Newsletter

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VOICE OF ENVIRONMENT

Organization for Clean, Green & Sustainable Environment

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"CIRCULAR ECONOMY- AN APPROACH TO REDUCE BURDEN ON EARTH'S RESOURCES"

SCAN ME

www.voiceofenvironment.org
Email: voiceofenvironmentngo@gmail.com

Voice of Environment Newsletter

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Editorial Team

Moharana Choudhury
Environmentalist,
Guwahati, Assam, India

Dr. Priyabrata Roy
Centre of Excellence in Rice Value Addition,
International Rice Research Institute (IRRI),
South Asia Regional Centre (ISARC)
Varanasi, Uttar Pradesh, India

Anu Sharma (Ph.D)
Department of Environmental Sciences,
Government SPMR College of Commerce
Cluster University of Jammu, Jammu and Kashmir (UT), India

Designed By
Er. Hemant Kumar
Environmental Expert, Rajasthan, India

A brief account of Voice of Environment (VoE)

A group of university students have started activities like public awareness camps, joint general discussions for pilgrimages and other familiar people to spread consciousness regarding environmental conservation. This initiative was primarily for the holy river Ganga during the "Maha Khumb Mela" at Haridwar, Uttarakhand, India, in 2010. Later, this group started working to spread mass awareness to citizens of India and the entire globe by using social media and other media sources. Gradually this mission extended to the global environmental conservation and protection mission. Thus, the name came into the mind of group members of the organization "Voice of Environment", the organization for Clean, Green and Sustainable Environment. The Voice of Environment was established officially on 22nd September 2014 and finally registered under the society registration Act. XXI of 1860 on-30-10-2014.

Editorial Message

Dear Esteemed Readers and Nature Lovers,

The edition of volume 05, issue 01 of the Voice of Environment Newsletter, is now available! First and foremost, this issue aims to address climate change and ensure a pollution-free, long-term future. This issue aims to disseminate an awareness message across the globe. However, we intend to do all possible to ensure that our newsletter contains fascinating, provocative articles that will appeal to a broad spectrum of researchers, environmentalists, and practitioners. Finally, we'd like to express our gratitude to various individuals whose assistance and support have made our first issue possible. All of our well-wishers and supporters deserve our appreciation. We also appreciate any feedback that will assist us in formulating our future problems more comprehensively and scientifically.

Editorial Team,

Voice of Environment (VoE) Newsletter,

Guwahati, Assam, India

September 9, 2022

Message

I take this great opportunity of forwarding a message to the **Voice of Environment (VoE)** newsletter **Volume 05, Issue 01, 2022** on the central theme "**Circular Economy**"—**an approach to reduce the burden on Earth's resources**. The entire world today is expressing great concern for the survival of humanity because the impact of climate change has become a serious problem. The impact of this phenomenon is visible in the current year in the form of rain, floods, landslides, and other natural disasters due to unusual rain patterns.

Pollution is understood as the introduction of undesirable substances into the natural environment. Pollution has been a danger to human health and the Earth's many ecosystems for a long time. Environmental pollution can also cause long-term damage to people's nerves, brains, kidneys, livers, and other organs. In short, environmental pollution is a big challenge to humanity. Every citizen can participate in bringing down pollution within the permissible limit. Some measures among many are to increase forest cover, stop uncontrolled deforestation, increase green belts around institutions and public places, control the use of automobiles and personal vehicles, regular maintenance of vehicles, inculcating the habit of using pooled vehicles or public transport, and minimal use of coal and firewood, and so on.

I wish the "**Voice of Environment**" team would take these suggestions to educate and inform the public about simple actions. I am confident that such measures will facilitate the creation of a healthy and livable environment. Better environmental research and innovation can safeguard and improve our environment and our mother earth.

Prof Mika Sillanpää

Department of Biological and Chemical Engineering, Aarhus University, Nørrebrogade 44, 8000 Aarhus C, Denmark
& Distinguished Professor at University of Johannesburg, South Africa

Circular Economy & Sustainable Development

Rwitabrata Mallick
Department of Environmental Science
Amity School of Life Science
Amity University, Gwalior-474005, Madhya Pradesh, India
Email: rmallick@gwa.amity.edu

The circular economy is a representation of the specific economy model which showcases the best practices and scope of business. Here the economy is in a circular approach and highly predominant rather than the linear processes. From the design point of view, this model is highly restorative and regenerative, and it always focuses on maintaining the quality and usefulness of the products to the maximum. It aims to keep the materials and components at their best utilization and maximum business output but in a sustainable way1.

The products are prepared in a fashion that can be easily unassembled, and the used materials might be broken down naturally or recycled back to the production house. As a result, the biological materials consist of harmless, clean feeds and technologically advanced materials. These materials are sketched so they can be used in industrial activities repeatedly. The purpose of a circular economy is to include everything and exclude nothing to minimize the requirement for buying neo commodities. A circular economy emphasizes the best possible sustainable way of achieving eco-friendly transportation and a green economy through applying renewable energy sources2.

In the present world of existing socio-economic infrastructure, materials and products are generated, utilized in various ways, and discarded when they are of no use. This is a process of the linear economy, which is unidirectional and often generates a bad economy. This particular mode of the economy is almost similar to the food chain system prevailing in the ecosystem, which shows the beginning of the chain is a producer, and the end is a consumer, as it is in the case of the natural ecosystem, like primary consumer or herbivores, secondary consumer, tertiary consumer and quaternary consumer. As the food chain is linear and always starts with the producer and ends with the consumer, a similar thing is observed in a linear economy. A producer produces the product, and there is a consumer at the receiving end. On the other hand, the circular economy model is very much different. In a circular economy, products and services are mapped in a way that makes them reused, reduced and recycled through chemically or biologically. (Fig1).

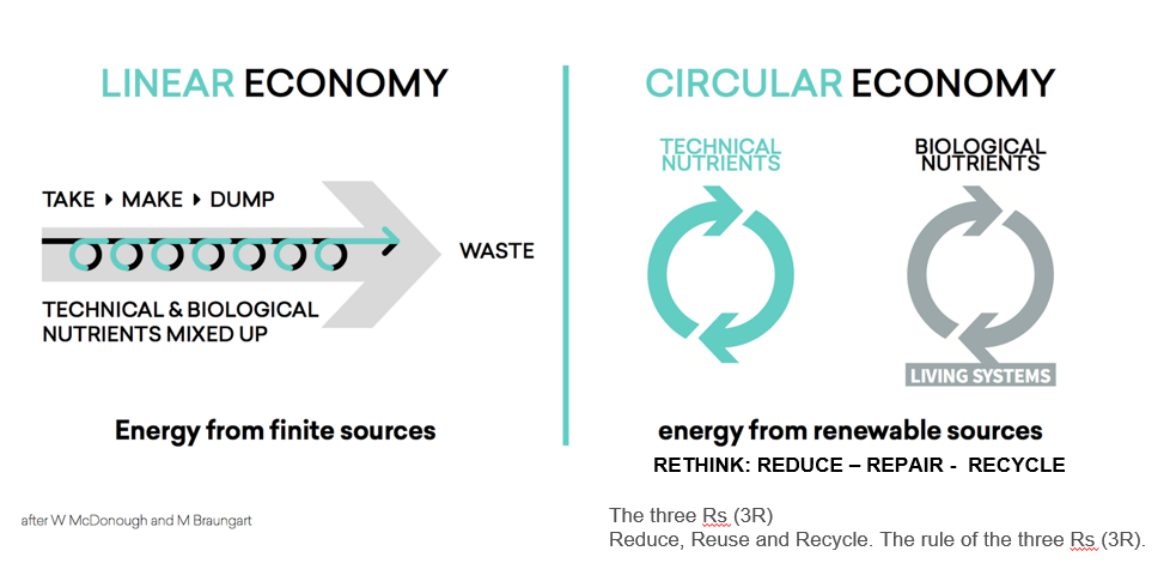

Fig1: Linear & Circular Economy (Source: W McDonough and M Braungart)

The circular economy is a markedly separate mode of doing business. It is a way to enforce companies to rethink reform and restart each aspect, from how to design and manufacture products to their relationships with customers. One of the major variations is the customer's role. A circular economy has various requirements in the business domain to enhance long-term partnerships and bonding in its business structure. The benefit is that organizations gain from each other's success in this cascade of different cycles. The basic principle of the circular economy shows a framework that weaves joint methods and approaches taken from different sources, namely - biomimicry, ecosystem services, industrial symbiosis etc. The circular economy focuses on established and new methodologies of recovery and recycling waste materials3.

The range of the products can vary from micro to macro, from small to giant. Companies collect and remodify their products and, after that, sell them in the store in a separate department. Through circular economy and its sustainable approach, companies will enhance value addition from waste to wealth concept and generate a new circular approach for sustainable socio-economic development[4].

Circular economy provided 3 key principles towards achieving sustainable development –

1. No waste
2. Maintaining proper value
3. Considering economic framework conditions

The circular economy is a system-based solution that tackles global challenges like biodiversity loss, global warming, climate change, waste generation, pollution, and contamination. Every element of nature should be transformed into the format of a take-make-waste system. The main 4 elements of circular economy are based on

-how we manage resources

- how we use products

- how we make products

- what we do with the materials

Although the circular economy is a road towards sustainability, circular metrics sometimes lack a social perspective and differ in scope and focus. These gaps can lead to diverging results, creating ambiguity and discrepancies within the circular economy metrics landscape Circular economy consists of four loops. (Fig2).

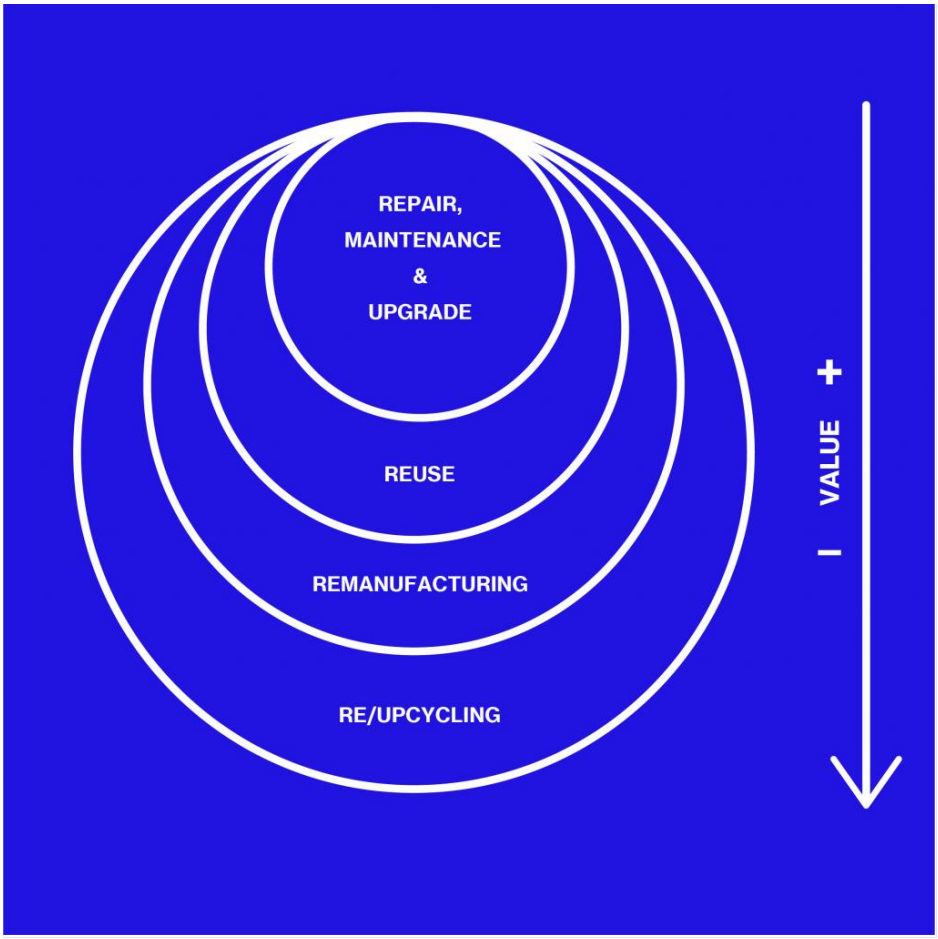

Fig 2: 4 loops of circular economy (Source: Ethica, Anne Raudaskoski)

It can be concluded that circular economy is all about gen next empowerment to use the mind and brain and chalk-out things sustainably and implement circular business systems to develop a better future.

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Circular Economy
An Approach to Reduce Burden on the Earth's Resources

Chandan
Department of Life Sciences,
Technical University of Munich
Freising-85354, Germany
E-mail id: aryanchandannita@gmail.com

The population explosion was thought to be one of the most important issues of the 21st century, but nobody imagined the array of problems arising from it. Soon, material usage has become one of the prominent issues globally. We use earth as our primary source for production but eventually discard it as waste in our linear economy. Contrary to this, the circular economy, which is a model for production and consumption, does not initially create waste. It is mainly a necessity than a need, or else we won't truly reach sustainability in today's world. It not only helps keep the resources usage intact but will help achieve climate neutrality, set global standards in product sustainability, and promote job creation in the future. It is more of a framework that tackles waste, biodiversity loss, climate change, and pollution. Nevertheless, it is flexible enough to help people, businesses and the environment.

Now the question is, how can we build a circular economy, and how does it work? Three principles govern it. The first principle, eliminating waste and pollution, is important because most waste goes into incinerators or landfills. This is often really critical because space on earth is limited. So, we need to fix the mindset of not creating waste in the first place. Waste elimination can be sorted by maintenance, sharing, reusing, repairing, remanufacturing and recycling as the final choice. For example, Nike is a footwear company that recycles its material from its manufacturing process. In 2015, the brand recovered 92% of its waste, which also shows its commitment. Many companies have adopted reusable packing as a method of avoiding waste. If the waste is not created, there won't be any material filling up landfills, which can help the environment on many levels.

The second principle, circulating products and materials, mainly refers to the circulation of products or using them as the raw material for newer products. The way by which this can be done is by two methods. One is the technical cycle, primarily reusing and recycling, while the other is a biological cycle, allowing biodegradable materials back into the soil by composting and anaerobic digestion. (*Circular Economy Introduction*, n.d.).

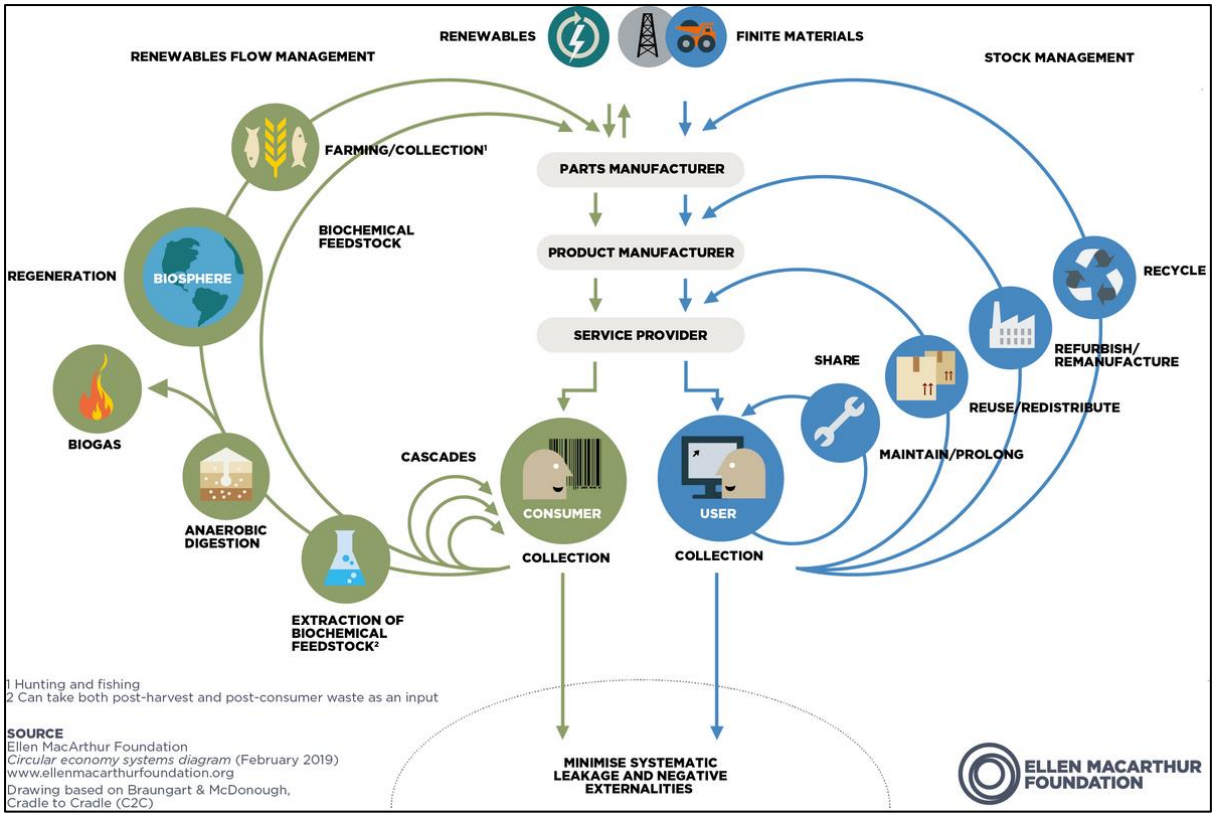

Figure 1 – Butterfly diagram visualizing the actual circular economy (Source - Ellen Macarthur Foundation)

Now the main point of reference is the design relevant to both the cycles. If not made with circulation in mind, they will turn into waste. Loop offers products such as Tide detergent in reusable packages as part of its reuse platform. Consequently, an empty container can be collected or dropped off without being cleaned by the customer. Once is refilled they can be used again. (Circulate Products and Materials, n.d.)

The third principle, regenerating nature, involves natural processes, basically shifting from extraction to regeneration. Technically, there is no waste in nature; it just gets circulated. Waste is much of human creation, and it needs to be controlled. One of the main places to start is the food industry. If we produce food regenerative, it will also reduce greenhouse gases and improve soil quality. These regenerative practices of conservation agriculture and agroforestry result in ecosystems similar to forests and native grasslands, which provide a habitat for many organisms and enrich biodiversity (Circular Economy Introduction, n.d.). The circular Economy Plan is important and has been taken up by various countries. Netherlands, France, and Italy are currently leading in establishing a circular economy. In Europe, it is a part of the Green Deal, and hopefully, other countries will follow up soon. Out

of all, the Netherlands is striving to ascertain a circular economy. It aims to become a country whose economy is fully keen on circularity in the coming decades and has set the guidelines to succeed by 2050 (Hope, 2022). As of the early 2000s, China's circular economy policies were quite sound. In the 90s and 00s, a resource-constrained country like Japan implemented a full-scale plotting of material flow, analyzing the inflow and outflow and asking how to better use it (Isles, 2021). However, globally we haven't reached an identical level. The earlier the countries realize, the sooner we will be towards achieving environmental goals.

Out of billion of tons of resources entering every year, approximately 9% gets recycled and utilized again. Having tripled since the 1970s, usage may double again by 2050 if trading extends. As a result, we won't have enough space to sustainably support our current resource use. This calls for carrying circularity in different parts of the world. With it, we can better use finite resources, reduce global greenhouse gases, protect human health and biodiversity, boost economies and create more opportunities (McGinty, 2021).

To achieve Sustainable Development Goals (SDGs), we must shift to sustainable consumption and production and circularity. Successful recovery from the current pandemic will require avoiding accumulating issues, improving socioeconomic conditions, and strengthening economies (United Nations Environment Programme, 2021). It would take a while, but striving toward a circular economy is important. Current economic trends typically bind us to a linear model, and as these trends persist, it becomes less viable. Thus, we must benefit from economic, technological, and social factors to accelerate the transition before the waste becomes too great a burden for the earth.

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The Unseen Dangers of Pollution Caused by the Cosmetic Industry and How a Circular Economy Could Help to Overcome it.

Nivedita Biswal
Incoming Graduate Student, University of Michigan, USA &
Former Manager, Operations (Coal India limited)
E-mail id- niveditabiswal003@gmail.com

Plastics are an indispensable part of human life today. The very reason that plastics are affordable, lightweight, durable, easy to store, and have a lower production unit cost makes them appealing to manufacturers and consumers.

According to a report published in business insider, the amount of plastic waste will outweigh the fish in the ocean by the year 2050. One of the major contributors to plastic waste is the cosmetic industry. According to a study commissioned by Zero Waste Europe, around 142 billion units of packaging in 2018 in the form of multi-layered boxes came from the cosmetic industry alone, which are not recycled. More than 80% of it ends up in the ocean. Barring the packaging waste generated, the pollution caused by the cosmetic industry is manifold. Microplastics and microbeads are impossible to filter out of oceans. Avobenzone; used in sunscreens, is now proven to deplete coral reefs. Volatile organic compounds (VOCs) used in fragrances and hairsprays contribute to smog and air pollution. It is estimated that palm oil is found in about 70% of the cosmetics we use. But, it has proven a disaster for the environment. As per the beauty website blog, i.e. Athr beauty, "So far, 27 million hectares of carbon sequestering forests have been cleared for palm oil plantations." The oils used in make-up remover can cause drain clogs. In addition to the waste generated, the carbon footprint for transferring the ingredients & finished goods showcases the ugly side of the cosmetic industry.

The waste generated from the cosmetic industry leaves a negative ecological footprint. Recycling dissimilar materials is a very complex process. Products like wet wipes/sheet masks (a combination of plastic and fabric lined with foil) are not recyclable. Make-up items like lipstick, kajal, mascara, and lip gloss are an amalgamation of metals, plastic, wax, silicone, wiper, polymer, beeswax, and other chemicals which cannot be recycled and eventually end in a landfill. Cardboard units used for wrapping lead to the felling of pine trees, causing massive deforestation. Most of the time, the cardboard units are not recycled. Waste is also added as cell phone paper and used as wrappers. Other incorrigible damages are

increased CO2 emission & water consumption. Products like aloe gel or micellar cleansing water are quite water-intensive.

Waste generated in the cosmetic industry can be categorized into solid, liquid and hazardous waste. Solid waste comes from plastic moulds, metals, tins, packaging units etc. Liquid waste is caused by run-off shampoos, body wash, conditioners etc. Hazardous waste is a potential threat to human life. For example, deodorant cans are difficult to recycle. It is also inflammable and considered hazardous if; partially empty. Leaching of dangerous toxic substances during decomposition, like bisphenol (widely known as BPA), phthalates, brominated flame retardants and chlorinated plastics, when mixed into groundwater, can severely impact the health of humans. Plastic waste can also travel through waterways disrupting the hydraulic flow and leading to sewage blockage. Land plastics contaminate the human food chain through agriculture & livestock.

Plastics have also found their way into the air. A study conducted in the mountains of the French Pyrenees revealed that 249 plastic pieces were found per sq. m/per day. As per the team's calculation, wind can easily transport microplastics over a distance of 95 km, causing land litter.

Alternative solutions-

It is pertinent to say that the pollution caused by the cosmetic industry is a lesser scrutinized area than other industries. Rare attention is given to the harmful waste generated by this industry, despite the massive global output it generates.

A major chunk of waste can significantly be cut down by reducing consumption. Eco-friendly/sustainable options like naked packaging, glass jars, shampoo bars, jute bags, and compostable packaging are great, but adopting a circular/closed loop economy model like refill stations, bottle-to-bottle recycling, and reuse can notably cut down waste. A collaborative push by major cosmetics brands can pave the way for a holistic circular approach.

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Towards a Circular Economy: Converting Kitchen Waste to Biofuel through Anaerobic Degradation

*Ratul Pegu[a], *Prajnyan Sarma[a], Bijay Thakur[a] and Bishal Paul[a]
[a] Department of Environmental Science, Tezpur University, Napaam, Tezpur, 784028, Assam, India
E-mail id: ratulpegu70@gmail.com & sarmarittik@gmail.com

Abstract

Municipal solid waste generation has always been an issue of concern as it is continuously increasing with rapid urbanization and an increase in population. Kitchen waste is one such municipal solid waste category that needs to be managed properly, as it is a source of methane and carbon dioxide that can further alter the prevailing climatic conditions. However, with proper management and technology, kitchen waste can generate biogas that can minimize dependency on fossil fuels. Moreover, the resultant muck from biogas plants can also be used as organic manure in farming. This article briefly describes and summarizes the processes involved in converting kitchen waste to biofuels.

Keywords: Kitchen waste, biogas, bacteria, methane

Kitchen waste

Kitchen wastes are organic and inorganic matter generated from restaurants, hotels, and households, consisting of food waste, plastics, glass, packaging cardboards, knives, chemical waste, liquid waste, etc. (Li et al., 2009). Kitchen waste is broadly classified into two groups, i.e., biodegradable and non-biodegradable waste. Biodegradable waste includes food waste, paper waste, vegetable waste, fruits, etc., and non-biodegradable waste includes plastics, glass, and metal.

Kitchen waste generation worldwide

In recent decades, waste generation has been increasing worldwide daily, and there is no cue to slow down this generation rate. Suppose the current pace of waste production is considered. In that case, it is approximated that by 2050, the global municipal solid waste (MSW) generation will be increased to 70% from the 2016 rate (Kaza et al., 2018). 2.01 billion tonnes of municipal solid waste were produced in 2016 (Meng et al., 2021). From that

waste generation, 33% of waste could not be disposed of sustainably (Kaza et al., 2018). Worldwide waste generation for a single person per day is 0.74 kilograms, but it varies between 0.11 and 4.54 kilograms (Kaza et al., 2018). Many factors are responsible for a large number of waste generation, including population explosion, economic growth, urbanization, and consumer habits (Meng et al., 2021). Due to rapid urbanization, population growth is increasing globally (Wang et al., 2020). As per statistics, the world population in august 2018 was nearly 8 billion, and it's expected to exceed 9 billion by 2040 (Wang et al., 2020). This rapid population growth creates various environmental issues by generating vast amounts of waste (Wang et al., 2020). Approximately 55 million tonnes of MSW are produced from urban areas of India (Apte et al., 2013). Kitchen waste (KW) is one of the major categories of MSW (Li et al., 2009). Below, figure 1 depicts the classification of MSW based on their composition.

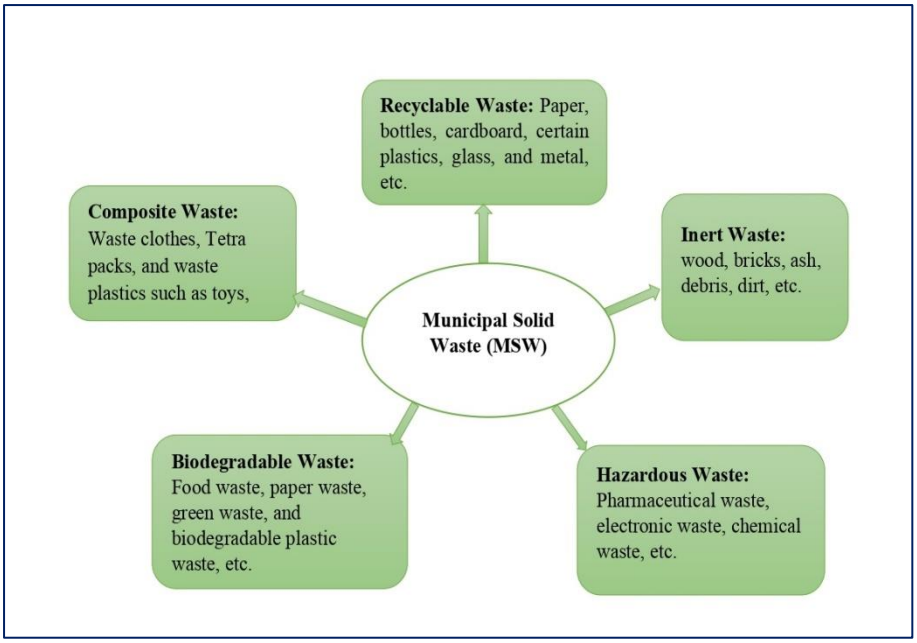

Figure 1: Classification of MSW (Kumar et al., 2021)

Globally 1.6 million tonnes of food waste are produced yearly (Meng et al., 2022). This is because of industrialization and improper waste management practice (Sindhu et al., 2019). We needed proper waste treatment and disposal practices to reduce such a huge amount of waste generation. However, every year below 20% of total waste generation is utilised in recycling, and many wastes are still sent to landfill sites. Worldwide, about 71% of municipal solid wastes are still dumped in landfills (Zacarias-Farah and Geyer-Allély, 2003).

The problem arises from kitchen waste generation

The global population is increasing at a rate of 1% per year (Ismail and Nizami, 2016). This uncontrollable human population growth has exerted massive pressure on the availability and security of both food and energy (Kaur et al., 2020). The growing and changing lifestyle of the population increases the number of kitchen waste generation worldwide. Discarding them creates many socioeconomic and environmental concerns (Kaur et al., 2020). In landfills, they generate greenhouse gases including methane (CH4) and carbon dioxide (CO2) that lead to an increase in global surface temperature and subsequent climate alterations. Attributable to organic matter and excessive moisture content (Zhang et al., 2007; Li et al., 2009), inappropriate disposal techniques of kitchen waste can give rise to environmental issues (Slack et al., 2005; Li et al., 2009). Hence, we need innovative and sustainable technologies to minimize or manage kitchen waste.

Conversion of kitchen waste to bioenergy

Kitchen waste is one of the best alternative sources for biogas generation through the biogas production plant. Biogas is produced from kitchen waste when bacterial decomposition of the waste occurs under anaerobic conditions. CH4 and CO2 form a large portion of biogas (Agrahari and Tiwari, 2013). The calorific value of biogas is determined by the proportion of CH4 present in it. The calorific value of biogas is significantly high at around 55% of methane content, i.e., 4700 kcal or approximately 20 megajoules (Agrahari and Tiwari, 2013).

Biogas generation process from kitchen waste

Kitchen waste plays a crucial role in community-level biogas plants. Kitchen wastes are used in biogas production because of their high biodegradability, high calorific value, and nutritious value to microbes (Iqbal et al., 2014). These generation processes reduce the dependency on other fossil fuels. Biogas is produced by the biochemical breakdown of organic matter under anaerobic conditions (Umeghalu et al., 2012; Sawyerr et al., 2019). Biogas is an amalgamation of different gases, mainly CH4 (55-65%) and CO2 (30-40%); and 1-5% other gases, including ammonia (NH3), hydrogen (H2), hydrogen sulphide (H2S), and nitrogen (N) (Sawyerr et al., 2019). The gas can be successfully used for biogas-based power generation after dewatering and cleaning the gas. And also, the muck generated in the process is used as organic manure for farming and sustainably maintaining soil health.

Stages of bacterial biogas production

Bacterial community act as a driving force in the anaerobic digestion process. In the bacterial anaerobic degradation process, four basic steps are involved. These are hydrolysis, acidogenesis, acetogenesis, and methanogenesis (Sawyerr et al., 2019). And each step is carried out by a distinctive group of microorganisms. They also have a syntrophic relationship among the microorganisms with different growth states, physiology, metabolic activity and stress tolerance capacity. In figure 2, we depict the biochemical stage of the anaerobic biogas product.

Hydrolysis

Hydrolysis is the initial process of anaerobic degradation. Here hydrolytic bacteria, including Chloroflexi, Thermotogae, Firmicutes, Bacteroidetes, proteobacteria, and Spirochaetes are converting the complex organic matter into compounds such as sugar, amino acid, and peptides (Nguyen et al., 2019). These low molecular weight compounds are used as nourishment by the next group of microorganisms in the degradation steps or process chain. The wealth of hydrolytic bacteria on anaerobic degradation depends on factors, including types of inoculation, cell retention time (CTR), operating temperature, and substrate characteristics.

Hydrolytic bacteria generate a special multienzyme complex, “cellulosome”, which empowers them to secrete various hydrolases, including glucanases, hemicellulases, chitinases, and lihanases. These enzymes help hydrolytic bacteria to degrade a different types of complex organic waste (Nguyen et al., 2019).

Acidogenesis

Acidogenesis is the second phase of the bacterial anaerobic degradation process. In this phase, acidogenic bacteria, including Firmicutes, Bacteroidetes, Proteobacteria, and Actinobacteria, utilize the product of hydrolyzers, including sugar, amino acids, and peptides, as an electron acceptor to produce fermentation

products volatile fatty acids, alcohols, aldehydes, ammonia, carbon dioxide, acetate, and hydrogen sulfide (Kamusoko et al., 2022). The following three chemical equations are associated with the acidogenesis process.-

I. $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

II. $C_6H_{12}O_6+2H_2O \rightarrow C_2H_5COOH+2H_2O$

III. $C_6H_{12}O_6 \leftrightarrow 3CH_3COOH$

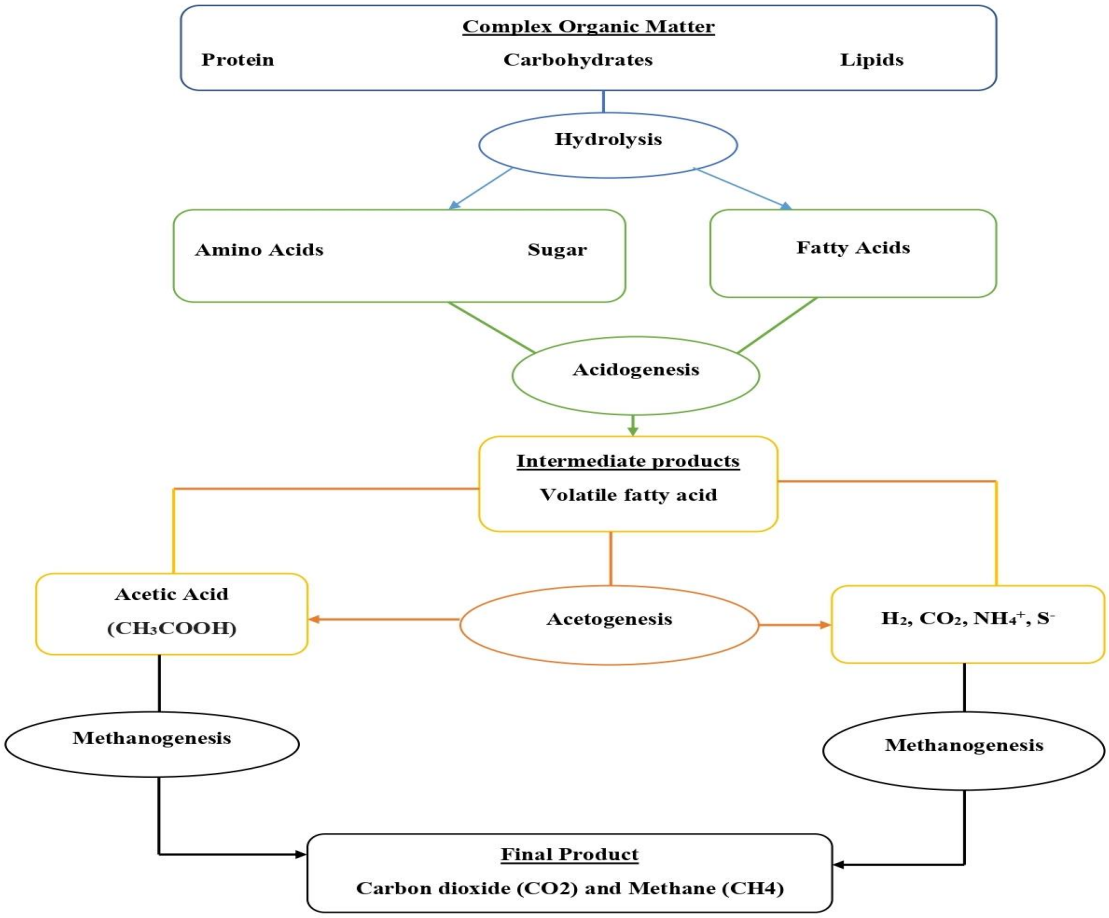

Fig 2: Biochemical phases of biogas production (Ramaraj and Dussadee, 2015; Sawyerr et al., 2019).

Acetogenesis

Acetogenesis is the third process of anaerobic degradation where organic acids, including propionic, butyric, and pentatonic acid, are assimilated into acetic acid and H2 by acetogenic microbes such as Syntrophobacter wolinii and Syntrophomonas wolfei. Later these methanogens are used for the CH4 formation. The methanogenic bacteria are the obligatory source of H2. H2 concentration is a key component for regulating the metabolism of acetate and methane formation. Acetogenesis is the main phase of biogas production in anaerobic degradation because acetate reduction contributes to 70% of methane production (Nguyen et al., 2019). So, biogas production depends on the success of the acetogenesis phase.

Methanogenesis

Methanogenesis is the last phase of anaerobic digestion; here, the by-product from acetogenesis is converted to CO2 and CH4 by methanogenic bacteria such as Methanobacterium bryantii, Methanobacterium formicum, Methanobrevibacter arboriphilicus, Methanococcus burtonii etc. So far, 65 methanogenic bacteria species have been identified by researchers and grouped in five orders: Methanosarcinales, Methanococcales, Methanopyrales, Methanobacteriales, and ethanomicrobiales (Wang et al., 2018; Nguyen et al., 2019). After these phases, the organic material used to feed into the anaerobic digestion is removed, as the product CH4 gas absorbs in the liquid phase.

The biogas produced through the anaerobic degradation of organic matter can be used with minimum post-production processing to generate heat and electricity. Moreover, the digestate can be further used in agricultural fields as it is rich in nutrients readily available for plants to uptake.

Conclusion

As an increase in waste production is directly related to population growth, different techniques and methods must be developed and implemented to reduce waste generation's harmful consequences. The generation of biogas (biofuel) from kitchen waste is one such approach where organic wastes produced from day-to-day activities are further used as an alternative energy resource. Using biogas as renewable and alternative energy helps reduce dependency on fossil fuel derivatives, enabling reductions in greenhouse gas emissions. This approach also helps in the proper degeneration and reduction of unwanted organic wastes, thereby lowering the environmental issues associated with conventional methods of organic waste disposal.

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Authors' brief profile

Ratul Pegu has completed his B.Sc. in Zoology from Dergaon Kamal Dowerah College, Dergaon and M.Sc. in Environmental Science from Tezpur University. Currently he is pursuing his Ph.D. from Department of Environmental Science, Tezpur University, Assam.

Prajnyan Sarma has completed his B.Sc. in Botany from B. Borooah College, Guwahati and M.Sc. in Environmental Science from Tezpur University. Currently he is pursuing his Ph.D. from Department of Environmental Science, Tezpur University, Assam.

Bijay Thakur has completed his B.Sc. in Botany from Duliajan College, Dibrugarh and M.Sc. in Environmental Science from Tezpur University. Currently he is pursuing his Ph.D. from Department of Environmental Science, Tezpur University, Assam.

Bishal Paul has completed his B.Sc. in Zoology from Cachar College, Assam University and M.Sc. in Zoology from Tripura University. Currently he is pursuing his Ph.D. from Department of Environmental Science, Tezpur University, Assam.

Circular Economy Principles in Aquaculture

Vishwajeet Potadar
Kuvempu University,
Jnanasahyadri Shankaraghatta-577451,
Karnataka, India.
Email: vishwajeetpotadar@gmail.com

A circular economy is defined as "an industrial system that is restorative or regenerative by intention and design", enabling the conservation of used resources to their fullest and eliminating waste via better designs of materials, systems, and products. The changes fabricated in the system model undertake the virtues: sources of resources, fabrication into products, and conversion into waste. The circular economy pathways concentrate on minimising material utilization, re-designing materials to less resource-intensive products, and recapturing "waste" as a reserve for the production of converted products.

Fig.1. Linear Economy © Peter Varga (Royalty Free Vector)

The circular economic supply network is far more complex than the linear economy. The flow of materials throughout means that today's more or less labels like "raw materials," "products," and "waste" doesn't apply. Instead, a further dynamic understanding of material flow is employed to describe the supply chain and redesign and plan it.

Fig.2. Circular Economy © Peter Varga (Royalty Free Vector)

The idea of circularity is encompassed within the degrees of sustainable material management (SMM) approach ratified by several federal agencies, including the Environmental Protection Agency, since 2009. A circular economy under the SMM umbrella signposts continuity and steadiness in reducing environmental material impact, enveloping climate-derived impacts, minimizing the usage of dangerous materials, and dissevering the overuse of materials for better economic growth. The National Recycling Strategy (NRS) recognizes the necessity of uniform implementation of a circular economy approach abating waste creation and strengthening material management policies.

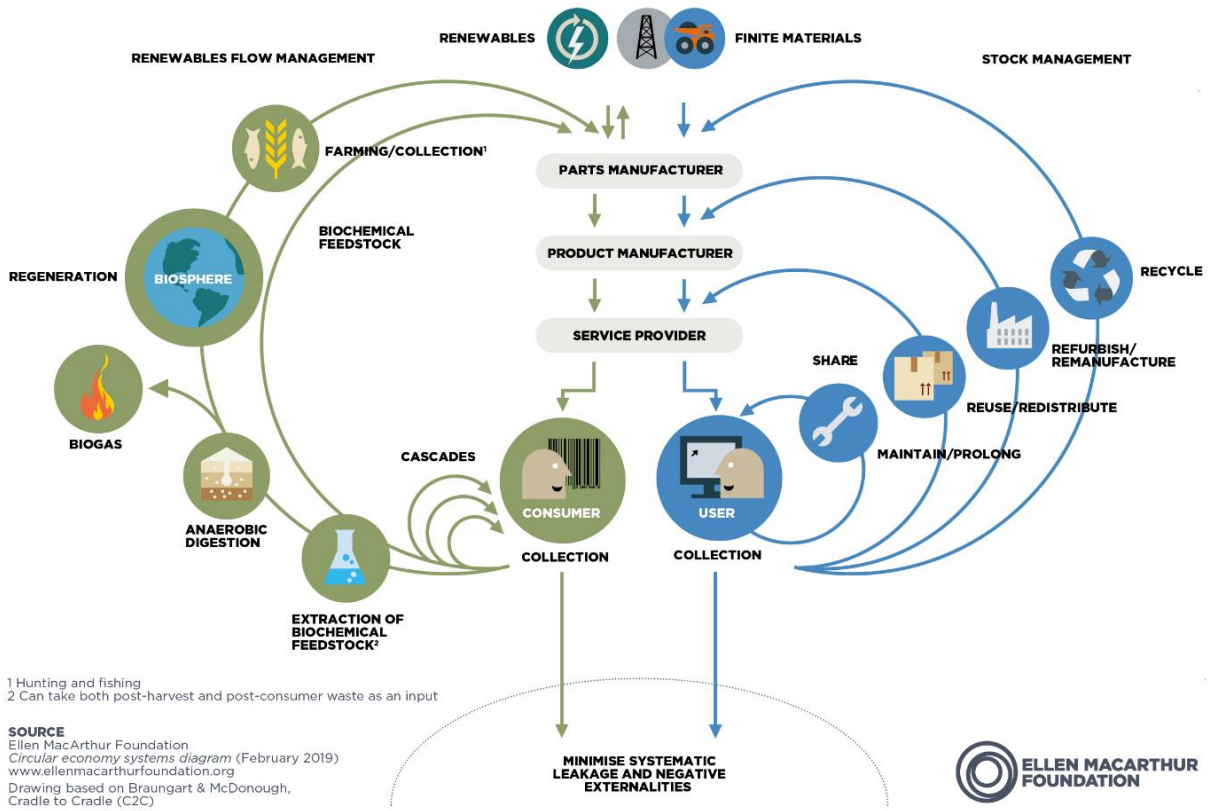

Fig.3. The following diagram represents the continuous flow of biological & technical materials through a circular economy.

The Ellen MacArthur Foundation (EMAF) has outlined the circular economy approach as "one that is restorative and regenerative by design and its goal is to keep products, components, and materials at their highest utility and value at all times, distinguishing between technical and biological cycles." The embedding principles highlighted are designing out waste and pollution, retaining the usage of products and materials in action, and regenerating the natural regular system. (MacArthur, 2013)

Circular Economy and the aquaculture

The decisions and resolutions contoured in the designing phase of the aquaculture system are imperative because once a designed system is fashioned, the insinuations for resource usage and emission are largely sheltered. Observing relatively new and recently introduced aquaculture systems schemed on the foundations of ecological regenerative methodologies of IMTA, bio-floc, aquaponics, etc., is promising. The intensive shrimp farming and novel re-circulation prototypes allow solid waste recovery, and the latter's use in biogas production, eyeing further down to the aquaculture value chain system, copious prospects in the usage of

waste generated during processing have been noted. The processed plant wastes are regularly concentrated and assimilated in the aquaculture feeds. Chitosan and Chitin extracted from shrimp shell waste are used as biodegradable plastic as thickeners in food processing and pharmaceuticals. The skin of tilapia is used in the treatment of burns and boils. A circular economy for aquaculture products and fisheries impersonates natural regenerative systems jettisoning waste generation and employing feedstock for the next cycle. In the process, the organic resources are devoid of pollutants and are processed as organic fertilizer. Some by-products provide supplementary values by creating novel food products, fertilizers, bioenergy sources and pharmaceutics. These cycling approaches rejuvenate living systems supporting biodiversity and offer resource renewability. It also avoids food waste/ loss, reducing the likelihood of spoilage due to inadequate cold storage or long-distance travel to market; food waste at the consumer level and sale.

Greenhouse Gas Emission Reduction

At a global level, aquaculture and fisheries are relatively smaller in terms of emissions. They have done well in espousing the fundamental doctrines of the circular economy, though some areas need a more considerate approach. At the farm level, the responsible agency should sightsee, inspect and appraise the ways of improving resource usage efficiency and resourceful ways of 3R (reuse, reduce and recover). At the value-chain or comprehensive provincial level, wastes generated from aquaculture can be employed in other economic sectors. Nevertheless, firsthand easy-to-manage innovative systems propose the potentialities for producing valued co-products, enhancing the sustainability and profitability of aquaculture (Food and Agriculture Organization, 2000).

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The Assam Tribune Date 6 Jun 2022

Urgent action plan need

World Environment Day

STAFF REPORTER

GUWAHATI, June 5: Governor Prof Jagdish Mukhi today said that in view of the harm meted out to the environment, an urgent action plan is required to protect Planet Earth.

Kicking off the celebrations of the World Environment Day with the theme 'Only One Earth', the Governor gave a clarion call to everybody to focus human actions on sustainable living in harmony with nature.

Speaking on the occasion of World Environment Day celebrated at Assam Biotech Park at Amingaon today, Prof Mukhi said that as part of the action plan to reverse environmental degradation, the government of Assam is strengthening people-forest interface and encouraging people's participation in forestry and wildlife management.

The Assam Forest Department too has involved the forest fringe villagers and eco-development committees to address environment-related concerns, he said adding that in the last five years, the government has implemented several programmes for conservation and protection of forest and wildlife in the State.

During this period, 10,353 hectares of land were brought under plantation. Further works are in progress for enhancing the quality of forests by raising plantations on 12,510 hectares under Assam Project on Forest and Biodiversity Conservation and 1,784 hectares plantation under CAMPA.

Earlier, he attended a World Environment Day programme at Raj Bhavan where he spoke on the need of safeguarding the environment against several human actions in the presence of the school students. Synchronising with the day, a sapling plantation programme was also organised at the Raj Bhavan campus.

The Regional Office, Pollution Control Board Assam, in collaboration with Sonapur College and Assam Science Technology and Environment Council (ASTEC) observed the day at Sonapur College auditorium. A tree plantation programme preceded the meeting which started with the welcome speech by Dr Devabrot Khanikor, principal of Sonapur College.

He explained the concerns stemming from environmental degradation and the ways to check it.

Environmental activist of Sonapur, Samiran Bordoloi, founder of Spread NE, spoke on 'seed bombing', elaborating how one can preserve the top soil and create a food forest.

Gokul Bhuyan, senior environmental engineer-cum-regional officer, Regional Office, Guwahati, Pollution Control Board, Assam, emphasised on creating a balance with nature and explained the importance of the theme of this year's World Environment Day. He stressed on green consumption, green investment, green production and green building besides waste management at household level, community level and vegetable markets through *in-situ* methods such as Bakashi composter, drum composter or by traditional methods.

Prof Khanindra Pathak of IIT Kharagpur spoke on the concerns about environmental degradation and the urgent need to stop it through sustainable methods. Dr Bibhab Talukdar, CEO of Aranyak, delivered a power-point presentation on the WED's theme and emphasised on the need for preservation of the wetlands to mitigate the flood problem. Certificates and prizes were awarded to the winners of the drawing and painting competitions.

In sync with the theme of this year's World Environment Day 'Only One Earth', Voice of Environment (VoE) has initiated a collaborative programme with the association of Royal Global University, Guwahati and Assam State Zoo-cum-Botanical Garden Guwahati.

The event began with a plantation drive team led by Dr Ashwini Kumar, DFO, Assam State Zoo, Dr Priyasa Saikia, ACF, Assam State Zoo, and Indrani Borgohain, Range Officer, along with environmentalist Moharana Choudhury, Dr Mitrajit Deb, Assistant Professor, Department of Zoology, RGU, Bhaskar Hazarika, Sunita Mishra, VoE, school students, research scholars, and other Forest Department officials.

News Links-

1) https://neindiabroadcast.com/2022/06/05/voice-of-environment-and-royal-global-university-celebrated-world-environment-day-2022-at-assam-state-zoo-cum-botanical-garden/

2) https://indigenousherald.com/TripuraNews/initiatives-on-the-world-environment-day-2022-19186.html#:~:text=GUWAHATI%2C%20June%2005%202022%3A%20Keeping,Global%20University%2C%20Guwahati%20also%20joined.


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Initiative during the Assam Flood 2022

শাসনের সভা। মঙ্গলবার। পাল, শিবানী রায় প্রমুখ।

ত্রাণ বণ্টন মানবাধিকার সহায়তা সংঘ ও ভয়েস অব এনভায়রনমেন্টের

বার্তালিপি প্রতিবেদন, বদরপুর, ৫ জুলাই : মানবাধিকার সহায়তা সংঘ ও ভয়েস অব এনভায়রনমেন্ট সামাজিক সংস্থার যৌথ উদ্যোগে করিমগঞ্জ লঙ্গাই রোড উমাপতি গ্রামের প্রায় ৭৫০ বন্যাদুর্গতদের প্রতি সাহায্যের হাত বাড়িয়ে দেওয়া হয়।

সংস্থার পক্ষ থেকে কাপড় ও চাল, ডাল, মোমবাতি সহ অন্য ত্রাণ সামগ্রী বিতরণ করা হয়। ত্রাণ বিতরণে অন্যদের মধ্যে উপস্থিত ছিলেন সজন নাগ, উমাপতি জিপির পঞ্চায়েত সদস্য জয়ন্ত দাস, সুরজিৎ রায়, চন্দন নাগ, রতন রায়, লঙ্গাই জিপি সভানেত্রী সোমা রায়, ও কামরুল ইসলাম।

এছাড়াও মানবাধিকার সহায়তা সংঘ ও ভয়েস অব এনভায়রনমেন্ট সংস্থার পক্ষ থেকে গৌরব রায়, বানিব্রত চৌধুরী, নিগমজ্যোতি চৌধুরী, শ্যামল চৌধুরী, বেনুধর রায়, অপরূপ দাস, রণজিৎ কুমার দাস, রিনটি দাস, অরুণিমা নাথ, উৎপলা দেব, রীতা পুরকায়স্থ, দুলোন দাস, রূপদীপ দাস, কাজরী সর্মাচাজি, ভবানী দাস, জন্মজিত চক্রবর্তী, জুয়েল চক্রবর্তী, টিংকু রায় সহ অন্যরা উপস্থিত ছিলেন।

লঙ্গাইরোডে ত্রাণ শিবিরে খাদ্য সামগ্রী বণ্টন

প্রান্তজ্যোতি প্রতিবেদন, বদরপুর, ৫ জুলাই : মানবাধিকার সহায়তা সংঘ ও ভয়েস অব এনভায়রনমেন্ট সামাজিক সংস্থার যৌথ উদ্যোগে করিমগঞ্জ লঙ্গাইরোড উমাপতি গ্রামের প্রায় ৭৫০ বন্যাদুর্গতদের সাহায্যের হাত বাড়িয়ে দেওয়া হয়। এতে সব স্তরের উপযুক্ত কাপড় ও চাল, ডাল, মোমবাতি সহ বিভিন্ন সামগ্রী বিতরণ করা হয়। এদিন অন্যান্যদের মধ্যে উপস্থিত ছিলেন সজন নাগ, জিপি মেম্বার জয়ন্ত দাস, সুরজিৎ রায়, চন্দন নাগ, রতন রায়, লঙ্গাই জিপি সভানেত্রী সোমা রায় ও কমরুল ইসলাম। এছাড়াও ভয়েস অব এনভায়রনমেন্ট সংস্থার পক্ষ থেকে গৌরব রায়, বানিব্রত চৌধুরী, নিগমজ্যোতি চৌধুরী, শ্যামল চৌধুরী, বেণুধর রায়, অপরূপ দাস, রণজিৎকুমার দাস, রিনটি দাস, অরুণিমা নাথ, উৎপলা দেব, রীতা পুরকায়স্থ, দুলোন দাস, রূপদীপ দাস, কাজরী শর্মাচার্যি, ভবানী দাস, জন্মজিৎ চক্রবর্তী, জুয়েল চক্রবর্তী, টিংকু রায় প্রমুখ।

News Link-

https://neindiabroadcast.com/2022/07/03/an-initiative-toward-flood-victims-of-assam-by-voice-of-environmentvoe-and-manavadhikar-sahayota-sanstha-at-karimganj/

Initiative on Azadi Ka Amrit Mahotsav 2022

Azadi Ka Amrit Mahotsav: Badarpur Vidya Mandir, Voice of Environment conduct plantation programme

CHRONICLE NEWS SERVICE

BADARPUR: Badarpur Vidya Mandir High School and Voice of Environment NGO jointly organised a tree plantation programme in Badarpur on Saturday. The team members started the plantation drive from Badarpur Fort. Department of Social Forestry, Karimganj supplied 75 numbers of saplings.

Mohammed Shajahan, director of Progressive School, Badarpur, adopted a few saplings from the school students and he planted saplings inside the school premises. Officer-in-charge of Badarpur police station also adopted some saplings SI Safikul Islam Majumdar and ASI N. Ahmed encouraged the students of Badarpur Vidya Mandir to plant more saplings. Badarpur Civil Hospital's medical and health officer Dr. Muslim Uddin, Al Ameen Academy's headmaster Motiur Rahman and Ajitesh Das, area manager of Badarpur railway subdivision, N.F. Railways also adopted some saplings.

Plantation drive organised by Voice of Environment, Badarpur Vidya Mandir High School as part of Azadi Ka Amrit Mahotsav.

Doctors Shivashish Dhar and Ashish Kumar Mishra, and senior matron Supriya Dey, were also present. Gaurav Roy, Nigam Jyoti Choudhary and Sujan Deb were present on behalf of Voice of Environment. Among the students who took part in the plantation drive included Zahirul Islam, Kamil Ahmed Majumdar, Indrajit Basfore, Mohit Saha, Mustafa Ahmed, Shurabh Hussain, Prithijit Das, Taniya Afruja, Rubina Parbin and Srestha Das.

Former students Arif Ahmed, Gulzar Hussain, Rupak Ghosh, Rajib Dutta, Kangkan Nath and Shubhajit Debnath were present. Team Voice of Environment conveyed their gratitude to Bhulanath Paul, headmaster of Badarpur Vidyamandir High School.


A PLANTATION DRIVE
An Initiative by:- Voice of Environment(VoE)
#GreenIndia
#GreenKasan
"Join hands, together we can make the differe-e"

News Links-

1 https://neindiabroadcast.com/2022/08/19/a-plantation-drive-organized-by-the-voice-of-environment-in-collaboration-with-the-students-of-badarpur-vidya-mandir-high-school/

2 https://www.southasia24x7.com/archives/25357

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Voice of Environment Newsletter: http://www.voiceofenvironment.org/publications/

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Thank you