किए जानेवाले प्लास्टिक की कुल मात्रा कम हो सकती है और इसके जीवनचक्र में सुधार हो सकता है।

– बलजिंदर सिंह,
सविता ऑइल टेक्नोलॉजीस लिमिटेड

The Environ - Mental Perspective

There is a well-known saying "It is all in the mind". These days, the global environmental problems are being highlighted, emphasized, and research is progressing towards finding solutions. At the same time, a large section of the population are still unaware about the gravity of the situation we are into. Global temperatures are rising beyond 1.5ºC on an average. India has been seeing more than 80% days of natural disasters in a year. Heat waves, unseasonal rains, cyclones, droughts, floods, etc. are common occurrences every year. Based on independent researches by different environmental institutions, NGOs and individuals, it is a proved that if these problems are not seriously dealt with, in the next 25-30 years, human life is doomed. Phrases such as 'beginning of the end', 'tragedy of commons', etc. are popular in this context. It is heartening to notice the growing awareness among the youngsters towards these global environmental issues and they are trying their best to spread this awareness starting from their homes, though the percentage of such youngsters are minimal. Overall, the rate at which the awareness is rising for finding solutions is less than the rate at which the problem is gaining severity though.

Problems in the environment are existing today and they have been rampant since many decades, especially more since the era of Industrial Revolution and technological advancements. The instinct of 'co-existing with Mother Nature' was replaced by 'dominating the Mother Nature' for fulfilling one's needs and greeds. For instance, people in rural areas made houses of mud, which is a natural insulator. Then came multi-storeyed buildings made of glass facades with artificial cooling that led to urban heat island effects.

It added glamorous appeal to the urban aesthetics, but at the cost of the environment and health of people. At a minimal rate, today the concept of 'green buildings' are being revived in order to promote eco-friendly living. Some corporate offices in cities such as Bengaluru have incorporated these techniques. Artificial cooling and heating have become a rising trend with increasing per capita income and lifestyles. A major part of this requirement can simply be avoided though. Our ancient heritage showcases innumerable examples of co-existence.

If one has to travel from point A to point B that can be easily covered by walking or cycling, there are people who still prefer motorable air-conditioned mode of transport. Many affluent people in higher positions in developed nations prefer cycling as their mode of transport. There is no glamour or status symbol associated with it. One can learn from such examples and incorporate in one's lives. While

buying packaged products, for example, a bottle of shampoo is better than buying small sachets of it. There is environmental cost involved in the packaged material, the toxic prints, the microplastics generated, and recyclable potential. There are products with unwanted extra packaging that may be avoided. Cooking in closed pans to reduce fuel requirements, use of clay pots for drinking water, avoiding electrical appliances with more electricity requirements, maintaining vehicle efficiency, avoiding food and water wastage, ensuring maximum waste management, etc. are choices right in front of us. Government rules and regulations are not needed for such options. A logical human mind can make the right decisions if the concern remains. The main point here is the choice selected by people in their daily lives. If one looks at all such points minutely, it is noticeable that by switching over to a better yet less convenient choice, there can be a good level of contribution to the environment.

The concept of carbon footprint can act as a tool to keep a track of one's resource usage. There are many such online carbon footprint calculators available wherein if one puts all the individual data honestly, the output of carbon footprint is generated owing to one's activities, the number of trees required in one's life to nullify the associated direct and indirect emissions which gives a clearer picture of the impact of one's choices on the environment. There need not be any incentive to bring about change in lifestyle for contributing towards the environment. The consciousness of being indebted to the Mother Earth must be enough to bring about this change.

The statistical data provided by various environmental researches as well as the grave events occurring worldwide in terms of climate change and natural disasters are evidences enough to highlight the rising problem. Educational institutions, social organizations, and

independent environmentalists are trying best to impart this awareness to the masses. It is disappointing to notice that a large chunk of the people are turning a blind eye to this. Some Indians also have opinions such as 'Being kalyug, this was bound to happen!'. The problem is easily dismissed off. When one litters on the road and if a responsible citizen tries to refrain them, they are dismissed altogether and mocked at. Many people take it for granted assuming that it's the duty of the authorities to clean up their mess. This tendency needs to be checked. Unnecessary honking on the roads, especially at traffic signals reflect the level of patience in us. In the name of festivals and other celebrations, the effects seen on the environment in the form of extreme noise levels, fireworks, toxic material dumping, high amounts of solid waste, etc. are equally evident. Ironically, we worship those water bodies which are some of the toxic and polluted ones. At the academic level, environmental education is yet one of the side-lined subjects with less real impact on the minds. Students and academicians bluntly state that EVS subject doesn't have any scope! This kind of casual approach is the actual bigger problem. With this trend, the near future is at stake. The change must happen rapidly and every human being must be involved in this change.

The change must be from within us for our own future generations. It does not require rocket science to understand that if one lives a human life with the requirement of oxygen, water and food, then one is indebted to the environment irrespective of one's profession or societal status. The term 'mental' in the word 'environmental' itself brings this issue to the fore. If every person connects emotionally with the environment, and accepts one's responsibility to the fullest, the actions put forth will altogether create a larger impact. The consequences are anyways here to see in the environment around us.

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Empowering Indian Villages : The Promise of Extraction for Sustainable Growth

Introduction

Agriculture and related industries have long been the main source of income for India's large rural areas. However, new options that can boost rural economies and establish sustainable lifestyles are emerging as a result of scientific and technological breakthroughs. Extraction technology, or the process of separating valuable components from natural and agricultural resources, is one viable approach. Village-level integration of extraction processes can help rural communities cut waste, open up new revenue streams, and pave the way for a more affluent future.

The promise of extraction in rural economics

From food and medicine to cosmetics and biofuels, extraction technologies have long been important to the processing industries. Rich raw commodities like oilseeds, fruit by-products, agro-wastes, and medicinal plants are still underutilized in Indian communities. Through extraction, these resources can be transformed into high-value goods including edible oils, bioactive chemicals, like polyphenols, tannins, carotenoids essential oils, and herbal extracts, generating revenue from locally accessible resources.

Mango kernel oil, for instance, which is extracted from the seeds of mangoes, finds use in cosmetics and as a substitute for cocoa butter in confections. The pharmaceutical and nutraceutical industries can benefit from the antibacterial and antioxidant extracts

produced by medicinal plants like moringa and neem.

Konkan Region : A Case Study in Opportunity

Maharashtra's Konkan region is well known for its variety of fruit crops, which include cashew apples, jackfruit, kokum, and mango (Alphonso). Even with this abundance, a large portion of the biomass produced during processing is thrown away as waste.

- ***Mango (Alphonso) :*** Konkan makes a substantial contribution to Maharashtra's yearly production of over 1.2 million metric tonnes (MT) of mangoes. Waste (peels and kernels) makes up between 30 and 40 % of the mango weight. These byproducts can be turned into useful resources by the extraction of mango kernel oil. According to research, the oil content of mango kernels ranges from 8 to 10% by weight, and it may find use in the chocolate and cosmetics industries.
- ***Kokum (Garcinia indica) :*** More than 15,000 tonnes of kokum are produced yearly in the Konkan region. Extracted from seeds, kokum butter has a fat content of 35–40% and is prized for its moisturizing qualities in the cosmetic industry. Furthermore, kokum rind extracts are a popular ingredient in nutraceuticals due to their high content of hydroxycitric acid (HCA), which is known to have weight-management benefits.
- ***Jackfruit seeds :*** More than 200,000 tonnes of jackfruit are produced in the Konkan each year, and seeds make about 10% to 15% of the fruit's weight. These seeds are high in proteins and carbohydrates. Jackfruit seed starch extraction can help the food processing industry and offer a gluten-free substitute for baked goods.
- ***Medicinal Plants and Perfume Extracts :*** The Konkan region is also home to a wide diversity of medicinal plants such as sarpagandha (Rauwolfia serpentina), ashwagandha (Withania somnifera), and tulsi (Ocimum sanctum). Extracts from these plants are prized for their medicinal properties for instance, sarpagandha root extracts are utilized in antihypertensive compositions. Furthermore, the humid environment of the area is ideal for fragrant and perfume plants like vetiver (Chrysopogon zizanioides), patchouli (Pogostemon cablin), and lemongrass (Cymbopogon flexuosus). The demand for essential oil extraction from these plants is rising in the natural cosmetics, aromatherapy, and perfume sectors. For instance, lemongrass essential oil sells for between ₹1,200 and ₹1,500 per litre on the market, providing small-scale producers and processors with a sizable profit.

Scientific Perspectives on Extracting Bioactive Compounds

The potential of extracting bioactive compounds from rural biomass is highlighted by recent studies. Research shows how effective various extraction methods are at separating these important compounds.

- ***Solvent Extraction :*** Polyphenols, flavonoids, and other bioactives are extracted from plant materials using common solvents such as ethanol, methanol, and water. For example, according to Ghadge et al. (2018, Journal of Food Science and Technology), a high yield of hydroxycitric acid (up to 40% w/w) was obtained from the ethanol extraction of kokum rind.
- ***Ultrasound-Assisted Extraction (UAE):*** This green technique has become effective in increasing yield and decreasing extraction time. According to research by Patel et al. (2020, Food Chemistry), ultrasound produced a 25–30% greater yield of mango kernel oil than traditional techniques.
- ***Supercritical Fluid Extraction (SFE):*** SFE for thermolabile chemicals has been investigated using CO_2. Kokum butter extracted by SFE retained more antioxidant activity than solvent extraction, according to research by Kamat et al. (2021, Journal of Supercritical Fluids), which makes it appealing for high-end cosmetic products.
- ***Microwave-Assisted Extraction (MAE):*** MAE increases extraction efficiency by using quick heating to break down plant cell structures. Joshi et al. (2019, International Journal of Biological Macromolecules) have demonstrated that MAE produces greater purity starch with improved functional characteristics for jackfruit seeds.
- ***Enzyme-Assisted Extraction (EAE):*** EAE breaks down plant cell walls by using enzymes such as cellulase and pectinase. Mango peels have been effectively treated with this technique to extract polyphenols, with recovery rates as high as 50% (Sharma et al., 2020, Journal of Food Engineering).

Economic and market impact

There are several benefits of integrating extraction units in villages:

1. Value Addition: Instead of selling the raw product at a discount, villagers might make and sell high-value extracts at a premium value. For instance, Konkan lemongrass oil can sell for between ₹1,200 and ₹1,500 per litre, which significantly increases local revenues.
2. Waste Utilization: The circular economy idea is supported by the reduction of waste that results from processing byproducts.

3. Market Access: Extracts can increase rural incomes by taking advantage of the 5000 lakh worth of essential oils and extracts that India exports each year.
4. Women's Empowerment: A lot of extraction techniques work well for cottage-scale production, which involves women's self-help organizations and promotes inclusive development.

Policy and Government support

The Indian government has started a number of programs to encourage value addition and entrepreneurship in rural areas:

- Cluster-based growth for traditional industries, particularly extraction-based operations, is supported by SFURTI (Scheme of Fund for Regeneration of Traditional Industries).
- MSME (Micro, Small and Medium Enterprises (MSME) programs provide credit-linked training and equipment acquisition subsidies.
- Small and medium-sized extraction units can be funded through National bank for Agriculture and Rural Development's rural development programs.
- Training programs offered by the Skill India Mission can be tailored to the needs of extraction technology operations.

Future directions: Research and collaborations

Cooperation between government organizations, the commercial sector, and research institutes is crucial if extraction is to reach its full potential in Indian villages. Research can concentrate on the following areas:

- Creating affordable, energy-efficient extraction technology specifically for rural areas.
- Eco-friendly extraction methods and green solvents to guarantee sustainability.
- Using residues after extraction to create zero-waste systems.
- Diversification of products to create new bioactive extract markets.

Conclusion

By bridging the gap between traditional agricultural methods and contemporary value-added enterprises, extraction technologies offer rural India a revolutionary potential. Villages like those in the Konkan region may turn waste into money and promote equitable prosperity by using their abundant biodiversity to produce high-value extracts, such as fruit byproducts or medicinal and fragrant plants. In India, extraction has the potential to stimulate economic expansion and sustainable rural development with cooperation and policy assistance.

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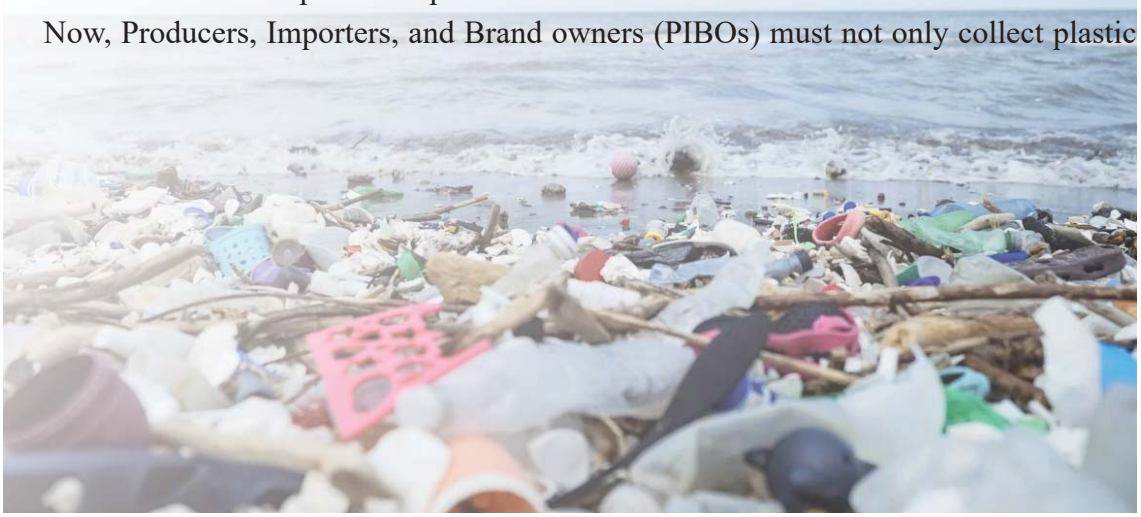
Plastic Waste : India's Approach

Extended Producer Responsibility (EPR) for plastic waste in India has evolved significantly over past few years to address growing environmental concerns.

In India, the concept of EPR for managing plastic waste has developed over years to tackle increasing environmental challenges. The Ministry of Environment, Forest and Climate Change (MoEF&CC) introduced Plastic Waste Management Rules in 2016 which first made Producers responsible for collecting and managing plastic waste generated from their products.

Over time, these rules have been strengthened by MoEF&CC in support from Central Pollution Control Board (CPCB) and in 2022, the updated Plastic Waste Management Rules extended the scope and responsibilities under EPR.

Now, Producers, Importers, and Brand owners (PIBOs) must not only collect plastic



waste but also promote recycling, use recycled plastic in their products, and report their compliance through an online platform managed by CPCB. This system is helping to build a circular economy for plastics by encouraging accountability and transparency across all stages of plastic production and disposal.

CPCB is playing major role in implementation of EPR system. It is not only setting compliance requirements but also actively helping stakeholders in providing technical guidelines, offering phone consultation, holding online meetings etc. to understand and address their concerns. It is also conducting regular audits of PIBOs and Plastic Waste Processors (PWPs)to make the entire EPR management system stronger, more transparent and effective. By doing all this, CPCB is standing as a strong pillar of support, ensuring that EPR system works smoothly and benefits all involved without causing burden.

These rules have bought several positive changes, some of them are :

1. Managing Plastic in Food Delivery

Services such as Zomato or Swiggy contribute to plastic waste through containers, spoons, and packaging used in food deliveries. While restaurants are the primary source, platforms are increasingly supporting waste collection initiatives or tying up with PROs to help offset this impact under EPR guidelines.

2. Packaging in Online Shopping

Online sellers like Amazon and Flipkart use a lot of plastic for packaging, such as courier bags, bubble wrap, and covers. Under EPR rules, they are responsible for managing the plastic waste that customers throw away. To meet their targets, they can buy plastic credits or support proper collection and recycling of this waste.

3. Plastic Bottles in Beverages

Companies like Coca-Cola, Pepsi that sell drinks in plastic (PET) bottles must, under EPR rules, collect and recycle the same amount of plastic they put into the market. To do this, they often work with Plastic Waste Processors (PWPs) or Producer Responsibility Organizations (PROs) who help collect, recycle, and sometimes reuse the plastic to make new bottles.

4. Plastic Used in Supermarket Foods

Supermarkets that sell ready-to-eat or pre-packed food often use multilayered or

flexible plastic. Under EPR rules, the stores or their suppliers must make sure this plastic is properly collected and recycled. This is important because multilayered plastic is harder to recycle and harms the environment more.

5. Milk Pouches

Popular dairy brands like Amul pack milk in LDPE plastic pouches. As per EPR rules, they must make sure these used pouches are collected and recycled. To do this, they can set up their own collection systems or work with local waste management agencies.

6. Packaging in Beauty and Care Products

Personal care brands like Dove or L'Oréal use plastic bottles and containers for products like shampoos and creams. Under EPR rules, they must keep track of how much plastic they use, help collect and recycle it, and start using recycled plastic in their packaging. This is often shown on product labels with the percentage of recycled content used.

7. Plastic Packaging in Electronics

Brands like Samsung and Apple must take responsibility for the plastic used in mobile phone boxes, cases, and accessories. EPR rules say they have to manage this plastic waste when it's no longer in use. They do this through buyback programs, recycling efforts, or by buying plastic credits to balance out their plastic use.

The Extended Producer Responsibility (EPR) system is thus bringing positive changes in plastic waste management across India. It is not only promoting better recycling practices, improving waste collection systems, but also helping to reduce the overall impact of plastic waste on the environment.

- Ms. Aarti Muchandi

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