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Sustainable Management of Floral Waste to Produce Bioenergy and Valuable Products

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Abstract: **India is one of the foremost religious nation from all religious places, an outsized number of flower waste is generated and it's improperly dumped in open places or any water body like pond, lake, and river. In those solid waste about 40-50% organic in nature and contributing to the environmental pollution (air, soil, and water) as well as human health also affected by this solid waste. In India, nearly 4.74 x 106t/day floral waste is released from different religious and social programmes after a single-use. This big quantity of floral waste may be controlled with the aid of using changing it into consumable cost brought items like herbal colors for silk and cotton products, perfumes, incense sticks, indoors ornamental items, composts, biogas, etc. Many investigators have developed eco-friendly bio-sorbents to get rid of heavy metals and toxic dyes by using flower petals from water sources.**

Keywords**: Biofuel, biogas, bio sorbents, coloring agents, composting, Floral waste management**

Abbreviations

SDG- Sustainable development goals
UP- Uttar Pradesh
C: N- Carbon: Nitrogen
CSIR- Council of scientific and industrial research
AP- Andhra Pradesh
MSW- Municipal solid waste
NHB- National Horticulture board
NPK- Nitrogen, Phosphorus, Potassium

I. INTRODUCTION

Solid waste disposal is a major concern around the world. The variety of content in garbage creates challenges in its reduction. The correct temple management has a difficult time dealing with the careless dumping of flower waste. If floral waste is dumped directly into water bodies such as rivers, ponds, lakes, and oceans, it creates a negative impact on water quality as well as the health of living species. Floral waste is commonly emitted from hotels, wedding gardens, religious sites, and other civilising and sacred rituals, making them a never-ending supply of floral trash. People use flowers to make offerings to their idols. Every day, worshippers bring a large number of flowers to religious sites, which are then left unused and thrown away. This large amount of floral waste is collected at religious sites like as temples, gurudwaras, and mosques, as well as from residential neighbourhoods, community centres, and other locales. After Andhra Pradesh (AP), Karnataka, and Tamilnadu, West Bengal ranks fourth in India in terms of flower promotion. Banaras (UP), one of India's holiest cities, lacks enough coverage for the disposal of large amounts of flower debris. Every day, 3.5–4.0 tonnes of flower waste is deposited behind the temples, according to [36]. Temples in Chitrakoot are also noted for producing a lot of floral debris. Several individuals offer flowers to Chitrakoot temples on a daily basis. Flowers are dropped in two locations: one on the Ramghat on the Mandakini River's bank, and the other on Lord Kamtanathji's platform. Approximately 5.48 tonnes per year. Floral debris is produced in both locations [70]. Prasadam is another location where flower waste is generated, estimated to be 2.08 tonnes per year. According to the Varanasi Nagar Nigam, the city generates roughly 10 tonnes of floral waste per day. When compared to kitchen waste degradation, floral waste degradation is a very slow process [25]. As a result, proper and environmentally friendly procedures for flower waste disposal are essential. Studies show that flower waste management and utilisation can be accomplished. Durga temple, Durgakund's flowery waste Varanasi has Gudhal (Hibiscus rosa sinensis), Genda (Marigold) flower with Gulab (rose) at Lord Vishwanath temple, and Madar (Calotropis gigantean) flowers waste at Lord Shiva temple, Visheshwarganj. Dutch grow around 4.32

billion tulip blooms per year, of which 2.3 billion are cut flowers. When compared to kitchen waste degradation, floral waste degradation is a very slow process [25]. As a result, proper and environmentally friendly procedures for flower waste disposal are essential. Studies show that flower waste management and utilisation can be accomplished. Durga temple, Durgakund's flowery waste Varanasi has Gudhal (Hibiscus rosa sinensis), Genda (Marigold) flower with Gulab (rose) at Lord Vishwanath temple, and Madar (Calotropis gigantean) flowers waste at Lord Shiva temple, Visheshwarganj. Dutch grow around 4.32 billion tulip blooms per year, of which 2.3 billion are cut flowers. Even Nevertheless, there are few reports on the management of floral waste. We'll talk about the problems with floral waste and how to deal with them by transforming them into value-added items in this presentation. Floral wastes can also be used to make bio sorption, which is beneficial in the treatment of wastewater and other industrial effluents. Floral waste management will also help to prevent water pollution and environmental contamination.

Problems associated with improper floral waste disposal

Incineration, which manages the combustion of waste substances to a non-flammable residue or ash and exhaust gases, is one of the most used disposal and remediation strategies for floral waste. In the United States and Europe, incineration is the method of choice for a variety of hazardous and poisonous waste streams. To get a close look at the final state of the waste that has been disposed of through land treatment. The land treatment aids in utilising the natural features of the soil in order to restore substances to a form that is similar to the unique state from which they were extracted and purified. A waste management system with a volatilization mechanism is also beneficial. The volatilization device's business gadgets aid in the removal of hazardous compounds from soil by raising the temperature to between 100 and 500 degrees Celsius. Flowers that have dried and rotted are discarded as garbage in landfills and water bodies. Sri Lanka and India are two instances of countries where around 40% of total flower production is unsold and wasted on a daily basis [35]. This flower debris is thrown into bodies of water or dumped on undeveloped ground, polluting both the environment and the water [72]. People avoid throwing flowers and other offerings to their gods because of their faith, instead placing them in plastic bags and releasing them publicly in water bodies and barren landsides. Eel and worm development, soil and water pollution, and terrible odour can all result from improper flower waste disposal. Solid trash and littering cause the physical look of water figures to deteriorate, as well as the water quality to deteriorate. The flower waste gives the streets and highways a filthy appearance, as well as distorting the image of ghats along various water bodies. However, a modern methodology exists to convert floral wastes into value-added products such as compost, biofuels, bioethanol, organic acids, pigments, dyes, polyhydroxybutyrate-co-hydroxyvalerate production, food products, bio surfactants production, sugar syrup, incense sticks, handmade paper production, and so on.

Floral waste management

As shown in Fig. 1, a generalised framework proposed by [46] can be employed for successful solid waste management. This technology could provide integrated solid waste management techniques for extracting various products from municipal garbage, such as compost and energy. As a result, it has been stated that organic waste can be exploited to generate energy and organic manures. However, as detailed in the next sections, floral waste material has a high chance of recovering various valuable items. When compared to other debris, floral waste material does not require separation and may be simply collected from religious sites (temple, mosque, gurudwara, and church), wedding functions, festival zones, and other cultural programmes. Floral waste is collected in India at a rate of roughly 300 tonnes per day, according to [53]. In India, a considerable quantity of flowers, such as roses, marigolds, and carnations, are incorrectly disposed at various religious sites, banquet venues, and other festivals [70]. Approximately 8 x 106 tonnes of flowers are tossed in water bodies such as rivers, lakes, or ponds (because of sacred regard) or open landfills each year, posing an environmental danger. Decaying flowers contain organic material, which stimulates algae growth and lowers oxygen levels in water bodies, posing a threat to aquatic species. On the other hand, roadside abandoned floral waste (by flower vendors or otherwise) attracts vectors [24] and can be a source of disease transmission as well as worsening of air quality because their decomposition generates greenhouse gases such as carbon dioxide (CO2) and methane (CH4) [54]. Furthermore, the environment deteriorates during the monsoon season because this is the best time for mosquito breeding, and flies are widespread on these wastes. If the leachate from the floral remains is mixed with water, it might cause health problems [70]. On the other hand, according to [59], this floral residue can be turned into value-added items or compost by employing some current scientific procedures, such as the formation of biochar, vermicompost, natural dye, and biogas for industrial application. Because of the presence of key plant chemicals such as phenolic compounds and carotenoids, some flowers have antioxidant qualities [51]. These types of plant compounds can also be useful in the treatment of skin diseases and as anti-aging agents [1]. Different sections of flowers are used as feedstock for the food, pharmaceutical, and cosmetic sectors due to their antioxidant and therapeutic characteristics [67]. Vermicomposting is one of the best biotechnological approaches for floral waste management since it involves diverse soil microorganisms and earthworms converting organic waste into usable fertilisers (vermicompost) [57]. However, the presence of phenolic compounds dominated by lignin and cellulose in the composting mixture, as well as other environmental conditions, delays the vermicomposting process of floral waste [9]. As a result, certain more suitable methods for obtaining value items from floral waste are in demand [60]. [22] conducted a case study on proper solid waste control procedures on every person of Mumbai (India) as well as some groups such as the University of Mumbai, Godrej, and others. The success percentage in those waste management studies was reported to be between 80 and 98 percent. As a result, large trash generated by ritual offerings in

India, such as various types of flowers, leaves, milk and its products, and so on, requires an acceptable management system for efficient disposal [59]. According to [7], flavonoids and carotenoid pigments, as well as yellow to red-colored marigold flowers, are the principal components of floral waste generated in Indian cities.

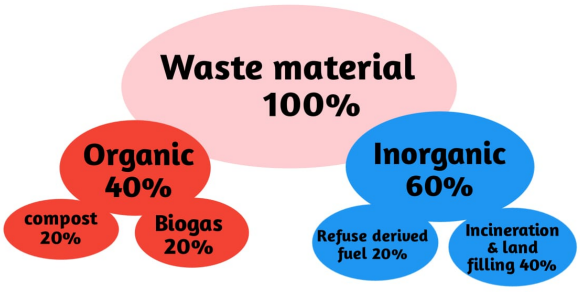

Figure 1: An integrated approach for MSW management [64, 46]

Floral waste management by different value-added products

Compost production

Compost made from flower waste is high in key nutrients like nitrogen, phosphorous, calcium, and potassium, as well as micronutrients like iron, magnesium, zinc, and copper, making it a valuable agricultural commodity [52]. A rotary manner is an effective mechanism among many composting approaches (rotary drum, windrow pile, agitated pile, and aerated pile). The use of a rotary drum and aeration produces compost that is well mixed, secure, and developed. Furthermore, this system is simple to set up anywhere there is an organic or floral waste supply. This method is also used to make compost from sludge waste and by-products from olive and wine mills, organic waste materials such as vegetable residues and tree leaves [27], and household garbage (kitchen waste) [71]. Despite the fact that there are just a few studies of the use of this procedure for floral waste composting [54], different types of agents (rice shell, sawdust, outer layers of wheat, and dead leaves of plants) have been purposefully utilised in the rotating drum organic wastes compost manufacturing method. The C: N ratio is an important determining element for microorganism proliferation, compost nutritional content, and purity, as well as the maturity of organic compost [20]. According to [4], flower waste maturity is largely determined by the range of NH4+-N, which should not exceed 400 mg/kg. Floral waste material is often a high supply of phosphorus (almost 3.18 g/kg), which promotes crop maturity, seed formation, and plant growth and development [55]. As a result, in India, compost generation is suited for the effective management of floral waste. Floral, sawdust, and cattle dung in amounts of 65kgs, 10kgs, and 25kgs, respectively, can be used to generate compost with a 14 Carbon to Nitrogen ratio, 7.1 pH, roughly 32.98 percent total organic carbon, and an electrical conductivity of 3.31 S/cm [55].

Production of vermicompost

Residents in India's most sacred places, such as Varanasi, Haridwar, and others, used to throw tonnes of offered flowers in the Ganga River, which aided the proliferation of disease-causing organisms and contributed to the filthy banks. Converting floral wastes into nutrients and humus-rich organic compost by aerobic composting was proven to be a major strategy as a solution to manage this problem and control negative environmental consequences [58]. According to [15], vermicomposting is one of the best organic waste disposal alternatives, and it can be quickly accelerated in mesophilic settings by microorganisms and earthworms. Vermicompost has been recommended as an agriculturally useful material with little contamination and a high water holding capacity [41] due to the availability of homogenous nutrients, low contamination, and a high water holding capacity. Apart from important plant growth hormones, vermicompost provides a rich source of helpful microbes, enzymes, and macro and micronutrients that are advantageous to plant growth [28], as well as having an infinite nutrient holding capacity for agriculture-friendly microorganisms [44]. Plant growth hormones such as Cytokinins, Gibberellins, and Auxins [31] are abundant in vermicompost, as are plant growth promoters such as humic acids, which aid in the production of a variety of crops [3]. Plant growth and development are also influenced by microorganisms such as fungus, actinomycetes, and bacteria [17]. Furthermore, earthworms thrive in areas with high porosity, are well-drained, have a high water holding capacity, and are well-aerated [65], and provide a plethora of micro-sites to preserve high nutrients and microbial activity [56]. Organic waste from agro-industries [6, sewage sludge [21], and animal compost (dung, fodder residue) [66] are all important sources of raw material for vermicompost. [25] developed a microbial consortium to create NPK-rich bio fertilisers for the rapid degradation of floral waste material. By using mechanisms such as Phosphorus dissolution in the soil and nitrogen fixation from the atmosphere, these bio fertilisers help to boost crop output in a desired way without causing harm to the soil. Through the conversion of floral waste indicated by [34], physico-chemical characteristics such as electric conductivity, temperature, pH, volatile solid samples, and moisture content material are gathered from several temples in Surat city (Maharashtra, India). [45] discovered that organic waste is a rich source of cellulose, hemicellulose, and lignin, which can be decomposed quickly using extremophiles such as Pseudomonas sp. and Bacillus subtilis, reducing the time spent in different stages of decomposition such as the Psychrophilic phase (>15oC), Mesophile phase (15-45oC), Thermophile phase (45-80oC), and Hyper thermo According to [48], extremophiles present in floral waste can shorten the time it takes for organic wastes to reach the thermophilic phase of decomposition.

Natural coloring agents

In Indian temples and other religious buildings, marigold (*Tagetus erecta*) flowers, which belong to the Asteraceae family, contribute significantly to floral waste. Marigold is used as a natural textile colour because it contains carotenoid-

lutein and flavonoid-patuletin. Pre-treating silk, wool, and cotton with 5% plant extract and 1-2 percent metal mordant yielded a strong colouring agent for silk, wool, and cotton. The extraction of carotenoids and flavonoids from dry marigold flowers using ethanol and a new solvent allows for selective extraction. In this removal technique, the ethanol solvent can also be recovered [69]. Kusum flower (*Carthamus tinctorius* L.) is used to remove natural colours so that it can be utilised as a taste enhancer in food items, and vegetable oil can also be employed [75]. According to [19], 627,653 tonnes of safflower were produced worldwide in 2018, with Kazakhstan, the United States, and India being the top three producers. According to a case study conducted by [49], over 1450 tonnes of flowers, including rose, jasmine, marigold, chrysanthemum, hyacinth, roselle, and tuberose, are given in Indian sacred locations and are the most wasted flowers. They suggested that we use this floral waste to extract essential oils and dyes to tackle the problem of such waste. Hexane, methanol, and ethanol solvents are used to dissolve dried and ground flower waste in the extraction of dyes, while oils are extracted via distillation, soxhelt apparatus, and heated sparkling flowers with an appropriate solvent in the extraction of oils. Extracted dyes can be used as a colouring agent on clothing [73]. The by-product of the dye extraction process can be converted into an efficient absorbent or biochar, which can be utilised to treat water and enhance soil quality [60].

Biogas production

[47] conducted an experiment in which they used cow dung as inoculum to produce biogas from floral waste (*Chrysothemis pulchella*, *Hibiscus sabdariffa*, *Markhamia lutea*, *Peltophorum africanum*, *Albizia julibrissin*, and Jasminum) and vegetable residues (ladies finger, carrot, brinjal, cabbage, and so on) and vegetable residues (ladies finger, carrot, Biogas produced from floral waste had a lower decomposition time of 16.7 g/kg, while biogas produced from vegetable waste had a lower decomposition duration of 9.1 g/kg. Furthermore, most flowers in India are appropriate for biogas extraction, and this will create a sustainable concept of wealth from waste [73]. According to a study [47], biogas (biofuel for power generation) may be created utilising a variety of flower species, with each flower species carrying a different amount of biogas, as shown in Fig. 2.

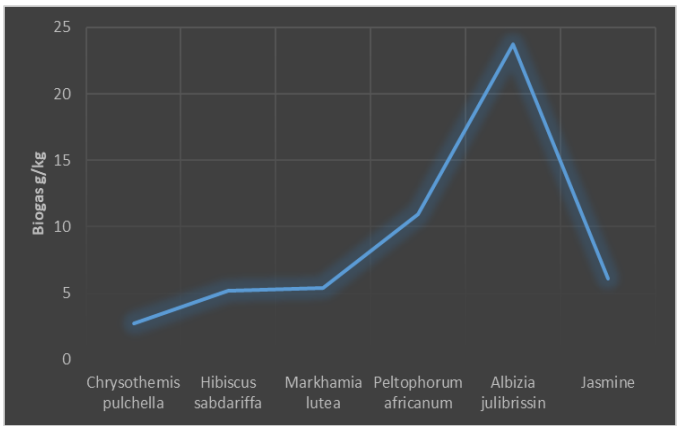

Figure 2: Biogas production from various flowers in Kenya [64]

Biogas was created utilising safflower (Kusum flower)-based lignocellulosic waste in an experiment [23]. It's said to be cost-effective, and it's also been proven to be suitable for biogas extraction via anaerobic breakdown of organic waste. Superior quality compost produced as a by-product of anaerobic digestion, on the other hand, may reduce the risk of air and water quality degradation [14]. Biofuels such as methane and hydrogen can also be produced from many forms of lignocellulose-rich waste materials, according to [63]. However, compared to hydrogen energy production, methane production from such waste is more cost-effective. According to [13], these types of wastes are abundant in agriculture-related businesses, and creating bioenergy from them would be a valuable resource. Mishra et al. [37] conducted a study on dahlia to determine the plant's ability to produce sustainable biofuel. According to the study, using four kinetic models, this flower debris can be exploited to release a significant quantity of bioenergy. As a result, it is clear that, as compared to other plants, silk tree mimosa and African wattle have a huge capacity to supply organic fuels. This study, on the other hand, reveals that flower waste can also be used to generate electricity for better use.

Environmental friendly bio sorbents

Some researchers have created environmentally acceptable bio sorbents from floral waste to remove hazardous colourants and heavy metals present in the aqueous media, according to [70]. Saffron flower debris has been used as a green bio-adsorbent to remove lead from aqueous solutions [30]. Within 9 minutes, the adsorption system reached stability, with a capacity of roughly 36.97 mg/g. According to [61], lignocellulosic biomass can be converted into bio-oil, charcoal, and syngas by thermochemical conversion when combined with environmental management. Acid blue 9 (also known as Food blue 2), methylene blue [60], [16], lead & cobalt [8, chromium (III and VI) [18], chromium (VI) [68], and nickel [10] have all been identified as potential adsorbents for removing hazardous colourants and metals from water. Biochar was recently produced by [60] using flower waste to remove a dye, methylene blue, from an aqueous media. At 500oC and 350oC, respectively, about 36 percent and 42 percent biochar adsorbents were produced. As a result of the pyrolysis technique, it is feasible to convert floral waste material to biochar, which can be utilised as an effective adsorbent to remove pollutants like as heavy metals, synthetic dyes, and other organic pollutants from waste water [60] and to enhance soil quality [61]. According to [38], biochar is a nutrient holding capacity improver and also mitigates global climate change since it is a highly carbon carbonaceous and soil ameliorant with a wide external surface area and macro and micro nutrients on the surface. Figure 3 depicts the percentage value of several types of nutrients present in biochar generated at 500°C for soil health enhancement.

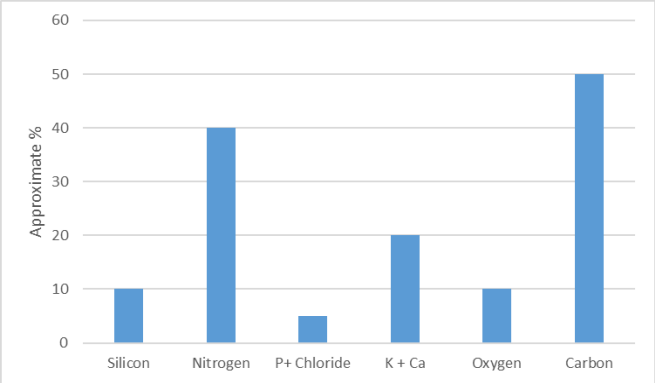

Figure 3: Status of soil nutrients availability in biochar produced at 500°C [64]

As seen in Fig. 4, carbon was reported at 50%, while nitrogen was at 40%, and (C: N) carbon and nitrogen are two of the most critical nutrients for maintaining soil health [11]. As a result, researchers have confirmed that a floral ingredient may both eliminate water contaminants and improve soil health.

Miscellaneous products extraction from the floral waste

Flowers in various areas of the saffron contain calcium, manganese, potassium, phosphorus, iron, and a substantial number of proteins and fibres, according to [51]. In the minimal carbonless media, a dried and 1% sterile powder made from of flower waste collected from various temples and other sacred sites was added. The strong growth of numerous mixes of soil isolates (strip injected on this agar medium of floral waste) was exploited for related development [25]. In Morocco, [26] extracted some beneficial chemical components (antioxidants) from saffron blossom waste. According to the authors, 1 kg dried saffron requires the trimming of 167,000 florets, and after saffron is collected, the other floral parts become unusable. Minerals, proteins, soluble sugar, and lipids, among other things, were recovered from this waste residue. Natural phenols with strong therapeutic potential were also discovered. The findings aided in the development of undiscovered value-added goods from saffron floral waste, as well as trash management to keep the country clean. [5] conducted research and discovered that certain flowers can be used to create natural nanoparticles for use in modern medical sciences (for example, breast cancer treatment, gastrointestinal difficulties, pancreas diseases, and so on) since these nanoparticles have antibacterial and antifungal properties. *Punica granatum* L. (Pomegranate) has been widely employed in traditional medicinal disciplines such as Ayurveda, Chinese, and Unani in the treatment of unique human disorders such as diabetes and baldness, according to [62]. Similarly, biochar was obtained by [33] from the blossom of *Cotinus coggygria* L. (commonly known as European smoke tree) using a carbonization method that was seen using chemical stimulation. Biochar was obtained and employed as supercapacitors to improve the characteristics of an electrode.

Handmade paper production

Temple floral waste can be used as a sustainable source of raw material for the manufacturing of handmade paper [74]. This method not only reduces the amount of rubbish generally wasted from city temples, but it also recycles and reuses it as a raw material for environmentally beneficial paper production. Handmade paper manufactured from flower waste has a number of advantages, including being 100 percent wood and chemical-free, as well as producing no harmful by-products throughout the manufacturing process [12]. As a result, the concept of reducing, recycling, and major reuse can be used to the production of handmade paper from floral waste. The difficulty of disposing of flower trash can also be solved.

Significance of floral waste management in India

According to [43], India produces roughly 4.74 x 106 t/d of floral wastes, putting it in second place behind China. Approximately 40% of daily flower production goes unsold, resulting in waste. Only in India and Sri Lanka [25,35]. Varanasi (India), for example, although being one of the holiest cities in the world, lacks a well-managed system for safely disposing of vast amounts of trash. In this holy city, 3500 to 4000 kg of material is discarded as rubbish [37]. Only in the vicinity of temples, according to the Varanasi Nagar Nigam (VNN), 1000 kg of flowers are lost every day. According to [70], commonly wasted flower species include Hibiscus *Rosa sinensis* (Gurhal), marigold with rose, and *Calotropis gigantean*, which can be found in well-known temples such as Durgakund, Varanasi, including (Gudhal), Vishwanath temple, and shiv temple Mrityujayamahadev, Visheshwarganj, Varanasi. Similarly, floral waste from two famous Chitrakoot temples, Ramghat near the Mandakini river and Lord Kamtanathji, is generated 5000-7000 times every year [70]. Some researchers reported making vermicompost out of floral wastes, which is a great way to get people interested in organic gardening [50]. Because India is one of the most religious countries in the world, worship is an important part of daily life, and people offer a variety of flowers, eatables, and wearables, with the most commonly offered flowers include. Jasmine, hibiscus, rose, and marigold are some of the most popular flowers. Because of the great number of flowers available, a lot of floral waste is generated, which can be used to make useful and consumable products through vermicomposting, extracting colourants and essential oils, making eco-friendly Holi colours, and extracting bio-gas. Furthermore, it will aid in the control of environmental degradation caused by incorrect dumping of floral waste, thereby saving the environment. Floral waste material can also be utilised to make handmade paper and incense sticks, as recommended by [73]. In India, the CSIR's sister research laboratory, IIT-Kanpur, and some Maharashtra academic institutes have developed scientific techniques for extracting a variety of valuable products from floral waste, including natural colours, sticks, hawan samagri (for religious purposes), interior decorative items, environmentally friendly manures, and so on. Normally, waste generation should be controlled at the source. For example, at the industrial level, it can be lowered after changes to the packaging steps, lowering the

number of extra derivatives used throughout production, and improving technical viability. Local residents, on the other hand, can contribute to waste management initiatives by adopting responsible behaviours such as using more ecologically friendly and recyclable items that are not harmful to the environment or human health. Raw food materials are in higher demand in underdeveloped countries, while processed food materials are in high demand in industrialised ones. As [39] suggests, the municipal solid waste management frameworks of emerging and industrialised countries cannot be comparable due to significant differences in waste contents. viability. Furthermore, [40] found that integrated municipal solid waste management strategies may be achieved by reducing trash at its source by employing effective extraction, collection, and transportation methods, as well as the processing of reusable waste materials, composting, and energy production. According to [39], industrialised countries have better solid waste management since they can collect 100% of wastes, whereas underdeveloped countries can only collect 74.1 percent (average 18 percent -100 percent). Similarly, [2] found that in 2008, London and Kumasi (Ghana) created 30 percent and 64 percent of organic waste products, respectively. Low financial input, insufficient infrastructure, and a lack of citizen accountability are all key hurdles to effective solid waste management in underdeveloped countries. In addition to proper solid waste management, waste materials have been reported to be an inexhaustible source of energy generation. Furthermore, it will contribute to economic growth [29]. The biggest challenge in producing energy from waste materials in developing nations, however, is the high establishment charge of the systems [32]. The infectious organisms found in garbage made up of plastic, papers, or other materials can be killed by burning them. However, it produces toxic dioxins, which are extremely harmful to ecological systems and human and animal health [42]. As a result, trash recycling and the manufacture of value-added commodities from waste materials may be beneficial to the country and its people.

II. CONCLUSION

Improper disposal of solid waste material has become a global issue. Solid waste includes mainly five major types like as municipal solid waste, Debris (construction as well as demolition), e-wastes, industrial sludge, and hospitality wastes. Due to the modern lifestyle of humans, municipal solid waste is increasing rapidly specially in urban areas. However, about 50% of the total solid wastes are organic. Floral residues are also a valuable organic waste material that may be used to gain treasured goods including natural coloring agents, bio fertilizers, biofuel and bio adsorbents for water treatment. Moreover, some important nutrients are also obtained from saffron flowers in Morocco. Therefore, it has been well-known that proper floral waste management can give us various valuable goods. Further, the medicinal properties of the flowers should also be explored in near future. However, it is imperative to include all the participants such as academia, NGOs, scientists, ministries, local public, etc. to put in the best efforts for the improvement in the techniques of waste management as well as to increase the financial level of the residents. Furthermore, waste management methods can be useful to get the fractional aims of 9-10 sustainable development goals which are given by the United Nations. At last, it can be determined that every waste can give valuable goods if it managed properly.

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