

INTRODUCTION OF RECYCLE AND REUSE

Recycling is the process of converting waste materials into new materials and objects. It is an alternative to "conventional" waste disposal that can save material and help lower greenhouse gas emissions. Recycling can prevent the waste of potentially useful materials and reduce the consumption of fresh raw materials, thereby reducing: energy usage, air pollution (from incineration), and water pollution (from landfilling).

Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse, and Recycle" waste hierarchy. Thus, recycling aims at environmental sustainability by substituting raw material inputs into and redirecting waste outputs out of the economic system.

There are some ISO standards related to recycling such as ISO 15270:2008 for plastics waste and ISO 14001:2015 for environmental management control of recycling practice.

Recyclable materials include many kinds of glass, paper, cardboard, metal, plastic, tires, textiles, batteries, and electronics. The composting or other reuse of biodegradable waste—such as food or garden waste—is also a form of recycling. Materials to be recycled are either delivered to a household recycling center or picked up from curbside bins, then sorted, cleaned, and reprocessed into new materials destined for manufacturing new products.

In the strictest sense, recycling of a material would produce a fresh supply of the same material—for example; used office paper would be converted into new office paper or used polystyrene foam into new polystyrene. This is accomplished when recycling certain types of materials, such as metal cans, which can become a can again and again, indefinitely, without losing purity in the product. However, this is often difficult or too expensive (compared with producing the same product from raw materials or other sources), so "recycling" of many products or materials involves their reuse in producing different materials (for example, paperboard) instead. Another form of recycling is the salvage of

certain materials from complex products, either due to their intrinsic value (such as lead from car batteries, or gold from printed circuit boards), or due to their hazardous nature (e.g., removal and reuse of mercury from thermometers and thermostats).

We should all recycle everything that is capable of going through this process. In the home, some common materials that should be recycled include:

- Paper- such as newspapers, magazines and cardboard packing.
- Metals-such as cans, metal food containers and foil.
- Plastic-such as bottles, carrier bags, tubs, food containers and wrappers.
- Glass-such as bottles, jars and food containers

IMAGE OF RECYCLE

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INTRODUCTION OF REUSE:

Reuse is the action or practice of using an item, whether for its original purpose (conventional reuse) or to fulfill a different function (creative reuse or repurposing). It should be distinguished from recycling, which is the breaking down of used items to make raw materials for the manufacture of new products. Reuse – by taking, but not reprocessing, previously used items – helps save time, money, energy and resources. In broader economic terms, it can make quality products available to people and organizations with limited means, while generating jobs and business activity that contribute to the economy.

Historically, financial motivation was one of the main drivers of reuse. In the developing world this driver can lead to very high levels of reuse, however rising wages and consequent consumer demand for the convenience of disposable products has made the reuse of low value items such as packaging uneconomic in richer countries, leading to the demise of many reuse programs. Current environmental awareness is gradually changing attitudes and regulations, such as the new packaging regulations, are gradually beginning to reverse the situation.

One example of conventional reuse is the doorstep delivery of milk in glass bottles; other examples include the retreading of tires and the use of returnable/reusable plastic boxes, shipping containers, instead of single-use corrugated fiberboard boxes.

Reuse has certain potential advantages:

- Energy and raw materials savings as replacing many single use products with one reusable one reduces the number that need to be manufactured.
- Reduced disposal needs and costs.
- Refurbishment can bring sophisticated, sustainable, well-paid jobs to underdeveloped economies.
- Cost savings for business and consumers as a reusable product is often cheaper than the many single use products it replaces.

- Some older items were better handcrafted and appreciate in value.

Disadvantages are also apparent:

- Reuse often requires cleaning or transport, which have environmental costs.
- Some items, such as Freon appliances, infant auto seats, older tube TVs and secondhand automobiles could be hazardous or less energy efficient as they continue to be used.
- Reusable products need to be more durable than single-use products, and hence require more material per item. This is particularly significant if only a small proportion of the reusable products are in fact reused.
- Sorting and preparing items for reuse takes time, which is inconvenient for consumers and costs money for businesses?
- Special skills are required to tweak the functional throughout of items when devoting them to new uses outside of their original purpose.
- Knowing the standards that legacy products conform to is required for knowing what adapters to buy for newer products to be compatible with them, even though the cost of adapters for such applications is a minor disadvantage.

IMAGE OF REUSE



What is the difference between reuse and recycling?

Recycling means turning an item into raw materials which can be used again, usually for a completely new product. This is an energy consuming procedure.

Reusing refers to using an object as it is without treatment. This reduces pollution and waste, thus making it a more sustainable process.

Examples of recycled items include fiberglass made from glass bottles, and insulation materials made from newspaper or plastic bottles. Reused items include anything that was bought second hand, often furniture and clothing.

Recycling still produce waste and pollution

The reusing process is not about repurposing the materials an object is made of, but repurposing the very object itself. This includes buying and selling used goods and repairing items rather than

discarding them. There are also lots of online platforms that can aid this through allowing users to borrow, rent or sell any unwanted items that are still in good condition.

Reusing is better than recycling because it saves the energy that comes with having to dismantle and re-manufacture products. It also significantly reduces waste and pollution because it reduces the need for raw materials, saving both forests and water supplies.

The market benefits from reuse thanks to an influx of quality products at reduced prices. After the Greater London Authority introduced reusing in their sustainability plan a few years ago, 12,000 tons of goods were reused in 2013.

7 Tips for Home Waste Recycling

Follow these recommendations for easy and successful recycling at home.

1. Use a recycling bin to make your recyclable waste easier to organize.
2. Look for the universal recycling symbol on packaging if you are unsure if an item is recyclable. One of the reasons why we recycle is to reduce the use of resources and energy when making new packaging so this could really help.
3. Always wash containers before recycling, especially if there are remnants of food on them. Remove labels and bottle tops.
4. Give unwanted clothes to charity, friends and family, or take them to a clothes-recycling service if they are no longer wearable.
5. Recycle your food waste by making compost out of it. Simply collect organic food waste, such as fruit, vegetables, coffee grounds and eggshells, in a plastic bin with a lid and leave until it is decomposed. This works particularly well in warm climates but you will need to add a little water to keep it moist.
6. Start using biodegradable soap so that you can water your plants with leftover bath or sink water.

7. Recycle electrical and gadgets where possible. Some companies offer collection services and may even pay you for your old gadgets. Just make sure you reset them first and remove any personal data.



REVIEW OF LITERATURE:

Recycling has been a common practice for most of human history, with recorded advocates as far back as Plato in the fourth century BC. During periods when resources were scarce and hard to come by, archaeological studies of ancient waste dumps show less household waste (such as ash, broken tools, and pottery)—implying more waste was being recycled in the absence of new material.

In pre-industrial times, there is evidence of scrap bronze and other metals being collected in Europe and melted down for perpetual reuse. Paper recycling was first recorded in 1031 when Japanese shops sold repulsed paper. In Britain dust and ash from wood and coal fires was collected by "dustmen" and down cycled as a base material used in brick making. The main driver for these types of recycling was the economic advantage of obtaining recycled feedstock instead of acquiring virgin material, as well as a lack of public waste removal in ever more densely populated areas. In 1813, Benjamin Law developed the process of turning rags into "shoddy" and "mongo" wool in Bartley, Yorkshire. This material combined recycled fibers with virgin wool. The West Yorkshire shoddy industry in towns such as Bartley and Dewsbury lasted from the early 19th century to at least 1914.

Industrialization spurred demand for affordable materials; aside from rags, ferrous scrap metals were coveted as they were cheaper to acquire than virgin ore. Railroads both purchased and sold scrap metal in the 19th century, and the growing steel and automobile industries purchased scrap in the early 20th century. Many secondary goods were collected, processed and sold by peddlers who scoured dumps and city streets for discarded machinery, pots, pans, and other sources of metal. By World War I, thousands of such peddlers roamed the streets of American cities, taking advantage of market forces to recycle post-consumer materials back into industrial production.

Beverage bottles were recycled with a refundable deposit at some drink manufacturers in Great Britain and Ireland around 1800, notably Schweppes. An official recycling system with refundable deposits was established in Sweden for bottles in 1884 and aluminum beverage cans in 1982; the law led to a recycling rate for beverage containers of 84–99 percent depending on type, and a glass bottle can be refilled over 20 times on average.

New chemical industries created in the late 19th century both invented new materials (e.g. Bakelite [1907]) and promised to transform valueless into valuable materials. Proverbially, you could not

make a silk purse of a sow's ear—until the US firm Arthur D. Little published in 1921 "On the Making of Silk Purses from Sows' Ears", its research proving that when "chemistry puts on overalls and gets down to business ... new values appear. New and better paths are opened to reach the goals desired."

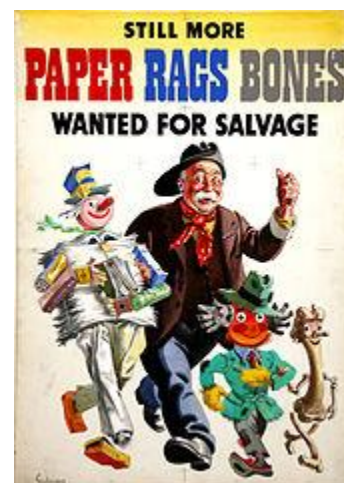
Recycling (or "salvage", as it was then usually known) was a major issue for governments throughout World War II. Financial constraints and significant material shortages due to war efforts made it necessary for countries to reuse goods and recycle materials. These resource shortages caused by the world wars, and other such world-changing occurrences, greatly encouraged recycling. The struggles of war claimed much of the material resources available, leaving little for the civilian population. It became necessary for most homes to recycle their waste, as recycling offered an extra source of materials allowing people to make the most of what was available to them. Recycling household materials meant more resources for war efforts and a better chance of victory. Massive government promotion campaigns, such as the National Salvage Campaign in Britain and the Salvage for Victory campaign in the United States, were carried out on the home front in every combative nation, urging citizens to donate metal, paper, rags, and rubber as a matter of patriotism.

A considerable investment in recycling occurred in the 1970s, due to rising energy costs.¹ Recycling aluminum uses only 5% of the energy required by virgin production; glass, paper and other metals have less dramatic but very significant energy savings when recycled feedstock is used. Although consumer electronics such as the television have been popular since the 1920s, recycling of them was almost unheard of until early 1991. The first electronic waste recycling scheme was implemented in Switzerland, beginning with collection of old refrigerators but gradually expanding to cover all devices.^[20] After these schemes were set up, many countries did not have the capacity to deal with the sheer quantity of e-waste they generated or its hazardous nature. They began to export the problem to developing countries without enforced environmental legislation. This is cheaper, as recycling computer monitors in the United States costs 10 times more than in China. Demand in Asia for electronic waste began to grow when scrap yards found that they could extract valuable substances such as copper, silver, iron, silicon, nickel, and gold, during the recycling process. The 2000s saw a large increase in both the sale of electronic devices and their growth as a waste stream: in 2002, e-waste grew faster than any other type of waste in the EU.

This caused investment in modern, automated facilities to cope with the influx of redundant appliances, especially after strict laws were implemented in 2003.

As of 2014, the European Union had about 50% of world share of the waste and recycling industries, with over 60,000 companies employing 500,000 persons, with a turnover of €24 billion. Countries have to reach recycling rates of at least 50%, while the lead countries were around 65% and the EU average was 39% as of 2013. The EU average has been rising steadily, to 45% in 2015.

In 2018, changes in the recycling market have sparked a global "crisis" in the industry. On 31 December 2017, China announced its "National Sword" policy, setting new standards for imports of recyclable material and banning materials that were deemed too "dirty" or "hazardous". The new policy caused drastic disruptions in the global market in recycling and reduced the prices of scrap plastic and low-grade paper. Exports of recyclable materials from G7 countries to China dropped dramatically, with many exports shifting to countries in south-east Asia. The crisis generated significant concern about the practices and environmental sustainability of the recycling industry. The abrupt shift caused countries to accept more recyclable materials than they could process, raising fundamental questions about shipping recycling waste from economically developed countries to countries with few environmental regulations—a practice that predated the crisis.



METHODOLOGY:

The Methodology of Paper Recycling

The majority of paper mills in the United States are equipped to use recycled paper in their products and they certainly have a lot of material to work with. According to the U.S. Environmental Protection Agency, more than 60 percent of paper used in the United States in 2009 was recycled. Paper recycling spares trees from being cut down and reduces the amount of paper waste in landfills --- both benefits reduce the amount of greenhouse gases generated by paper use. The recycling process for paper is fairly basic, and paper mills are getting increasingly more efficient at reusing all of the components of this process, from waste water to chemicals.

At Home

The recycling process starts at home, when you put recyclable paper in the bin for curbside pickup or transport the collected paper directly to a recycling facility. Almost all paper products are recyclable, including magazines and newspapers and most card stocks. The best way for you to facilitate this early stage of the recycling process is to follow your local waste authority's rules regarding paper recycling. For example, paper and cardboard contaminated with food or coated in wax or plastic are generally not accepted --- avoid including these and other prohibited items. Some programs may require you to sort out the paper products yourself by type, but often the recycling facility will do this onsite.



At the Recycling Center

Employees at the recycling facility go through collected paper to remove anything that cannot be recycled, such as staples and the plastic windows of envelopes. They bundle paper by type into large bales and ship those bales to paper mills, where the rest of the recycling process takes place.

Breaking it down

Paper products are basically made of wood pulp. The start of the recycling process is to return it to this form. The paper is soaked in large vats containing water and some chemicals to loosen the fibers so that they separate more easily. The soaking paper is occasionally agitated to help fibers loosen. Some products, such as cardboard, take a little longer than others to break down due to the thickness of the material.



Filtering and Cleaning

After the paper is broken down into pulp it is pushed through several sets of screens to filter out coatings and impurities that might have covered or been stuck to the paper. Once this process is complete, the pulp is cleaned of inks and dyes. Chemical surfactants are used to remove ink from the pulp; air bubbles are forced into the chemical solution to give the ink something to attach to -- the bubbles rise to the surface, bringing the ink and other impurities, such as leftover glues, with them. This process also helps to remove dyes from colored papers.

Making New Paper

After the pulp is thoroughly broken down and cleaned it can be used to make new paper. Pulp that is reserved for white paper will be bleached first before being used in the manufacturing process. To make new paper products, the manufacturer may mix the recycled pulp with that of new, or virgin, wood. This is not always the case --- some products contain 100-percent recycled fibers -- but certain products require the strength of new fibers for high-quality results.



THE METHODOLOGY OF PLASTIC RECYCLE

Plastic recycling refers to the process of recovering waste or scrap plastic and reprocessing the materials into functional and useful products. This activity is known as the plastic recycling process. The goal of recycling plastic is to reduce high rates of plastic pollution while putting less pressure on virgin materials to produce brand new plastic products. This approach helps to conserve resources and diverts plastics from landfills or unintended destinations such as oceans.

The Need for Recycling Plastic

Plastics are durable, lightweight and inexpensive materials. They can readily be molded into various products which find uses in a plethora of applications. Every year, more than 100 million tons of plastics are manufactured across the globe. Around 200 billion pounds of new plastic material is thermoformed, foamed, laminated and extruded into millions of packages and products. Consequently, the reuse, recovery and the recycling of plastics are extremely important.

What Plastics Are Recyclable?

There are six common types of plastics. Following are some typical products you will find for each of plastic:

PS (Polystyrene) – Example: foam hot drink cups, plastic cutlery, containers, and yogurt.

PP (Polypropylene) – Example: lunch boxes, take-out food containers, ice cream containers.

LDPE (Low-density polyethylene) – Example: garbage bins and bags.

PVC (Plasticized Polyvinyl chloride or polyvinyl chloride)—Example: cordial, juice or squeeze bottles.

HDPE (High-density polyethylene) – Example: shampoo containers or milk bottles.

PET (Polyethylene terephthalate) – Example: fruit juice and soft drink bottles.

Currently, only PET, HDPE, and PVC plastic products are recycled under curbside recycling programs. PS, PP, and LDPE typically are not recycled because these plastic materials get stuck in the sorting equipment in recycling facilities causing it to break or stop. Lids and bottle tops cannot be recycled as well. “To recycle or not to recycle” is a big question when it comes to plastic recycling. Some plastic types are not recycled because they are not economically feasible to do so.



Some Quick Plastic Recycling Facts

- Every hour, Americans use 2.5 million plastic bottles, most of which are thrown away.

- About 9.1% of plastic production was recycled in the U.S. during 2015, varying by product category. Plastic packaging was recycled at 14.6%, plastic durable goods at 6.6%, and other non-durable goods at 2.2%.
- Currently, 25 percent of plastic waste is recycled in Europe.
- Americans recycled 3.14 million tons of plastics in 2015, down from 3.17 million in 2014.
- Recycling plastic takes 88% less energy than producing plastics from new raw materials.
- Currently, around 50% of plastics we use are thrown away just after a single use.
- Plastics account for 10% of total global waste generation.
- Plastics can take hundreds of years to degrade
- The plastics that end up in the oceans break down into small pieces and every year around 100,000 marine mammals and one million seabirds get killed eating those small pieces of plastics.
- The energy saved from recycling just a single plastic bottle can power a 100 watt light bulb for nearly an hour.

The Plastic Recycling Process

The simplest of plastic recycling processes involves collecting, sorting, shredding, washing, melting, and pelletizing. The actual particular processes vary based on plastic resin or type of plastic product.

Most plastic recycling facilities use the following two-step process:

Step One: Sorting plastics automatically or with a manual sort to make sure all the contaminants are removed from the plastic waste stream.

Step Two: Melting down plastics directly into a new shape or shredding into flakes then melting down before being finally processed into granulates.

The Latest Advances in Plastic Recycling

Ongoing innovations in recycling technologies have made the plastic recycling process easier and more cost-effective. Such technologies include reliable detectors and sophisticated decision and recognition software that collectively enhance the productivity and accuracy of automatic sorting of plastics. For an example, FT-NIR detectors can run for up to 8,000 hours between faults in the detectors.

Another notable innovation in plastic recycling has been in finding higher value applications for recycled polymers in closed-loop recycling processes. Since 2005, for example, PET sheets for thermoforming in the UK can contain 50 percent to 70 percent recycled PET through the use of A/B/A layer sheets.

Recently, some EU countries including Germany, Spain, Italy, Norway, and Austria have begun collecting rigid packaging such as pots, tubs, and trays as well as a limited amount of post-consumer flexible packaging. Due to recent improvements in washing and sorting technologies, the recycling of non-bottle plastic packaging has become feasible.

Challenges for the Plastic Recycling Industry

Plastic recycling faces many challenges, ranging from mixed plastics to hard-to-remove residues. The cost-effective and efficient recycling of the mixed plastic stream is perhaps the biggest challenge facing the recycling industry. Experts believe that designing plastic packaging and other plastic products with recycling in mind can play a significant role in facing this challenge.

The recovery and recycling of post-consumer flexible packaging is a recycling problem. Most material recovery facilities and local authorities do not actively collect it due to a lack of equipment that can efficiently and easily separate them.

Oceanic plastic pollution has become a recent flashpoint for public concern. Ocean plastic is expected to triple in the next decade, and public concern has prompted leading organizations around the world to take action towards better plastic resource management and pollution prevention.

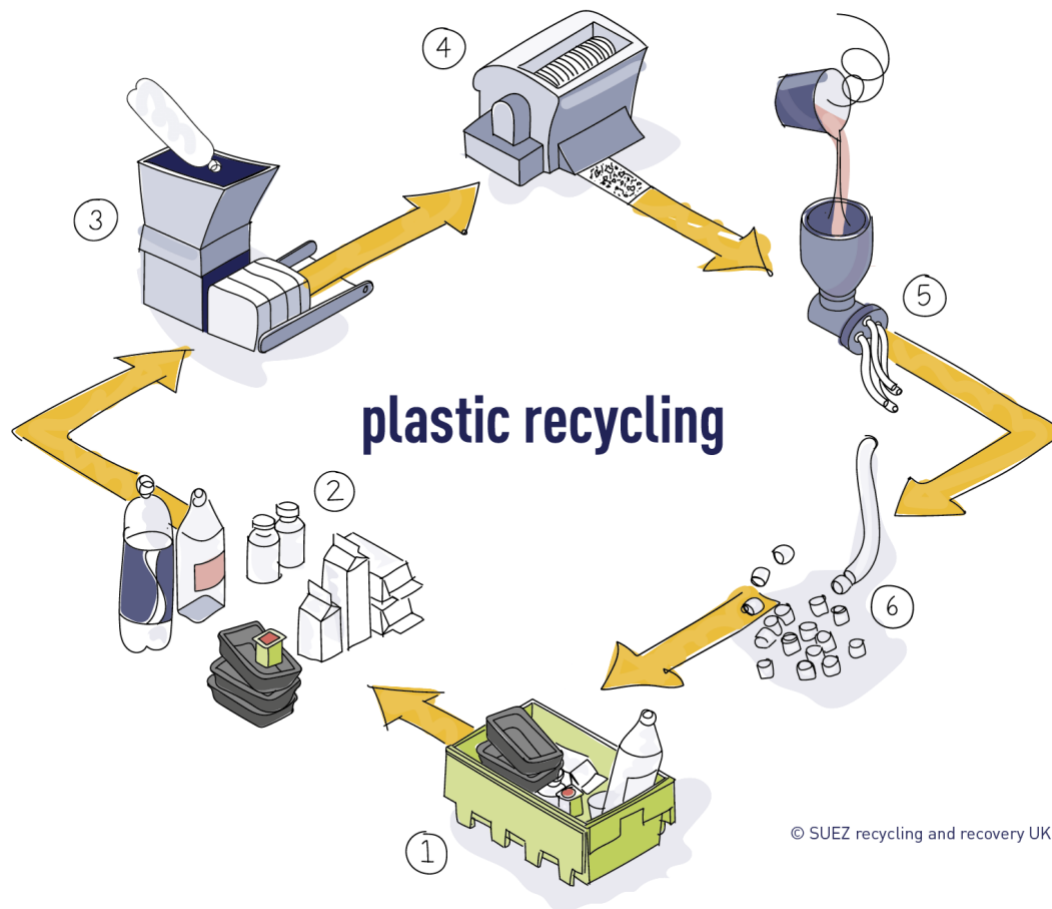
Plastic Recycling Laws

The recycling of plastic bottles has been made mandatory in several U.S. states including California, Connecticut, Massachusetts, New Jersey, North Carolina, Pennsylvania, and Wisconsin. Please follow the respective links to find the detailed of plastic recycling laws in each state.

Looking Ahead

Recycling is critical to effective end-of-life plastic management. Increasing recycling rates have resulted from greater public awareness and the increased effectiveness of recycling operations. Operational efficiency will be supported by ongoing investment in research and development.

Recycling of a greater range of post-consumer plastic products and packaging will further boost recycling and divert more end-of-life plastic wastes from landfills. Industry and policymakers can also help stimulate recycling activity by requiring or incentivizing the use of recycled resin versus virgin plastics.



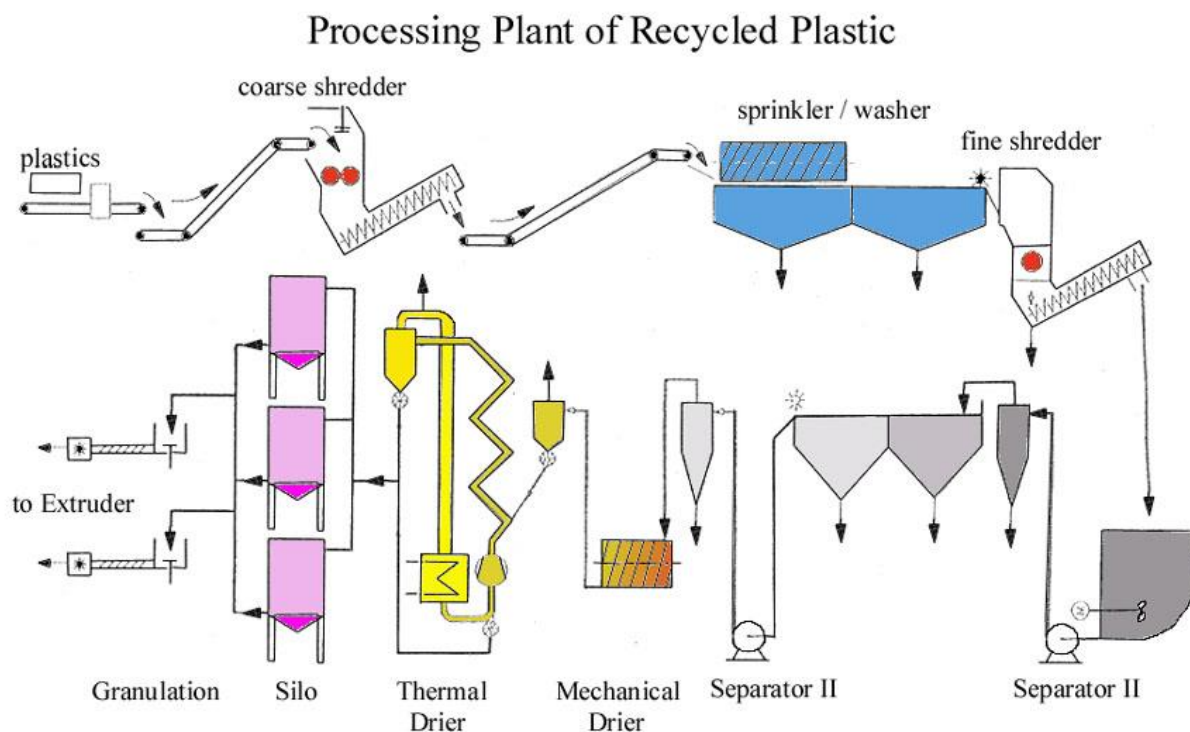
Plastic Recycling Industry Associations

Plastic recycling industry associations are the bodies responsible for promoting plastic recycling, enabling members to build and maintain relationships among plastic recyclers, and lobbying with government and other organizations to help create the best possible environment for the plastic recycling industry.

The Association of Plastic Recyclers (APR): APR represents the international plastic recycling industry. It represents its members which include plastic recycling companies of all sizes, consumer plastic product companies, plastic recycling equipment manufacturers, testing laboratories and organizations that are committed to the advancement and success of plastic recycling. APR has multiple education programs to update its members about the latest plastic recycling technologies and developments.

Plastics Recyclers Europe (PRE): Established in 1996, PRE represents plastic recyclers in Europe. Currently, it has more than 115 members from all over Europe. In the first year of establishment, PRE members recycled just 200 000 tons of plastic waste, however now the current total exceeds 2.5 million tons. PRE arranges plastic recycling shows and annual meetings to enable its members to discuss the latest developments and challenges in the industry.

Institute of Scrap Recycling Industries (ISRI): ISRI represents over 1600 small to large multinational companies include manufacturers, processors, brokers and industrial consumers of many different types of scrap commodities. The associate members of this Washington DC-based association include equipment and key service providers to the scrap recycling industry.



The Metal Recycling Process

The metal recycling process is similar to the usual recycling process. The metals are first sorted on the basis of their properties. It is however important to have the basic understanding of

knowledge about metals. This will help in recycling them and keeping a green environment. The metal recycling process follows the following steps.

1. Collection

This is the first and most important step in metal recycling. It simply involves collecting all materials that are made of metals. This process should be organized in such a way that there should be containers specifically designed to collect metals. Some people and business persons have established scrap yards whereby people are encouraged to collect different metals, take them there and be paid for what they have collected. Different metals cost differently at the yards. The scrap metal yards are used as collecting centers for the metals.

2. Sorting

Once the metals have been collected, the next important step is to sort the metals. This involves separating what can be recycled from what is non-recyclable. It is essential to point out that the quality of metal recycled is very important. A high quality recycled product or item can only be created if the original materials used in the recycling process are of good quality. This therefore, calls for strict quality checkup during the sorting process.

3. Processing

After sorting, the next step is to compact or squeeze the metal. All the recycle materials are squeezed and squashed using machines so that they do not occupy so much space in the conveyor belts.

4. Shredding

After the crushing and breaking of the metal, the shredding process starts. The metals are broken down into tiny pieces or sheets to allow further processing. The small pieces have large surface to volume ratio that can be melted using less energy as compared to when they are in large pieces of metal. Normally, steel is changed into steel blocks while on the other hand aluminum is converted into sheets.



5. Melting and Purification

Melting of the scrap metal takes place in a large furnace. Each metal is taken to a furnace that is specifically designed to melt that particular metal based on its specific properties. The melting process uses a considerable amount of energy. However, the energy required for melting recycled metal is less compared to energy required to make metal from its raw material. The furnace is heated to appropriate degrees capable of melting the particular metal. Melting can take minutes or hours depending on how big the furnace is, the volume of metal placed in the furnace and the heat degree of the furnace.

6. Purification

After the melting process is complete, the next step is the purification process. Metals are purified using different methods. Purification of metals is done to ensure that the final product is free of impurities and that it is of high quality. Electrolysis is one of the methods of purifying some metals. Other metals are simply passed under powerful magnetic systems that separate metals from other recyclables. Today there are different purification methods depending on the type of metal.

7. Melting and Solidifying of the Metal

After the purification process, the molten metal is then carried by the conveyor belt to a cooling chamber where it is cooled and solidified. It is at this stage that the scrap metal is made into a solid metal that can be used again. Other chemicals are then added into the molten metal to make it acquire its density and other properties. It is at the cooling stage that different shapes and sizes of metals are made and designed.

8. Transportation of the Metal Bars

Once the bars have been designed and made, the final product is then packed depending on their sizes and shapes ready for transportation to different factories and to people who require the metal. Thereafter, the cycle begins again.



GLASS RECYCLING PROCESS

1. Local Bottle Bank

Glass Recycling (UK) Ltd have over 7000 Bottle Banks around the UK, usually placed in Supermarket car parks, where consumers can easily drop off bottles whilst on their normal weekly shopping trip.

Our purpose-built trucks empty the full bottle banks into the three compartmented vehicle keeping the colors separated, the empty bank is then replaced back into position. The glass from full banks is then transported to our processing Plant in Brantley, South Yorkshire

2. Collection

At our main depot in Brantley, we have the capacity to process 250,000 bottles per hour.

The glass is stored in bays by color until we are ready to process it.

3. Loading

A Loading Shovel transfers the glass into one of 3 sorting lines so that we can process the three main colors Clear Brown and Green at the same time.

An endless conveyor belt system carries the glass through each part of the factory and to the next sorting process.

4. Manual Sorting

Our first job is to remove any large objects. Operatives check visually as the glass passes through on the conveyor, removing any foreign materials they see, for example Ceramic, Brick or Plastic.

5. Crushing & Screening

The next machine uses steel rollers to crush the glass to a size specified by our customer.

After the glass has been crushed, it is then carried to a vibrating 'bar screen', which removes paper, wine corks and other non-glass products.



6. Ferrous Metal Removal

From here the crushed and screened glass is passed over a rare Earth Magnet.

Housed in a rotating drum the immensely strong magnet removes most of the ferrous metals, such as pieces of steel, wire, and even iron filings etc...



7. Stone & Ceramic Removal

A vibrating screen is used to provide an even flow to Laser technology to remove stone, brick and ceramic.

It is essential to remove this type of material as it would not melt in the glass manufacturer's furnace.

8. Vacuuming

After the second screening process, the glass passes under a strong vacuum duct. Here paper from bottle labels and pilfer rings from drinks cans are lifted out and removed from the glass.



9. None Ferrous Metal Removal

A metal separator now takes out none ferrous metals such as Aluminum and Lead which come from the tops of wine bottles, the glass drops over the head of the metal detector and down towards a split chute. As it drops down, powerful air jets fire at the metal pieces to direct them down the waste side of the split chute.



10. Small Ceramic & Stone Removal

The last machine in the series takes out remnants of ceramic and stone. This works by passing the glass in front of a laser beam. The laser beam is able to pass through the transparent glass, but when it hits a solid object like ceramic or stone the beam is reflected Away.

The machine's computer detects this and fires an air jet to separate the object in a similar manner

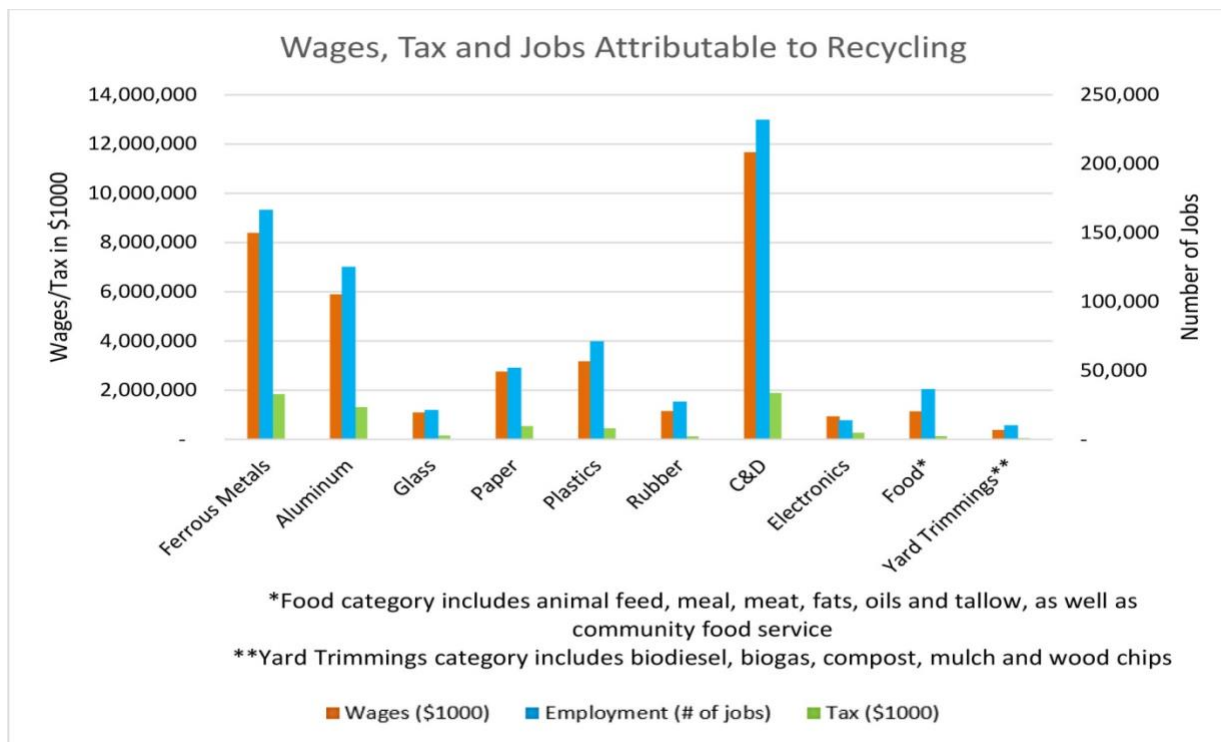
to the metal separator above.

This laser operated machine is a very sensitive piece of equipment and we are able to adjust it so it will detect things like fine bone china, which might otherwise fool it by letting a detectable amount of light through.



11. Final Visual Check

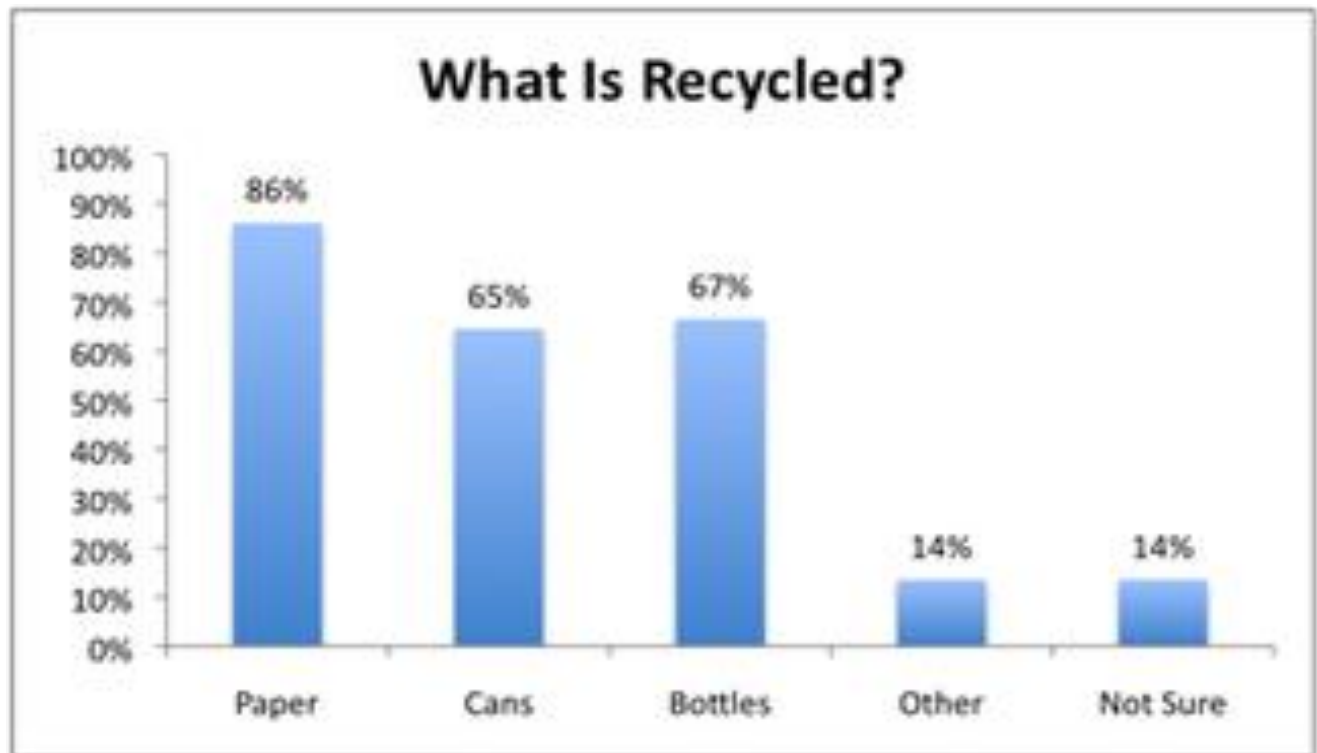
A final visual check is now carried out before the glass finishes the process, to check for any discrepancies in the recycled glass cullet.



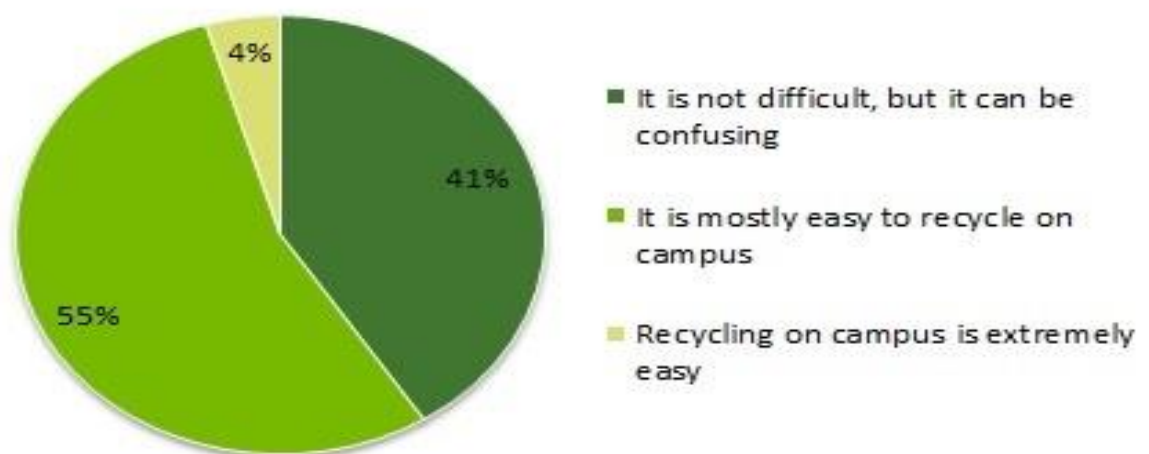
FINDINGS (RESULTS):

Comparison Chart

BASIS FOR COMPARISON		REUSE	RECYCLE
Meaning		Reuse, means putting an item to same or a different use, after it has fulfilled its original function.	Recycle is a process, wherein a used item is turned into a new product, to reduce waste of potentially useful material.
Form		Does not change the original form of the product.	A new product is created, so form of product is changed.
Harm to environment	to	It does not harm environment, in any way.	It sometimes causes harm to environment.
Energy		Saves energy	Consumes a little amount of energy, but saves it too.
Objective		To elongate the life of article.	To use basic material in the creation of various products.



Do you find it difficult to recycle on campus?

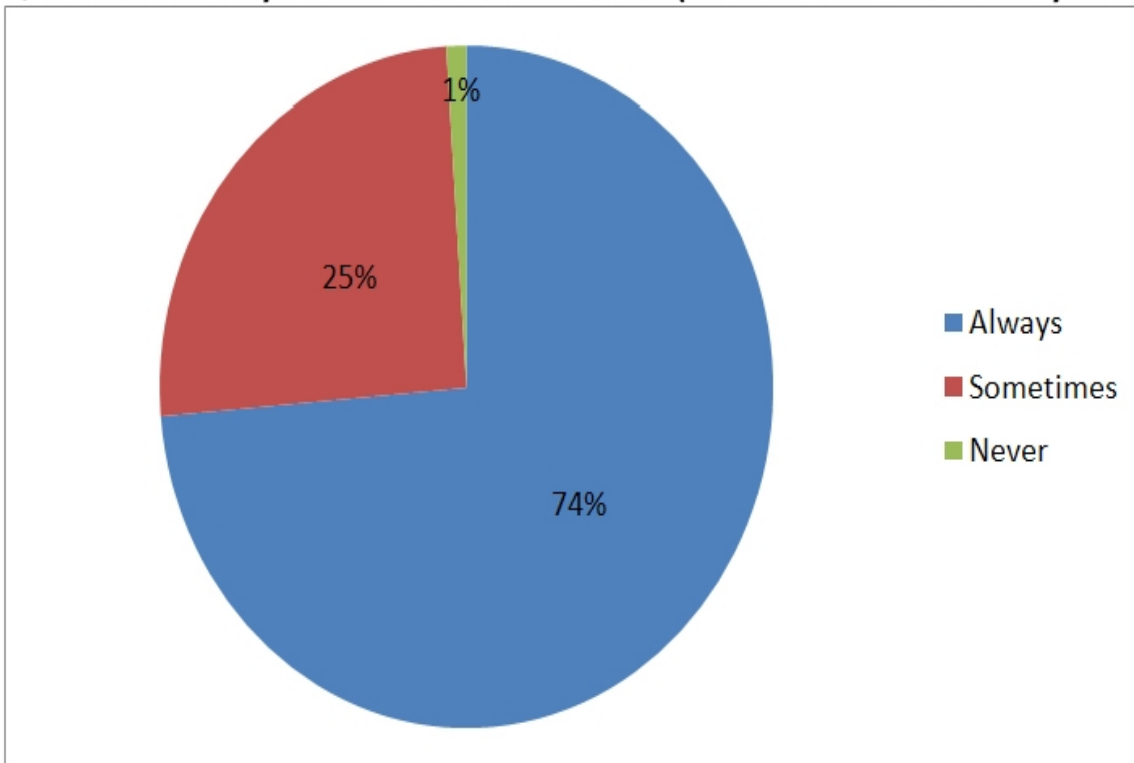


Key Differences between Reuse and Recycle

The difference between reuse and recycle can be understood clearly through the following points:

1. Reuse implies the practice of reutilizing an item into same or a different use after the original purpose is fulfilled. Recycle refers to process, a used item to change it into a new product so as to reduce waste of potentially useful material.
2. When a product is reused, it does not change its original form, whereas when a product is recycled, it is changed into a relatively new form that can be put to diverse uses.
3. Reuse is completely an environment-friendly technique, in which one uses a product that has been disposed of earlier by him or someone else. Conversely, in the recycling process, sometimes, harmful effluents are produced, which eventually causes damage to the environment.
4. Reusing a product doesn't consume energy. On the contrary, recycling consumes energy but up to the degree of recycling.
5. Reuse aims at using unwanted items, wherever possible, to increase the lifespan of the product. As against this, recycle aims at convert product, into such a form that can be used in the creation of various products.

Question 1: I recycle when it is convenient (i.e. when bins are easily accessible).



COMPARSION: RECYCLE/REUSE VS QUOTED DISPOSAL COST

Comparison: Reuse/Recycling vs Quoted Disposal Cost				
	Materials	Labor	Transportation	Total
Recycling Project (IRN)	\$8,421	(\$20,407)	(\$11,876)	(\$23,862)
Disposal as Mixed Debris	(\$10,193)	(\$18,350)	(\$9,668)	(\$38,211)
Savings or (Added Cost)	\$18,613	(\$2,057)	(\$2,208)	\$14,348
Percent Savings				38%

DICUSSION:

When you think about the huge amounts of plastics we produce and the problems that can occur when we try to Disposal of plastic, it makes sense to reuse or recycle what we can. Recycling: means making new things from items that have been used and are not needing any more.

Steps to recycling

First, de-polymerization is the step of transfer a polymer in a mixture of monomers. Second, thermal de-polymerization is a de-polymerization step using hydrous pyrolysis for the reduction of complex organic materials (often waste products of various sorts, often biomass and plastic) in a light crude oil. The heat compression processes have taken all unsorted cleaned plastic in all forms, from soft plastic bags to hard industrial waste.

The applications in plastics types. (PET) are recycled to reuse the material out of which they are made and to reduce the amount of waste going to landfills. (PVC) is a thermoplastic polymer. (HDPE) .The most-often recycled plastic (HDPE) came from petroleum.(Other plastics)The white plastic foam peanuts used as packing material are often accepted by shipping stores for use it again. Finally Example Items Recycling, Recycle Plastic Bags. Recycle Plastic Coat Hangers. Recycle Plastic Bottles .Recycle All Other Plastic Waste.

The Effect of Recycling Plastics on the Environment

Resource Conservation

Recycling plastic bottles assists to conserve natural resources, specially oil, that is nonrenewable natural resource obtainable only in limited provide recycling one ton of plastic can conserves around 3.8 barrels of oil according to the Environmental Protection Agency 2.12 millions of plastic was recycled in 2008 which is equivalent to approximately 7.6 million barrels of oil.

Energy Conservation.

The process of finding new materials from existing materials needs much less energy than what is needed for rare materials. Recycling one pound of the most common plastic used in water bottles called polyethylene terephthalate (PET) can conserve around 12,000 British thermal units of heat energy according to the Environmental Protection Agency the process of recycle needs less energy

by two- third than usual manufacturing which help in reducing the damage of the usual power grid that depend on burning fossil fuels.

Reduced Greenhouse Gas Emissions

The process of producing plastic is able to increase the greenhouse gasses in air like carbon dioxide. Which is known as a major reason of global warming because recycling plastic require less energy and fossil fuels it result in reducing greenhouse gas revival? The Environmental Protection Agency foredoomed that each family can help to reduce its production of carbon dioxide by the average of 340 pounds yearly just by reuse the plastic things

Decreased Pollution

Besides reducing greenhouse gases recycled plastic can decrease the amount of pollutants in air and water in addition many of landfill operations will burn the plastic bottles to keep waste that is able to secreted toxic pollutants and other materials that irritants into the atmosphere the plastic resin is useful to produce water bottles. Besides it contain unsafe chemicals

#Challenges of recycling

Recycled the Plastics have a low entropy of mixing. A macromolecule of plastic interacts with its environment along its entire length. Also In most places, plastics are collected for recycling. It is not easy to recycle plastics because the different kinds of plastic must first be sorted out. Mixed plastic cannot be used for recycling. In addition, some people donate support government so they didn't put kind of plastic in the right place. In Germany and some parts of the United States, you pay a deposit when you buy a full plastic bottle. When you take your empty plastic bottle back to the shop, you get the deposit back. This encourages people to return their empty plastic bottles and not just throw them away. The shops then return the bottles to the company that made them for refilling.

Another solution to reduce using of plastic

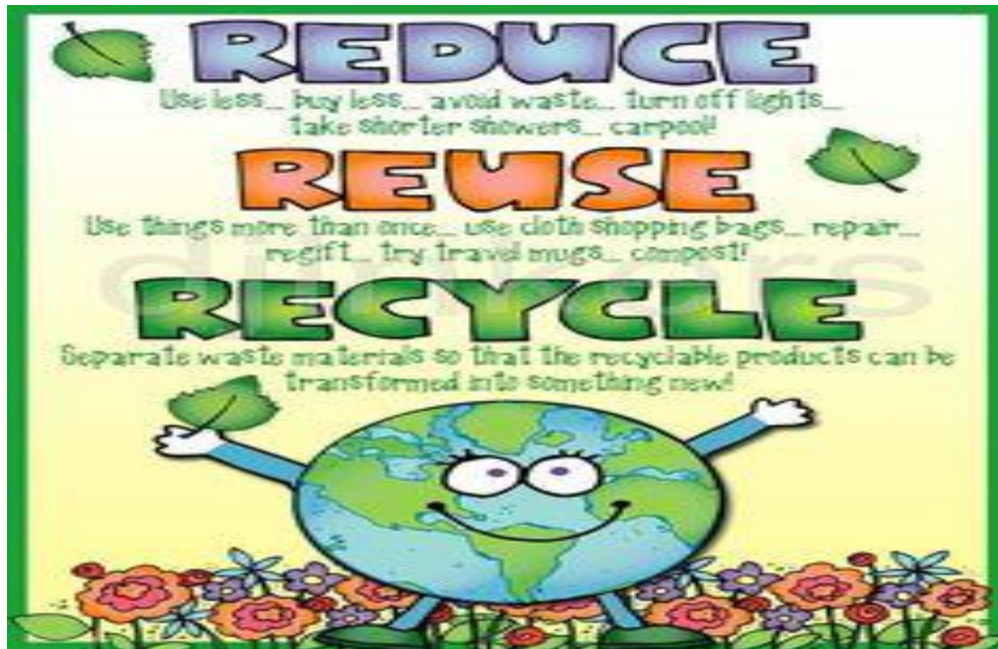
Many scientists and governments are working together to find ways to stop using plastic. In Bangladesh the government prohibited the plastic bags completely. In 2002 Ireland imposed taxes

for using plastic bags about 0.15 EUR per bag that helped to reduce the usage of plastic bags by 90 percent besides, they gain 1 million dollar as revenue. But as individual we can take the lead to reduce usage of plastic by several steps such as: we can use reusable bags which have a various shapes, designs and sizes, when you donate use it you can rolled and put it in your pocket. Another way you can use reusable water bottles which made of recycled materials that can last for a long time and be recycled once again also we can use glass bottles instead of plastic bottles which is reusable. Also the number of Disposable Diapers used nowadays is very huge, and it cost around \$300 million yearly to decompose single use diapers so families can use for their kids Disposable Diapers that made of wood base instead of the once with plastic base because it is going to decompose later so it will not cause environmental problems and it cost less than the plastic once. However, good cooperation between the people and government and the countries will lead to better results.

Recycling is the process of gathering used materials (mainly waste materials) & reprocessing them again in order to use them.

During recycling the used materials are sorted & processed out so that they can be used again as 'raw materials' to manufacture new products.

The most commonly recycled items are aluminum, glass, batteries, plastic, paper etc. Recycling is considered as the best way to create a positive impact over the environment where we live. Recycling plays an important role for both human beings and natural environment.



Major reasons that lead to increment in the amount of waste materials/ rubbish on earth:

- I. Due to increase in population and wealth people are purchasing more products that result in creating more waste products.
- II. Technological & new packing products that are being manufactured contain non-biodegradable materials.

Due to excessive use of non-biodegradable materials our planet is facing critical issues regarding their usage.

Recycling saves the environment from overconsumption of such resources & preserving them for the coming generation. Recycling also promotes cleaner water and air by reducing pollution.

Recycling is gaining huge popularity these days. It is becoming valuable to countries that do not have enough forests like China. Through recycling companies are able to manufacture products at cheap cost in comparison to products manufactured from new materials. This ultimately saves a lot of money on account of consumers. However some recycle products cost high amount of money but the benefits it gives over rules the cost because it helps to keep the planet healthy & safe for present as well as future generation.



Importance of recycling:

- I. Recycling helps to reduce the amount of pollution (harmful greenhouse gases & chemicals) that is released in the environment through rubbish in landfill sites.
- II. Recycling helps to preserve the forests/ natural vegetation which ultimately help to prevent global warming.
- III. Recycling helps to minimize energy consumption because hug amount of energy is used while manufacturing products from raw materials.
- IV. Recycling helps to save a lot of money because manufacturing products from recycled materials costs much less as compared to products made from raw materials.
- V. Recycling is the best way to preserve resources for future generations by optimally utilizing them.

The process of recycling involves 3 stages. In the 1st stage the waste materials are collected & processed. They are sorted, cleaned & prepared to manufacture new products. The 2nd stage involves formation of new products from the old ones. In the 3rd stage or the final stage the recycled goods are made available in the market so that people can purchase them. More purchases mean

more success which can be done by creating the awareness in the society. Create awareness and help to keep our planet safe and healthy.

Why should we care about the waste that we produce every hour of every day of every year? Throwing things away is a waste of the resources and energy which have been used to make the product. If we don't recycle we are creating environmental issues and for consequence harmful impact on the planet why is it so important to reduce, reuse and recycle?

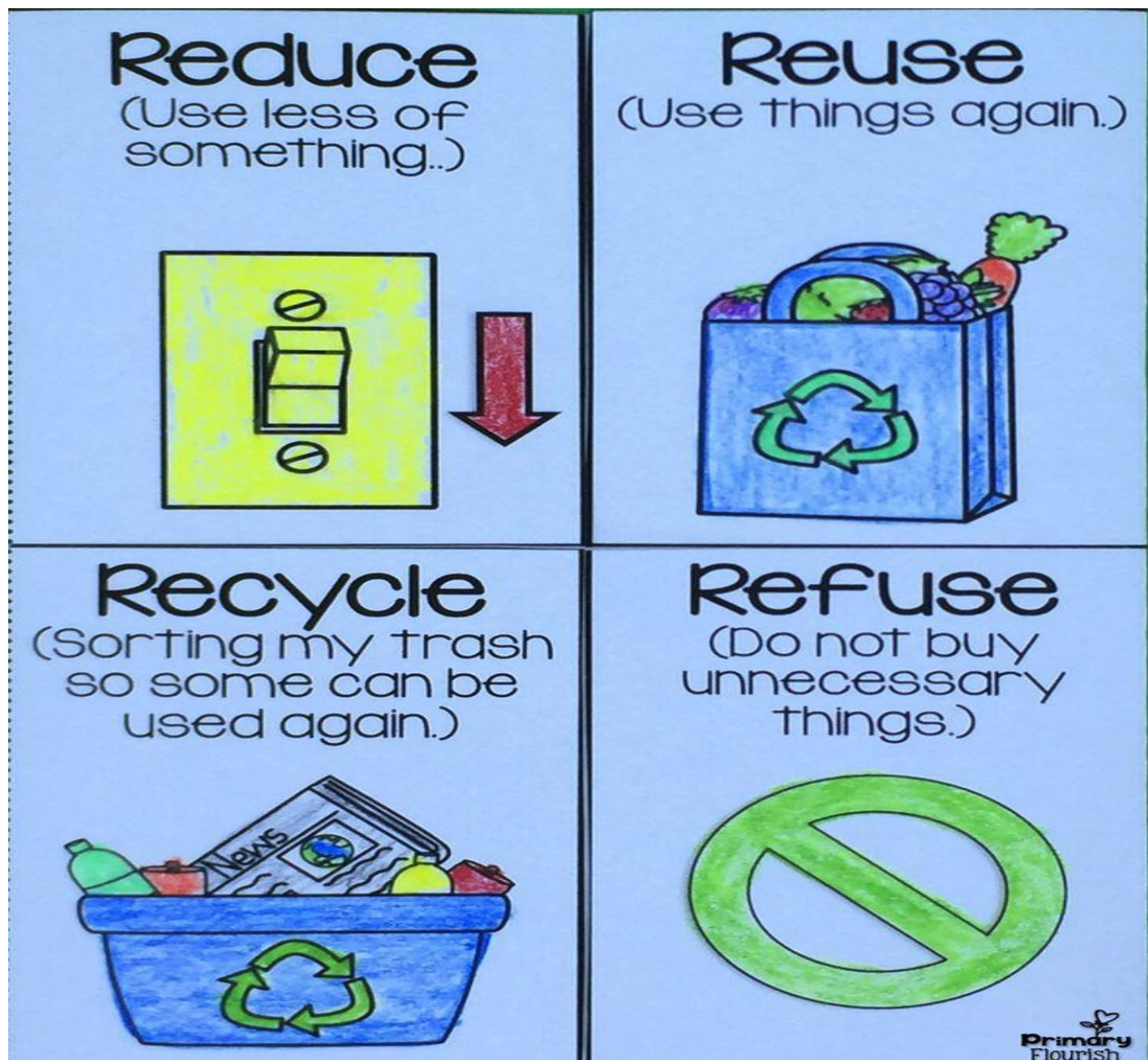
If we reduce, reuse and recycle instead of throwing away, fewer new materials need to be quarried or mined and fewer plantations need to be grown to make new things. Many parts of the world have already been damaged by mining and quarrying, which destroy the natural environment and wildlife habitats and may cause environmental and health problems for local people. In addition, the vast majority of resources that we use in manufacturing products and providing services cannot be replaced and so will eventually run out. Not only does reducing, reusing and recycling save resources and energy, it can also reduce pollution. Recycling old bottles, instead of making them from new, can cut pollution by up to 20% and reduce the demand for water by half. Making bags from recycled polythene rather than raw materials produces only a third of the sulphur dioxide and half of the nitrous oxide as well as only using one-eighth as much water. Where can we put it?

If we don't reduce, reuse and recycle our materials, they will have to be disposed of in one way or another. Most of the U.K.'s waste currently ends up in landfill sites, large holes in the ground which, over time, are filled up with rubbish. Once a landfill site is full, it is covered over, meaning that all of the materials in the site are buried and no longer of use. Also, although most landfill sites are well managed, people don't tend to like living near them. In any case, the space available to create new landfill sites is now almost all used up, so we're going to have to think about something else to do with our waste. One of the main alternatives to landfill is incineration, which means getting rid of the waste by burning it. Although the burning of waste in incinerators is often used to make energy, for example to heat nearby homes and offices, it also results in valuable resources going up in smoke. In the same way that people don't like living near landfill sites they also don't like living near to incinerators, particularly as they can view them as a potential health risk.

Why is recycling important?

Below are the reasons in which recycling can be helpful:

- **Recycling Saves the Earth** – Recycling a product can facilitate in preserving the environment. For example, recycling the paper can result in paper production without cutting more trees.
- **Recycling Saves Energy** – Recycling a product needs less energy than to create an article from virgin material. For example, an aluminum product uses both the aluminum and the vast amount of energy to create it from raw. Thus by recycling an aluminum item, we can reuse the metal again and also save the huge energy which helps protect the environment.
- **Recycling Helps in Reducing Global Warming and Reduce Pollution** – One of the main benefits of recycling is saving energy. Energy-saving results in less release of carbon or greenhouse gases which are a byproduct formed by energy production, which is injurious and detrimental to the environment if released into the atmosphere.
- **Recycling Reduces Waste Products in Landfills** – Waste that cannot be recycled typically ends up in the landfill. It is here that the waste is left to decay, rot or decompose, and this might take numerous years to fully decompose. More and more waste is being sent to landfills, and if recycling does not happen then the landfill might be right behind our homes in the future.
- **Recycling helps in saving money** – Recycled articles typically cost less. By using old material and a lot less energy, the recycled product can be sold for a very less amount as compared to items made using virgin materials. Apart from this, selling waste for recycling converts garbage into cash.



Recycling Creates Jobs

EPA released significant findings on the economic benefits of the recycling industry with an update to the national Recycling Economic Information (REI) Study in 2016. This study analyzes the numbers of jobs, wages and tax revenues attributed to recycling. The study found that in a single year, recycling and reuse activities in the United States accounted for:

- 757,000 jobs
- \$36.6 billion in wages; and

- \$6.7 billion in tax revenues.

This equates to 1.57 jobs, \$76,000 in wages, and \$14,101 in tax revenues for every 1,000 tons of materials recycled.

The Future of Water Reuse and Recycle

Evoqua provides Industrial Water Treatment services to a wide variety of industries. Could you provide information concerning trends, challenges, opportunities, technologies and changes in regulation that may affect the industries Evoqua services?

Evoqua provides industrial water and wastewater treatment solutions and services to chemical processing, food and beverage, hydrocarbon processing, life sciences, metal and mining, oil and gas, power, microelectronics, pulp and paper, and pharmaceutical markets.

Our technologies and services can help these industries manage the many complex challenges of water and wastewater treatment, including:

- Complying with regulatory requirements. We can help our clients meet strict pretreatment or direct discharge treatment goals.
- Reducing or eliminating wastewater surcharges. Responsible treatment can lower (or even eliminate) surcharges associated with discharging untreated water or wastewater to a local municipal treatment plant.
- Reusing water. High-quality effluent can be reclaimed, reducing plant operating costs.
- Converting wastewater into green energy. Valuable biogas can be generated from wastewater via anaerobic digestion, resulting in a source of money-saving renewable energy.
- Becoming an environmental steward. Minimize your environmental footprint.

Driving great opportunity for us is outsourced water. To provide our client's worry-free, hassle-free, water management solutions. Our remote monitoring services and fast, local service ensures

our clients have the water quality and quantity they need, when they need it. This revolutionary digital method for 24/7/365 service allows our clients to focus on their core business while we take the responsibility for managing their water.

How does Evoqua participate in the water reuse / recycled water market? What services and solutions do you provide to your clients? How do you develop a larger platform towards recurring revenue streams?

Evoqua prides itself on providing the best equipment, proven solutions, and a responsive service network that can ensure our client's equipment is working properly and efficiently. With four times as many local services branches as our next competitor, we have service professionals located within two hours of 90% of our industrial customer base.



We help our clients recycle water back into their processes. Industrial water may be reused in many ways, but before determining how to reuse water, consideration should be made for where potential water reuse opportunities exist. Common opportunities for water reuse in industrial plants include:

- Wastewater recycling
- Cooling tower blow down
- Boiler blow down
- RO reject recovery and reuse

- Once through cooling water
- Collected rain waters

Époque has designed and installed many custom, award-winning industrial wastewater recycling/reuse systems. We offer a wide range of solutions for wastewater treatment and reuse process including various suspended solids solutions, from our Vortisand filter to Memory embraces, as well as reverse osmosis.

We are excited to further expand our design-own-operate model. This model allows customers to focus on their core business while Evoqua takes responsibility for the design and operation of the water or wastewater treatment system. With the vast array of technologies and treatment solutions available, more and more companies are choosing this approach, which provides guaranteed water quality, quantity and cost, preservation of investment capital, reduced plant operating expenses, elimination of on-site hazardous chemicals storage, handling and disposal, and reduced plant waste streams.

How is water reuse changing the way your clients operate (in relation to industrial water treatment services)? What patterns have you noticed in the last couple of years and what is you expecting for the years to come?

Water is the world's most important resource and an essential element in industrial processes. In industry, it can be used as an ingredient, as well as for product and packaging washing, equipment cleaning, cooling, lubrication and conveyance.

Factors that are driving the need for water reuse include:

- Fresh water costs. The cost of clean, fresh water is continually increasing, and is impacting all regions.
- Discharge costs. Sewer and wastewater costs have increased at a higher rate than fresh water costs.
- Water scarcity. Many regions in North America are susceptible to drought. Additionally, some industrial plants have limited access to clean/fresh water. More

- Regulatory requirements. Many industrial sites have wastewater discharge permits that include flow and quality restrictions. Moreover, EPA Industrial Effluent Guidelines are often revised.
- Industrial and population growth. The growing population is placing greater demands on water resources.
- Social responsibility. Protecting the world's resources is a global concern and the public is paying attention. Negative publicity around a company's water use can have an impact on a company's sales/growth.
- Wastewater processing limitations. In many industries, plant wastewater treatment capacities have not increased proportionally with plant production. Plants are challenged to meet higher flows and have limited operational resources.
- Sustainability efforts. Many companies strive towards sustainability by utilizing economically sound programs that help minimize a plant's negative environmental impact while conserving energy and natural resources.

Water reuse measures can help ensure our clients manage these challenges.

The benefits of recycling industrial wastewater include reducing water footprint, decreasing fresh water costs, increasing operational efficiency, lowering wastewater flows, improving production capacity, and being a good corporate citizen.

Do you believe there is a certain resistance in the industry to the adoption of new technologies? If so, why is this happening? Which type of customers is more open to technological advancement?

In the industrial segment there is openness to new technologies and solutions to improve and optimize plant operations, much more so than the municipal market, who are less risk adverse. The industry is seeing a shift from wastewater treatment to resource recovery and progressive companies are redefining wastewater as a resource in its own right. They understand that responsible wastewater treatment is directly tied to both economic and environmental sustainability.

How do you see climate change affecting your clients going forward? Are there specific opportunities?

Global water shortages are prompting plant management to find ways to reuse treated industrial wastewater, which can be a vast resource if reclaimed properly. Our goal is to help our clients recycle water back into their processes. These reuse initiatives allow our clients to grow sustainably while meeting increased demands for fresh water.

How are operational strategies in the water / wastewater industry changing? What are the most significant issues that you often see in the way operations are conducted?

Continually changing environmental regulations can make water and wastewater management very challenging. This issue is compounded by growing populations and expanding development that has increased the demand for quality water. The combination of these issues has put significant demands on aging infrastructure and operational procedures that have driven the need for major infrastructure investment for modernizations, rehabilitations, replacements, and/or expansions.

Companies are realizing the benefits of partnering with service providers that have the proven expertise needed to help them optimally manage and maintain their water and wastewater processes, maximize the life of their equipment, and ultimately, meet these challenges while reducing their total cost of operation and improving their bottom line.

The report for Water Recycle and Reuse Market analysis & forecast 2019-2025 is segmented into Product Segment, Application Segment & Major players.

Global Water Recycle and Reuse Market Segmentation Includes:

Region-wise Analysis covers:

- North America
- Europe

- China
- Japan
- India
- Southeast Asia
- Other regions (Central & South America, Middle East & Africa)

The Major players include:

- AWWA
- GE Water and Process Technologies
- Nalco
- Siemens Water Technologies
- Veolia Environment
- Water Rhapsody
- Aqua Designs
- CatalySystems
- Dow Water and Process Solutions
- Hansgrohe
- Imagine H2O
- Lenntech
- PHOENIX Water Recycling
- ProChem
- WaterFX

Product Type Analysis:

- Conventional Treatment And Recycling Techniques Segment
- Membrane Filtration Technologies Segment
- Chemical Treatment And Disinfection Technologies Segment

Application Analysis:

- Industrial
- Agricultural
- Commercial

Water Recycle and Reuse Market research report delivers a close watch on leading competitors with strategic analysis, micro and macro market trend and scenarios, pricing analysis and a holistic overview of the market situations in the forecast period. It is a professional and a detailed report focusing on primary and secondary drivers, market share, leading segments and geographical analysis. Further, key players, major collaborations, merger & acquisitions along with trending innovation and business policies are reviewed in the report. The report contains basic, secondary and advanced information pertaining to the Water Recycle and Reuse Market global status and trend, market size, share, growth, trends analysis, segment and forecasts from 2019–2025.



Water Recycle and reuse is the process of treating wastewater with various technologies and converting it into the usable purpose. This process is also called as water reclamation. Recycled water contributes to improving the quality of drinking water and irrigation with such water can reduce the use of chemical fertilizers. In addition to this, water Recycle reduces the need for new water supplies and conserves the existing water resources.

CMFE Insights recently published an analysis titled Water Recycling and Reuse market to its increasing repository. The objective of this statistical report is to present a variegated overview of the competitive landscape across North America, Latin America, Europe, Asia-Pacific, and India. This informative report has been scrutinized by using some significant exploratory techniques such as primary and secondary research. In this report, the global Water Recycling and Reuse market is growing at a CAGR of +13% during the period 2019 to 2025.

CONCLUSION:

In conclusion, we learned a lot of reasons why recycling is important in our community and especially at school. We learned about waste and how some waste can be reused or recycled into other products. And remember... keeping recyclable items inside the Recycling Loop keeps them

of out the landfills and reduces pollution. Almost anything can be recycled and waste can be given new shape for re-usage but still, there are some items and materials like computers, batteries, light bulbs, etc. which are complex to recycle as they largely contain toxins. Hence, we must dispose of them responsibly we might contribute a little to the environment which shall certainly be fruitful in the long run. This would not only benefit the environment but also the individuals. So, before you throw something away, think first, if it can be reused.

Conclusion

In conclusion the more you recycle
reuse and reduce, our earth will be
less polluted.



CONCLUSION

the bigger the better, new trumps old and convenience is next to godliness.



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