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Circular economy in Poland: Good practices and recommendations – case study

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ABSTRACT

This review paper explores circular economy (CE) initiatives and Green Public Procurement (GPP) practices in Poland, focusing on practical implementation and regulatory frameworks. The concept of CE is explored in depth, focusing on its potential to mitigate climate change and resource depletion by extending product lifecycles and reducing waste generation. Transitioning to a CE model offers numerous environmental and economic benefits, including decreased greenhouse gas emissions, enhanced resource efficiency, and job creation. The transition to a circular economy aligns with sustainable development goals. GPP drives demand for eco-friendly products and services, evolving to include environmental and social considerations. The Sztum Circular Economy (SCE) project, funded under the "Environment, Energy, and Climate Change" program, serves as a case study to illustrate the practical application of CE principles locally through initiatives like selective waste collection and educational campaigns. This review highlights the synergy between CE and GPP, offering guidance for policymakers, municipalities, and stakeholders seeking to advance sustainability agendas at the local and national levels. By embracing CE and GPP, countries can accelerate the transition to sustainability while addressing environmental and social challenges.

Keywords: circular economy, green public procurement, waste management, good practice.

INTRODUCTION

The CE is one of the popular terms today. According to the European Union Parliament (European Parliament, 2023), the circular economy is "a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing, and recycling existing products for as long as possible". Therefore, the CE aims to minimize the amount of waste generated by extending the life cycle of products. An additional aspect is the potential to create further value through the productive use of materials retained in the economy through recycling. Thus, the CE represents a departure from the linear economic model (Ellen MacArthur Foundation, 2013).

The concept of the CE is presented in Figure 1. Recycling and reusing materials slows down the consumption of natural resources and reduces the overall annual greenhouse gas emissions, thereby mitigating negative impacts on ecosystems and biodiversity. The increasing amount of waste poses a growing problem worldwide and in Europe. More reliable products, modernized waste systems, and environmental considerations in the design phase would reduce waste. On a European scale, transitioning to a CE would mean reduced risks associated with raw material supply and dependency on the import of certain resources. CE can also enhance competitiveness and create new jobs. It is estimated that within the European Union alone, 700,000 jobs will be created by 2030 as a result of circular economy implementation (European Parliament, 2023).

In the case of waste management, a very important issue is GPP. The GPP refers to a process whereby public and semipublic authorities seek to procure goods, services, works, and utilities by

Figure 1. The circular economy model (https://repak.ie/driving-change/circular-economy-eu-legislation)

choosing solutions that have a reduced environmental impact throughout their life cycle when compared to goods, services, and works with the same primary function that would otherwise be procured. This means the concepts of the life-cycle analysis (LCA) and the life-cycle costing (LCC) are at the heart of the Green Public Procurement (European Commission, 2016, de Oliveira and de Souza, 2023). They are total economic and environmental costs that need to be considered by the buyer and supplier at every stage of procurement, from pre-procurement to the monitoring stage (Buying for Victoria, 2023). GPP takes a broader view of environmental sustainability by addressing issues such as the circular economy (maintaining the value of materials and products in the economy for as long as possible, reducing resource use, and preventing waste), land use, biodiversity, and air, water, and soil pollution.

The paper presents the experiences gained during the implementation of the Sztum Circular Economy – Responding to Contemporary Climate Challenges project, which was implemented under the "Environment, Energy, and Climate Change" program. This project initiative aims to support the implementation of a circular economy. The main objective of the project was to create a new integrated program to support the implementation of a circular economy. The primary investment of the project was the establishment of a selective collection point for municipal waste for the municipality of Sztum, along with a repair and storage hall. Other measures included solutions to enable the implementation of best practices in circular economy processes. These include creating educational offerings for a wide range of society, including adults, children, and youth. The project will also contribute to the dissemination of circularity ideas in the region and internationally through a series of seminars and international conferences.

The aim of the paper is to present best practices in waste management based on Polish case studies, as well as the principles of GPP, which have a significant impact on reducing the amount of waste.

FRAMEWORK FOR THE CIRCULAR ECONOMY

Legal framework for the circular economy

In Poland, actions related to the CE are not a new issue. Both the public administration and scientific institutions and entrepreneurs have been implementing various elements of the CE for many years, although they often refer to them differently. Actions implemented so far under the banner of green economy, cleaner production, sustainable development, or low emissions often contribute to "closing the loop" due to their primary goal being often to ensure that products are manufactured and utilized as efficiently as possible, and the resulting waste is managed in an economically and environmentally optimal way.

The legal framework is crucial for promoting the CE. A significant legislative instrument is the Waste Act of 14 December 2012 (Waste Act, 2012). This act aligns with the European Union's directives on waste, particularly Directive

2008/98/EC on waste, which emphasizes waste prevention, recycling, and environmentally sound disposal. It establishes a clear legal framework for the collection, transportation, recovery, and disposal of waste, ensuring that these processes are conducted in a manner that safeguards human health and the environment. One of the salient features of this Act is the waste hierarchy, which prioritizes waste prevention, followed by preparation for re-use, recycling, other recovery methods, and, as a last resort, disposal. This hierarchy is crucial for promoting resource efficiency and reducing environmental impact. One of the key aspects of this Act is the waste hierarchy, which puts waste prevention first, followed by preparing items for reuse, recycling, other recovery methods, and finally, disposal as the last option. This hierarchy is essential for using resources efficiently and reducing environmental impact. This Act indicates that producers are responsible for their products throughout their entire lifecycle. Thus, the producers are encouraged to design products that are easier to recycle and create less waste, promoting more sustainable practices. Additionally, the Act includes the polluter-pays principle, which ensures that the costs of waste management are covered by those who generate the waste. This helps internalize environmental costs and encourages waste reduction right from the source.

Complementing the Waste Act is the Regulation of the Minister of Climate of 2 January 2021 on the Waste Catalogue (Regulation of the Minister of Climate, 2021). This regulation provides a detailed classification system for waste, which is essential for the proper identification, monitoring, and management of waste streams. The Waste Catalogue categorizes waste based on its origin and composition, facilitating the segregation of hazardous and non-hazardous waste. Such precise classification is crucial for ensuring that waste is treated appropriately, minimizing environmental risks, and enhancing the efficiency of recycling and recovery processes. The Regulation also helps promote the CE by setting standardized practices for waste management. By defining specific codes and categories for different types of waste, it enables better tracking and reporting, which are necessary for assessing the effectiveness of waste management policies and identifying areas for improvement.

On September 10, 2019, the Council of Ministers adopted a resolution on the adoption of the Roadmap for the Transformation towards a Circular Economy (Service of the Republic of Poland, 2019). At the initiative of the Ministry of Environment, in cooperation with the Ministry of Development and Technology in implementing the CE, a pilot program called "Circular Economy in Municipalities" was launched in 2017 and funded by the National Fund for Environmental Protection and Water Management. The pilot program was implemented in 2020 and involved three municipalities: Łukowica (Małopolskie Voivodeship), Tuczno (West Pomeranian Voivodeship), and Wieluń (Łódź Voivodeship).

Institutional framework

In Poland, the main institutions responsible for waste management at the national level within the government are: (i) Ministry of Climate and Environment: responsible for shaping environmental policy, including waste management. The ministry supervises and coordinates the actions of other institutions in this area; (ii) Environmental Protection Inspectorate: serves as the environmental supervision authority, monitoring compliance with waste management regulations; (iii) Agency for Restructuring and Modernization of Agriculture: responsible for controlling and supporting activities related to waste disposal in the agricultural sector; (iv) National Fund for Environmental Protection and Water Management: finances environmental protection projects, including waste management, at the national level.

At the provincial level, waste management is overseen by:

- Provincial Environmental Protection Inspectorates: tasked with controlling and supervising waste management within a given province;
- Provincial Funds for Environmental Protection and Water Management: finance environmental protection projects, including waste management, at the regional level.

At the local level, waste management is the responsibility of:

- County offices: responsible for organizing and supervising the waste management system within a given county, collaborating with municipalities and overseeing waste processing facilities;
- Municipalities: serve as the primary entities in waste management as municipal waste is collected within their territories. Municipalities

are obliged to organize waste management systems, including collection, sorting, processing, and disposal of municipal waste.

BEST PRACTICE IN WASTE MANAGEMENT

In the face of the growing problem of environmental pollution and limited natural resources, effective waste management is becoming a key element of sustainable development. In the case of waste, the fundamental principle is to prevent its production, and then reuse, recycle, find other ways to recover materials, and as a last option, dispose. Municipalities play a crucial role in waste management by implementing innovative solutions like community recycling programs and sustainable procurement policies. Collaborative efforts between government, industry, and civil society are crucial for scaling up successful waste management initiatives and fostering the CE. Monitoring and evaluating the effectiveness of waste management strategies are critical to identifying areas for improvement and ensuring continuous progress toward sustainability goals. Public awareness campaigns and education initiatives are essential for promoting waste reduction behaviors and fostering a culture of environmental responsibility (UNEP, 2016).

Best practice in Poland

One of the most important solutions for sustainable management in Poland is recycling stations which are called the Selective Municipal Waste Collection Points (Recycling Station). These points enable residents to dispose of various types of municipal waste, such as used batteries, household chemicals, used paints, electronic waste, furniture, and other items that should not go into regular trash bins. Waste collected at recycling stations undergoes a process of selective collection and subsequent recycling or safe disposal. In municipalities where such points operate, there is a noted decrease in the mixed waste stream collected directly from residents.

According to the adopted Voivodeship Waste Management Plans and investment plans for 2016–2022, 1.752 recycling stations were operating in Poland, covering 69 percent of municipalities. On average, one point served 21.661 residents.

The location of recycling stations has a direct impact on its efficiency. When planning the investment, it is essential to find a primarily functional site, meaning it allows residents (including those without cars) to reach the point and utilize its services. Additionally, the service area should not be too large. It is recommended to establish a network of points in cities with over 100.000 inhabitants to efficiently serve a large number of residents, particularly in densely populated areas.

Practice shows that the highest number of visits to recycling stations occur in the afternoon hours on Saturdays, Mondays, and Fridays. Therefore, the recycling stations operator should adjust its operating hours to match the preferences of the local community, allowing residents to drop off waste at convenient times. Regarding the layout of containers, storage areas, and bays within recycling stations, these decisions should be made during the planning stage of the point. A thorough analysis of the waste stream generated by households will facilitate this. It is important to avoid stairs, ladders, and cramped spaces. Ensuring open areas and access ramps with appropriate inclines for wheelchair users is essential.

Between 2016 and 2022 in Poland, there were 35 repair points and 74 reuse points associated with recycling stations. These points provide essential services for extending the lifespan of goods. These facilities offer repair services for damaged items and opportunities for reusable items to find new houses, promoting sustainability and waste reduction within communities (Głuszyński et al., 2024)

Case study

SCE actions, Sztum commune, Poland

As a part of the Sztum Circular Economy Project, two key investments in the field of sustainable municipal waste management were implemented in the Sztum commune. Thanks to the project activities, the selective waste collection system was expanded within the commune and covered all its residents. In the city of Sztum and its surrounding model places have been created, where the assumptions of the circular economy are carried out in practice. In the village of Sztumskie Pole a modern recycling station was built, whereas in the city of Sztum a hall served as a preparation and repair point for waste items for reuse. Part of the hall is an exhibition space where restored products brought by residents are displayed.

Recycling station in Sztumskie Pole

The recycling station in Sztumskie Pole was opened for inhabitants in October 2023. The facility occupies an area of 2,685.0 m^2, including a building area of 194.54 m^2, paved surfaces of 1,642.31 m^2 and green areas of 848.15 m^2. It consists of a social and office container, a warehouse building, an access ramp with a truck scale, and waste containers designated for specific waste fractions. The station collects the following types of waste (Fig. 2):

- paper and cardboard;
- plastic;
- clear or colored glass (bottles and jars);
- other packaging waste, including multi-material packaging;
- metals and scrap metal;
- green and biodegradable waste;
- ashes;
- medical waste such as expired drugs, syringes, needles, thermometers etc.;
- expired chemicals, chemical packaging, used oils, solvents, paints, varnishes, etc.;
- fluorescent tubes and lamps, light bulbs;
- used batteries and accumulators;
- used electrical and electronic equipment;
- construction and demolition waste (excluding hazardous waste) including doors, windows, glass;
- concrete rubble;
- furniture and other bulky waste;
- used tires.

At the recycled station listed waste fractions are sorted and subjected to preliminary preparation. Some fractions (including hazardous ones) are transported to companies dealing with professional disposal of this type of waste or companies recovering raw materials. Whereas waste fractions suitable for reuse are forwarded to the repair, storage, and exhibition hall in Sztum called "Second Chance Circular Station", a point for repairing and reusing waste products, where they are further processed.

Second chance circular station (repair, storage, and exhibition hall in Sztum)

The Second Chance Circular Station in Sztum has been serving the residents of the commune since spring of 2024. Used items delivered to the hall can be repaired and regenerated in order to restore functionality or increase their attractiveness and utility value (which is in line with the upcycling idea). Such activity is consistent with the circular economy model and the zero-waste trend. Moreover, the station is also an educational space that brings together residents and strengthens social relations (Fig. 3).

Figure 2. Recycling station in Sztumskie Pole (photo: K. Fitobór)

Figure 3. The second chance circular station in Sztum (photo: L. Szymańska)

The total area of the hall is 1585 m^2, including a building area of 648 m^2 and paved surfaces of 937 m^2. Inside the hall there is an office, workshop, and exhibition space for the secondary turnover of part of the waste items, social rooms, and toilets. The repair point is a facility that receives waste products that can be given a "second life" (after being repaired and regenerated), thereby extending the product's life cycle. The point accepts products such as:

- furniture and other large items;
- electrical and electronic equipment;
- mirrors, heat-resistant glass, duralex;
- kitchenware, porcelain, faience, crystals;
- ceramics, flowerpots, etc.;
- toys;
- sports equipment;
- clothes, shoes, accessories (glasses, belts, jewelry, etc.);
- textile waste (curtains, carpets, rugs, blankets, bedding, etc.).

The carpentry and crafts workshop (established at the repair point) is equipped with the necessary tools that residents can use to carry out repairs themselves. The workshop is supervised by a person employed for this purpose, a so-called handyman. This employee also provides selected repair services for products returned to the point, which are then sent to the exhibition hall for further use by interested parties, mainly residents. However, the exhibition space is not only an area where upcycled waste is displayed. It is also a potential meeting place for the local community during thematic events (e.g. "Earth Day" or the annual Open Day of Second Chance Circular Station), as well as a perfect place to conduct multi-generational ecological workshops and creative upcycling classes.

In March and April 2024, as a part of the existence of the circular station "Second Chance", a series of 32 workshops were conducted. These were classes on repairing, renovating, decoration and giving new functions to used objects, in which the residents of the Sztum commune were involved. The classes covered a variety of topics, including: reusing used clothing and other materials, creative use of electronic waste, self-repair of bicycles using equipment available at home or "zero waste" culinary workshops. It should be emphasized that this type of workshop has a huge social dimension. They integrate residents of different ages and backgrounds, and what's more – they can also be combined with charity events, e.g. sewing beds for dogs and cats from a local shelter.

To sum up, the concept of building the recycling station and a repair-storage-exhibition hall, together with activities accompanying the investment, is a well-considered strategy that perfectly fits into the basic assumptions of the circular economy. This means the effective implementation of current tasks of sustainable municipal management, i.e. recovery and reuse of waste. On the other hand, it is the repair of worn or broken items in order to increase and even restore their utility value. Ultimately, it also involves sharing goods, which results in a reduction in the amount of waste produced.

EKOFABRYKA Wejherowo, Poland

Ekofabryka was established on the site of the former woodworks in Wejherowo, in the industrial district. It complements the existing municipal waste management system. It is a modern center for recycling and upcycling of reusable items and a center for environmental education for citizens and beyond. The building and its adjacent brick chimney are entered in the Wejherowo Communal Register of Historic Monuments and are under conservation protection (Fig. 4).

Figure 4. a) The front of Ekofabryka building, b) recycling stations (photo: K. Bobokowska)

In the Ekofabryka building, there is the Citizen Service Office, the "Wejherowskie Klamoty Gallery", the recycled library, the upcycling and recycling zones, and an internal educational path. Ekofabryka conducts pro-environmental activities, training, and meetings on ecological issues

In the upcycling and recycling area for repairs, there are stands comprehensively equipped with specific tools. This part of the Ekofabryka has eight stands (Fig. 5):

1. Two general workstations
2. A station for woodworking and antique restoration;
3. Bookbinding station
4. Tailoring station
5. Home appliance station
6. Bicycle repair station
7. Glass processing station
8. Metal working station.

The education center is open to anyone interested in ecology, recycling waste, refurbishing objects, repairing appliances, and a zero-waste lifestyle. The former factory building is adapted for people with disabilities. Workshops and lectures for children, young people, and adults are held to raise environmental awareness (Fig. 6a). Ekofabryka also cooperates with other municipal

Figure 5. General workstation (photo: M. Kasprzyk)

Figure 6. a) Educational room, b) "Wejherowskie Klamoty Gallery" (photo: M. Kasprzyk)

units in the field of education. It promotes eco-volunteering, which is still not very popular in Poland. This type of volunteering aims to activate the local community. Eco-volunteers have the opportunity to share their knowledge and skills with residents.

As part of its environmental activities, the Ekofabryka has a sales hall, the "Wejherowskie Klamoty Gallery" (Fig. 6b), with an area of over 400 m^2, which includes:

- a temporary exhibition, including a display of items recovered from the white goods workshop and furniture repair, etc;
- a permanent exhibition of technical relics;
- a recycled library.

The items undergo an initial assessment. If they do not require repairs or restoration, they go directly to the Gallery. If they require repairs, they go to the workshop. All items are valued. Those wishing to purchase an item are required to make a monetary donation to a non-governmental (local) organization of their choice. The total amount donated from the seven editions of the "Wejherowskie Klamoty Gallery" is over PLN 100,000.

Recycling station is a part of Ekofabryka (Fig. 4b). It is equipped with a weighbridge and loading ramp. It accepts a wide range of waste from residents: furniture and bulky waste, - paper and cardboard, glass, metals, plastics, green waste, rubble, building materials, chemicals, complete waste electrical and electronic equipment, used batteries and accumulators, light bulbs, expired medicines, clothing, and textiles, used car tires, items for reuse. A construction waste processing (recovery) yard is located in the eastern part of the site. A crusher enables the shredding of construction waste collected from residents and also accepted at the recycling station, and the material obtained will be almost 100% usable as, for example, raw material for road foundations.

General information:

- Number of inhabitants covered by the waste management system – over 70,000.
- The amount of waste accepted at the recycling station in 2023 (total) was 1000.63 Mg.
- The largest amount of waste collected in 2023, by category, is waste with codes:
  - 17 01 07 – mixed waste with codes of concrete, brick rubble, ceramic materials,
  - 17 09 04 – mixed wastes from refurbishment, and dismantling, other than those mentioned in 17 09 01, 17 09 02, and 17 09 03,
  - 20 03 07 – bulky waste.
- The level of municipal waste recycling in 2021–2022 was 33%.

GREEN PUBLIC PROCUREMENT

Green public procurement (GPP) criteria and requirements are the standards that public authorities use to procure goods, services, or works with a reduced environmental impact. They are based on a life-cycle approach and scientific evidence.

These criteria and requirements are normally set based on specific sectors. Requirements are the mandatory conditions that the tenderers must meet to be eligible for the contract. They are usually related to technical specifications, legal compliance, quality standards, and environmental performance. Criteria are the aspects that are used to evaluate and compare the tenders based on their quality, price, environmental performance, etc. They are usually expressed as weighted scores or percentages.

In both countries the priority sectors for GPP include (Rejeb, et al., 2023; Lundberg and Marklund, 2018)

- Construction (including raw materials such as wood, aluminium, steel, concrete, glass, as well as building products such as windows, wall and floor coverings, heating and cooling equipment, aspects related to building operation and decommissioning, building maintenance services, on-site construction works);
- Catering and food services;
- Transportation and transportation services;
- Energy (including electricity, heating, and cooling using renewable energy sources);
- Office equipment and computers;
- Clothing, uniforms, and other textile products;
- Paper and printing services;
- Furniture;
- Cleaning products and cleaning services;
- Healthcare equipment.

According to GPP in Poland, very important is Strategy or Action plan that helps public authorities implement GPP in a structured and effective manner. Thus, the GPP Strategy and Action Plan should consider the key principles that

provide a foundation for implementing GPP in a way that reduces the environmental impact of public procurement while promoting sustainable development. Basic principles for GPP include:

- Sustainability goals and policies: GPP should be aligned with the sustainability goals and policies of the public authority and the relevant legal and regulatory frameworks. (European Commission, 2013).
- Set GPP targets: Set ambitious targets for the adoption of green criteria in public procurement of products, services, and projects.
- Life-cycle approach: considering the environmental impacts of the goods, services, and works from cradle to grave, as well as the costs and benefits over their entire life span, when making procurement decisions (European Commission, 2016).
- Transparency: GPP should be transparent, fair, competitive, and non-discriminatory, ensuring equal access and opportunity for potential suppliers, vendors, and consultants.
- Innovation: GPP should be driven by innovation, providing incentives and opportunities for the development and adoption of environmentally-friendly solutions that meet the needs and expectations of the public authority and its stakeholders (Murray et al., 2017; Green Purchasing, 2023).
- Capacity building: GPP should be supported by adequate capacity building, awareness raising, and involving relevant internal and external actors.
- Pricautionary principle: GPP should apply the precautionary approach to avoid or minimize potential environmental harm.
- Polluter Pay Principle: GPP should consider the polluter pay principle to ensure the cost of environmental damage is borne by those responsible for causing it.
- Monitoring and reporting: Monitor the implementation of GPP and report on progress to ensure accountability and continuous improvement. (European Commission, 2013).

EDUCATION AND AWARENESS

The waste management principles create conditions for sustainable development, while environmental education ensures the proper functioning of waste management systems. Education and information on waste management are not only the responsibility of municipalities but also have a significant impact on the economic efficiency of waste management systems. Therefore, efforts should be made to reach residents through all possible channels, considering diverse target groups (age), types of settlements (rural, urban), and the availability of appropriate, tailored, and adequate information/communication tools within each municipality (European Commission, 2019): Ways and channels of communication with society:

- Websites dedicated to waste management in the municipality,
- Multimedia materials posted on websites, distributed among residents and educational institutions (preschools, schools),
    - o Movies about proper waste management,
    - o Announcements by municipal authorities and communal services in local media (websites, radio, and television),
- Collaboration with local media (Internet, press, radio, television):
    - o Interviews, broadcasts, articles, radio and TV spots, newspaper advertisements.
    - o Press materials: press releases, municipal/communal service announcements,
- Printed materials:
    - o Flyers, inserts, and brochures tailored to the age of the audience (especially recommended in rural and small urban municipalities, for people aged 50+ who have limited access to electronic devices and the Internet),
    - o Posters, including large-format ones, placed on municipal notice boards, bus stops, and local transport,
    - o Educational materials for teachers and students: lesson plans and educational materials,
    - o Calendars (including wall calendars) with ecological and waste-related content,
    - o Coloring books, crosswords, ecological and waste-themed games aimed at appropriate age groups,
    - o Printed forms for waste management payments (e.g., on the reverse of parking tickets – a solution for large cities),
    - o Signage on municipal vehicles and vehicles of companies involved in waste management (garbage trucks),
- Periodic promotional events dedicated to ecology and local occasions, enable ecological education of residents:

  - Recycling days, eco-picnics, open days at waste collection points (recycling station),
  - Environmental actions, e.g., waste collection in exchange for seedlings or gadgets,
  - Environmental competitions,
  - Local events (city days, festivals, fairs, harvest festivals, picnics),
  - Resident meetings, parish meetings, senior club meetings,
  - Workshops, seminars, local conferences,
  - Exhibitions particularly focusing on environmental protection topics;
- Mobile applications dedicated to waste management in the municipality (especially useful in large cities with over 250,000 residents),
- Eco-gadgets (pens, bookmarks, reflectors, coloring books, etc.) (Molok, 2024).

CONCLUSIONS

Based on the knowledge and experience gained during the implementation of the "Sztum Circular Economy" project, the following conclusions can be formulated:

1. The legal and institutional frameworks are crucial for promoting the circular economy.
2. In the case of waste, the fundamental principle is to prevent its production, and then reuse, recycle, find other ways to recover materials, and as a last option, dispose.
3. One of the most important solutions for sustainable management in Poland are recycling stations.
4. Good examples of sustainable waste management include the recycling stations in Sztum and Wejherowo, where, in addition to waste collection, a variety of other activities are carried out.
5. In the case of sustainable waste management, green public procurements play a very important role.
6. A crucial aspect of implementing sustainable waste management is raising awareness and providing education across all age groups.

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