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Eco-Technology For 3R: Reduce, Reuse, Recycle

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Abstract
As the economy is increasing, the quantity of waste is increasing with the same proportion, however, the Reduce-Reuse-Recycle (3Rs) technologies and policies are introduced through the strategic planning and management. Resource efficiency and waste management lacks a holistic approach which cover the whole chain of product life cycle and its management. The effective waste management helps us to increase resource efficiency and to replace fossil fuels with renewable energy sources. Sustainable production and consumption from the extraction-material use-disposal, could be directly linked with waste management. Addressing the problems and solutions of waste management system from 'waste' to 'resource', 'waste and resource management' and 'circular economy' all reflect the significant impact of decoupling between economy and waste management.
Keywords: platic, waste material, smart, intelligent

Introduction

The three R's – reduce, reuse and recycle – all help to cut down on the amount of waste we throw away. They conserve natural resources, landfill space and energy. Plus, the three R's save land and money communities must use to dispose of waste in landfills. Siting a new landfill has become difficult and more expensive due to environmental regulations and public opposition.The 3R Initiative aims to promote the "3Rs" (reduce, reuse and recycle) globally so as to build a sound-material-cycle society through the effective use of resources and materials.
Reducing means choosing to use things with care to reduce the amount of waste generated. Reusing involves the repeated use of items or parts of items which still have usable aspects. Recycling means the use of waste itself as resources. Waste minimization can be achieved in an efficient way by focusing primarily on the first of the 3Rs, "reduce," followed by "reuse" and then "recycle."

3R's Technologies And Applications: At the heart of the 3Rs approach is a belief that sustainable development is only approachable through dematerialization of economic activities (i.e. decoupling energy and materials use from economic growth) and preservation of natural capital. Relative decoupling (lower resource or environmental impacts than the relevant economic indicator) is distinguished from the more difficult to achieve absolute decoupling (where "resource use declines irrespective of the growth rate of the economic driver")**.** From past few years it is seen that a massive increase in the number of committees, interest groups, governments, news outlets, and more, talking about waste in its many forms. While all of these conversations are vital in driving forward all of us to think about the impact we make on the world, it has led to some green-washing – implementation of changes that on the surface appear to be for the better but, on the whole, aren't. For example, paper straws that aren't recyclable and biodegradable cups that require segregated collection and specific environments to be composted. Another type of green-washing is where companies focus their outbound environmental marketing on products that have a high recycled value, like PET and glass bottles, for example, whilst ignoring those pesky multilayer packages that are significantly more difficult to handle. And, of course, there are the unspoken areas of excessive packaging and the materials used in wholesale and supply chains. To focus solely on the packaging waste is also not to look at the complete picture. We need to consider that a lot of packaging covers food, and waste of that resource is estimated at one third of all food produced. This amounts to enough to feed all of the world's hungry four times over. So there are many such which needs to be focused on. There are some technologies and applications which if implied can help to manage the waste in better way. Some of them are mentioned below.

Roads From Plastic Waste: A fantastic way of RECYCLING the plastic waste is this technology. Plastic takes forever to degrade and disappear from the earth and the use of plastic is increasing day by day. So managing such a huge amount of waste has become very challenging. But a man from India has developed a technique in which this plastic waste can be used to make roads.Mr. R Vasudevan, is a Master in science from Madras University. He has completed his PhD in year 1974. He is working as a professor at Thiagarajar College of Engineering. In this technology, regular tar that is used in road construction is fused with plastic. For every kilo of stone, 50 grams of bitumen are used and 1/10th of this is plastic waste; this reduces the amount of bitumen being used. Plastic increases the aggregate impact value and improves the quality of flexible pavements.The use of plastic with tar increases the strength and quality of road twice as much from the regular tar roads. The use of plastic has proven to be resistant in creating potholes as the stagnant water has shown no effect on the road. The plastic road is a modular logo like system. A road will be delivered pre-installed and pre-assembled and we can click the modular parts of the road like lego, together and then we have a very robust and very flat and very safe and reliable road construction, purely made out of plastics. A very large part of those plastics are recycled. Path is consist of lego like blocks that stick to each other and can be easily repaired or replaced overnight. It is a modular concept helping cities to become future proof. A road that is not only a road but also a buffer for rainwater and creating a space for all kinds of utility services like pipelines and cables for fast internet in the modular concept, undernearh the surface. Ministary of road transport & highways using wate plastic as a sustainable innovation to convert plastic as a sustainable innovation to convert plastic waste into an opportunity. Not just India but many more countries have applied this technology to make the roads. This technique has been used in many areas of Indonesia such as Bali, Surabaya, Bekasi, Makassar, Solo and others. Even the United Kingdom has also announced that it is going to invest around £1.6 million in making plastic roads and if found successful more of these roads will be built in future as they have been proved long lasting and better than conventional tar roads. It is currently being implemented in cities like Gloucester, London, and Durham. Some benefits of plastic roads:

- Plastic roads are environment friendly since it help in reducing plastic waste
- Two link road uses 2 tons of plastic per km.
- Plastic roads are more resistant to water, have increased durability and improved fatigue life.

Handbags And Shoes From Recycyled Plastic From Ocean: This is another great example of recycling the plastic which is dumped in ocean.There is a brand names Rothy's, they use plastic waste (bottles) from ocean and this waste is converted into weave fabric which is called as PET or rPET. There is a machine which Rothy's have patented which is designed to create no waste on the cutting-room floor. This plastic waste is collected from the coastlines and it is recycled using the conventional methods. As this plastic is coming from saltwater, the structural integrity of the plastic is weaken. So to improve its structural integrity, this recycled plastic from ocean is mixed with some regular recycled plastic. The outcome is a plastic fiber and as claimed by the CEO and Cofounder Roth Martin, the quality of the fiber is very high and can be used to make some high quality shoes and handbags. And they have proved it as all of their products are machine washable, which requires the plastic to be durable.

Nanotechnology For Smart Packaging: As per the researchers, by the year 2025 our seas will be filled with 1 ton of plastic for 3 tons of fish. The main reason for such a huge amount of plastic waste is, plastic packaging materials such as plastic bottles. So we have to act now to minimize the waste and opt for better alternatives. Bioplastic is a very good alternative for plastic bottles. This is made from corn. It is biodegradable and durable plastic and can be used to make bottles, bioplastic films, food and fruit containers. Shrimp shells can be used to make biodegradable plastic bags. This plastic can be extracted from the exoskeleton of shrimps, crabs and crustaceans. The objective is to remove a thin film plastic that can be used in the of food packaging which can be biodegradable. It is not commercially used yet but soon it will be and it is predicted that it will completely replace the use of

plastic in food and beverage packaging. Sugarcane can also be used to make plastic which is 100% vegetable. This plastic can be used to make garbage bags, water bottles, shampoo bottles and many more. This plastic is made from ethanol which is made from sugarcane. It has the same protective and conservation properties same that of conventional plastic. Edible water bubbles made from seaweed can play a significant role is reducing down the use of plastic bottles. This British startup has come up with this idea. The water bubble contains 4 centiliters of water. We have seen that cardboard, paper and other biodegradable products are being used for packaging of various materials and products. By using nanotechnology, this cardboard and papers packaging materials can be coated with water resistant materials which can prevent these packaging from water splashes and rain. This nanotechnology can help in making such water resistant coatings much thinner and cost effective. There are some technologies which allows the use of antimicrobial Nano-materials which can be sprayed on perishable products so these can be protected from spoilage and their life can be improved. A company called Koktamills have developed a new coating for paper cups which makes the paper cups completely recyclable and repulpable. Whereas the conventionally the thin layer of plastic which is used inside the cups makes it a huge task for recycling.

Lightweight Aluminum And Steel: Not only plastic but there are many materials which are causing waste and are not recyclable. The researchers at Purdue University in the US have developed a super-strong aluminum alloy by altering the microstructure of aluminum by using nanotechnology. This newly developed aluminum is having strength equivalent to that of stainless steel. So you get the same strength with reduced weight. This steel can become a revolutionary material in manufacturing automobiles. It can also be reused and recycled into aluminum cups and bottles as well as metal foils used for packaging and wrapping purpose.

Chemical Recycling: The first step to reduce plastic waste is to find alternative substitutes, second step is to make the plastic biodegradable. In mechanical (conventional) recycling the plastic is sorted, melted and remolded to make the lower grade plastic products. But this process reduces down the performance of plastic with every recycle. So this plastic cannot be used to make a high grade plastic products and it cannot be considered as an ideal way to recycle the plastic. But in chemical recycling the plastic breaks down at molecular level and the performance of plastic is retained which helps in using the recycled plastic to make more useful products. Chemical recycling can increase the overall recycling rates and contribute to a more circular economy for plastics.

Conclusion

Current scenarios like population growth, migration from rural to urban areas, consumption patterns and others are having substantial pressure on our ability to preserve a clean environment. These problems lead to increased consumption of resources and the generation of both liquid and solid waste. Proper management of solid waste is one of the most important challenges faced by a number of municipalities around the world. The concept of the solid waste management hierarchy also known as the 3Rs offers viable solutions to the sustainable management of the wastes and at the same time meet goals towards achieving zero waste discharges. Learn to reduce: Reduction or sometimes known as waste minimization is nothing but reducing the generation of waste causing materials such as plastic, paper, steel etc. as discussed above. It can be considered as the best method for keeping the environment clean, as by reducing you stop the problem at source. As you create less waste you have to clean less and that itself solves the problem. Learn to reuse: Reusing the materials will also help in reaching a goal of zero discharge of waste. Most of the times we dispose the things for them getting out of fashion or small repairs or retouching can improve their life or their use. We can also reuse the things by giving them to the needy ones rather than throwing them into the waste. So reusing the materials can help in solving the waste problem and cover all the pillars of sustainability. Learn to recycle: As discussed in this paper, recycling is the most commonly used strategy and there are many methods for doing so. Recycling can vary from simple methods to complex and costly approaches.

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Reducing and reusing are the most cost effective methods whereas recycling can be considered as most costly method. But it is the most practical approach. The only problem is we have to put more efforts for making it happen. As the technology is improving, we are able to develop more methods for recycling the waste and will be able to achieve the objective of zero waste discharge.

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