

# Impact of “R” Factor on Circular Economy

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## Abstract:

The circular economy (CE) isn't about one manufacturer changing one product. It's about all the interconnecting companies that form our infrastructure and economy coming together. It's about energy. It's about rethinking the operating system itself. The Circular Economy is a "make/remake – use/reuse" economy. The “R” factors play a vital role in circular economy here we considered the 4R i.e. reuse, repair refurbish and recycle and their effect on different factor used for circular economy.

**Keywords** — Circular Economy, Linear Economy, Reuse, Repair, Recycle

## I. INTRODUCTION

Product, component and equipment all around us like phones, computers, cars, automobiles, and buildings etc are made of material. Product nowadays operate according to the sell more, sell faster principal, it means produce a product at a low price and sell it at a higher price and repeat as often as possible in a certain amount of time means we face challenges in the supply of materials and the effect of this has on the planet. Since the industrial revolution, science has evolved more and more quickly. New tools aiming at people to live better have been designed. New technologies have often revolutionized the way we live, made somehow our lives easier but ended up causing pollution and climate alteration. Most often the consequences have not been foreseen or thought over, and some new breakthroughs linked to technological progress can also come into conflict with moral or social progress. More precisely, since the first industrial revolution, the use of factories and mass production has led to a depletion of certain natural resources, leaving the environment damaged.

As the world economy grows need more materials for the production product and as the production increases produce more waste. This is not a problem as long as the economy is relatively small compared to our natural ecosystem. The natural ecosystem is both the source of raw materials and the “sink” for our wastes.

we have to question the wisdom of extracting ever more raw materials and dumping more and more waste. This current economy of "take-make-use-dispose" is called the linear economy. It is not a sustainable model.



The idea of the circular development is the complete reorganization of the principles of human existence. People always used a simple economic scheme, called the linear economy:

In the living world there is no landfill, instead, materials flow. One species waste is another's food, energy is provided by the sun, things grow, and then die and nutrients return to the soil safely. And it works. Yet as humans we've adopted a linear approach: we take, we make, and we dispose. A new phone comes out so we ditch the old one. Our washing machine packs up, so we buy another. Each time we do this we're eating into a finite supply of resources and often producing toxic waste. It simply can't work long term. So what can? If we accept that the living world's cyclical model works,

can we change our way of thinking so we too operate a circular economy? Think with the biological cycle. How can our waste build capital rather than reduce it? By rethinking and redesigning products and components and the packaging they come in, we can create safe and compostable materials that help grow more stuff. As they say in the movies, no resources have been lost in the making of this material. So what about the washing machines, mobile phones, fridges? We know they don't biodegrade. Here, we're talking about another sort of rethink.

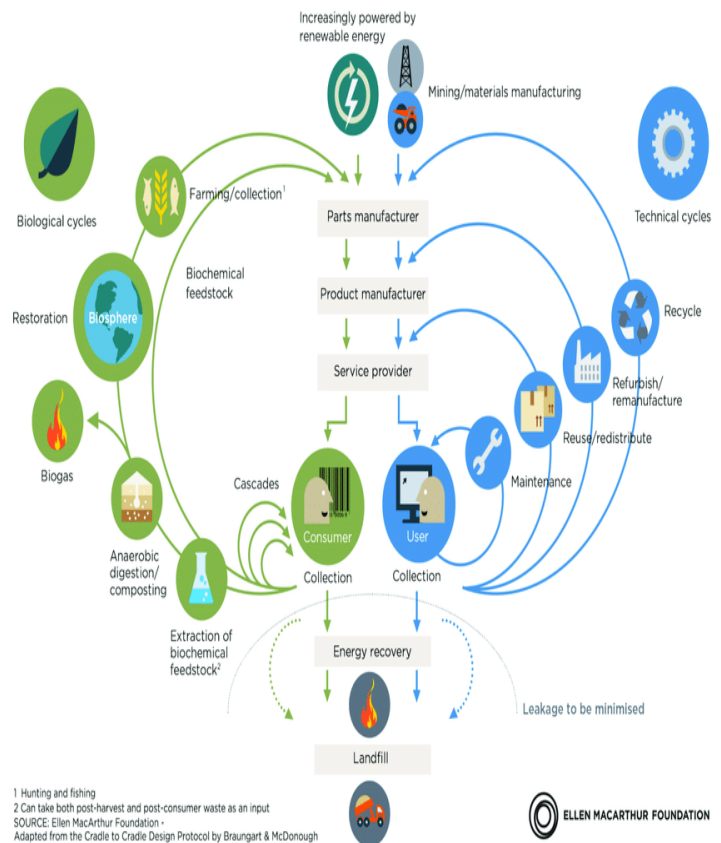
## II. MATERIAL AND METHOD

The circular economy isn't about one manufacturer changing one product. It's about all the interconnecting companies that form our infrastructure and economy coming together. It's about energy. It's about rethinking the operating system itself. We have a fantastic opportunity to open new perspectives and new horizons. Instead of remaining trapped in the frustrations of the present, with creativity and innovation, we really can rethink and redesign our future.

The circular economy is based on a few simple principles

- Waste equals Food
- Build resilience through diversity
- Use energy from renewable resources
- Think in systems
- Design out waste

The Circular Economy System Diagram, also known as the 'Butterfly Diagram', represents flows of products and materials in the Circular Economy. The Butterfly diagram starts from the current Linear Economy, depicted as the central, downwards flow from materials extraction and manufacturing at the top to incineration and landfill at the bottom. In the Circular Economy, resources are used, but not used up. By applying suitable strategies to products, components and materials during use and after the end of a lifecycle, resources are kept in the system.



According to the circular economy approach, there are two types of cycles: technical and biological ones. The technical cycle encompasses man-made materials and substances that are hazardous to the environment. It incorporates within its framework recycling, refurbishment/remanufacture, reuse/redistribution and maintenance/repair product life.

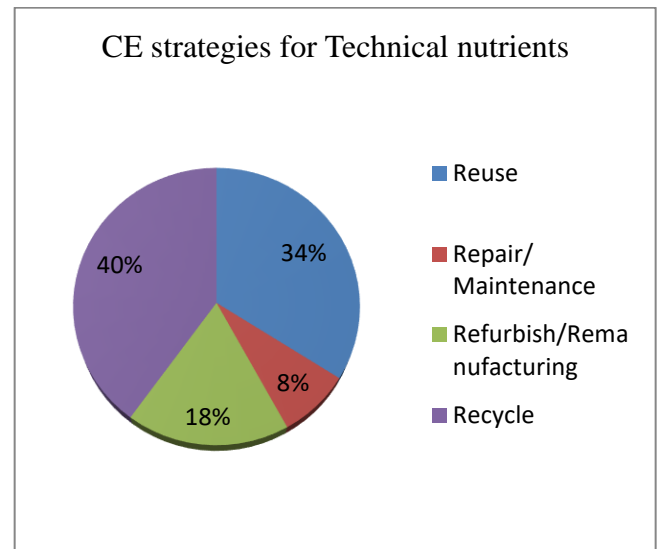
The "R" factors have various potentials to solve the resource challenge:

1. Reuse has a potential to solve the resource challenge by extending the service life of the products, reducing the waste stream and avoiding energy production and raw materials extraction.
2. Repair helps to solve the resource challenge by increasing the lifespan of the products, thus reducing the need for new resources.
3. Remanufacturing keeps the added value of the products saving resources and preventing mobilizing of new resources.
4. Recycling, on the other hand, destroys the value of the product and requires energy, which makes it the last option for the Circular Economy. However, the importance of the recycling is significant as it keeps the materials in use and reduces the waste streams.

We considered only 4R explain by the EMF foundation i.e. Reuse, Repair, Refurbish and Recycle only other author also suggested another R factor but another R also a part of these 4R. First R is Reuse it is the tightest loop of the system second closed loop is repair it is between users to service provider third is refurbish it is between user to product manufacturer and last loop is recycle is between user to parts manufacturer.

There are drawbacks and uncertainties related to the re-options:

1. While extending of product life, the balance between products being produced, reuse, repaired, remanufactured and recycled will be disrupted and the flows as well as the rates unclear.
2. While repair and remanufacturing we have to be cautious what parts are taken out and how the waste is managed. There is a danger of generation of waste streams in a new way, including emissions caused by products movements or unsafe disposal/reuse of hazardous components.
3. Another downside of reuse might be the extension of the life of products that are not energy or water efficient anymore.



In our analysis we focus only the four main “R” given in Butterfly diagram by EMF Foundation i.e. Reuse, Repair, Refurbish, Recycle

**Reuse:** It’s also called as a Redistribute cycle this is the tightest loop in the butterfly diagram or in the circular economy diagram. It saves resources by keeping existing products in use for longer. Products which get their service-lives extended by being redistributed are often not designed in any particular way. On the other hand, products intended for an intensified use - in a service or sharing economy - are often designed and engineered to be particularly durable and robust.

Two types of reuse:

1. Service-life extension: This is the most common type of reuse, the simple redistribution of existing, preowned products to new users.  
Service Life Extension - 'Olx' - second hand shops in the India where user can buy anything from clothes and kitchen utensils to furniture, Vehicle and heavy machinery.
2. Service-life intensification: An important part of the service and sharing economies. It is based on the use of a single product, by many users, within short periods of time. Like taxi services Ola, Uber etc.

**Repair:** Repair or maintenance is defined as a combination of all technical, administrative and

managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function. But most of people focused more on restoring consideration and think that the role of maintenance is 'to fix things when they break', but when things break down maintenance has failed. It led to a negative image, to be recognized as a cost and only limited to the production phase.

The impact of maintenance and asset management on CE can be viewed through the four asset management fundamentals: 1. value that is provided to the organisation, 2. alignment of plans and activities, 3. leadership and culture that ensures that employees in the organisation have clear role and responsibilities and are competent and empowered, and 4. assurance that assets fulfil their purpose

**Refurbish:** Refurbish/Remanufacturing means to take an used product back, bring it back to the designed working condition, and sell it again to a new (or the same) customer. It promotes more efficient use of our world's resources by making use of materials and the value that a discarded product still intrinsically holds. The main objective of remanufacturing is to create products in an "as new" condition. This is done by collecting used products and then sorting, cleaning, repairing, and finally combining them with new parts to sell them as new. It is widely accepted that a remanufactured product should be in an equal to, or better than, new condition. It is normal that the manufacturer is able to give the same warranties (guarantees) as for the original product.

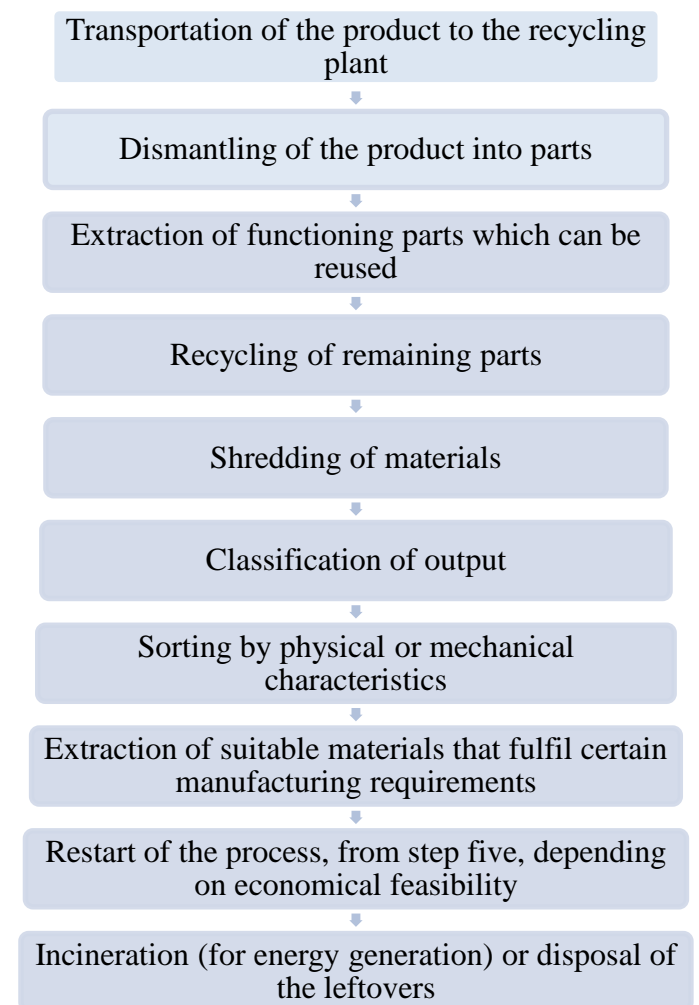
There are a number of strategies and concrete bits of advice that, in most cases, will facilitate and favour remanufacturing.

Documentation, Diagnostic tools, Materials, Upgrading, Modularization and product structure, Cleaning, Demounting, Standards, Dimensions, Bonus.

**Recycle:** The process of recycling involves: breakdown of the product into its basic raw materials, thereby taking away its original energy and value, and this needs the input of additional

energy and resources to make it a usable new product.

Steps in the process of recycling are:



**Designing a product for circularity basic conditions for the “R”:**

Which “R” factors are considered when we think about the designing of the product consideration circular economy? Here we considered four “R” in circular economy i.e. Reuse, Repair, Refurbish, and Recycle but when designing the product anyone “R” dominated with consideration of these are we decided the designing factors if repair is the main aim than we decide easy to disassemble, documentation and wear indication points are important in considerations

Important points designing consideration of “R”

| Factor consideration | Reuse | Repair | Refurbish | Recycle |
|----------------------|-------|--------|-----------|---------|
| Design Durability    | X     |        |           |         |
| Easy to disassembly  |       | X      | X         | X       |
| Upgrading            | X     |        |           |         |
| Documentation        |       | X      | X         |         |
| Labelling            | X     |        | X         | X       |
| Aesthetics           | X     |        | X         |         |
| Wear indication      |       | X      | X         |         |
| Cleaning             | X     |        | X         |         |
| Material choice      |       |        |           | X       |

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### III. CONCLUSIONS

Here we conclude that all the 4R are very much directly connect to circular economy we can cannot dropped any R in analysis of circular economy all 4R must be included in any analysis of circular economy.

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